ABSTRACT

MICHAELS, RONDA DEE. Benefits of Physical Activity for Children with Chronic Health Conditions. (Under the direction of Dr. Judy Peel).

It has long been proven that adults experience many benefits from regular physical activity, exercise and/or sport. Over the last ten years there has been an increase in research regarding the specific physical and psychosocial benefits of physical activity in adults and children. However, few research studies have examined both the physical and psychosocial benefits of an ongoing structured physical activity program for children with a chronic health condition.

Chronic health conditions including various cancers, congenital heart disease, lupus, diabetes, cystic fibrosis, renal disease, asthma, spina bifida, cerebral palsy, visual and auditory impairments, learning disabilities, attention deficit hyperactivity disorder and mental retardation affect approximately 10-20% of children aged 4-17 (Lanphear, Liptak & Weitzman, 1995; Cooper et al., 1999). There are approximately 45,000 children with a chronic health condition in North Carolina alone (Benedict, Farel & Howell, 1999).

Because of the proven importance of physical activity and the increasing numbers of children with chronic health conditions, it is important to explore the physical and psychosocial benefits of physical activity for these children. The purpose of this study was to determine if children with chronic health conditions, specifically those with a brain tumor, cancer and/or leukemia participating in Hoop Dreams Basketball Academy would score higher in physical self-efficacy and the health-related physical fitness components than children with cancer that do not participate in Hoop Dreams Basketball Academy.

The Physical Self-Efficacy Scale (Ryckman et al., 1982) and The Brockport Physical Fitness Test (Winnick & Short, 1999) were used to investigate the physical self-efficacy and
health-related physical fitness of a sample of children with cancer that were involved in Hoop
Dreams Basketball Academy compared to a sample of children with cancer that did not
participate in the physical activity programs provided by Hoop Dreams Basketball Academy. A
t-test for Equality of Means was used to test the significance of the relationships between the
control group and the experimental group. No statistically significant difference in the means of
physical self-efficacy or the various health-related fitness components were found. The small
sample size made it difficult to conduct an in-depth statistical analysis.
BENEFITS OF PHYSICAL ACTIVITY FOR CHILDREN WITH CHRONIC HEALTH CONDITIONS

by

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A thesis submitted to the Graduate Faculty of North Carolina State University in partial fulfillment of the requirements for the Degree of Master of Science

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Ronda Dee Michaels was born in Charlotte, North Carolina. She received her elementary and secondary education in the Charlotte area and graduated from Independence High School in 1993. She attended the University of North Carolina at Chapel Hill and received her undergraduate degree in Physical Education, Exercise and Sports Science in 1997. After graduation Ronda worked in several different settings including the clinic, high school and on the collegiate level as the Head Athletic Trainer. In 2003 she decided to return to North Carolina State University to pursue her graduate degree in Parks, Recreation and Tourism Management. During her graduate career, she worked with the non-profit organization Hoop Dreams Basketball Academy to provide fitness activities and instruction to children with chronic illnesses. Ronda, along with her business partner, Jessica Bottesch formed the company Empower Personal Training, a private personal training studio in Durham, North Carolina.
I would like to extend a sincere thank you to my committee members for their help and guidance in completing this research study. Special thanks go to Dr. Judy Peel for her hard work and dedication to this project. I am especially grateful for Dr. Beth Wilson for her guidance and advice over the last two years. I appreciate her willingness to join my committee at such a late date and provide her wisdom and insight to this research project. I would also like to thank Dr. Henry Friedman for his enthusiasm and for helping me recruit children with cancer from Duke University Hospital. A thank you also goes to Dr. Michael Kanter for his contribution to this research study.

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Chapter 1

INTRODUCTION

It is widely accepted that there are many physical and psychosocial benefits associated with physical activity, exercise and sport. In years past, most of the evidence regarding this claim was anecdotal; however, during the last ten years there has been an increase in research regarding the benefits of physical activity. For the first time in 1995, the U.S. Department of Agriculture and the Department of Health and Human Services mentioned physical activity in the Dietary Guidelines, a mandated report by congress that provides recommendations regarding diet and exercise to individuals aged two and older (Kennedy, Meyers & Layden, 1996; USDA and DHHS, 1995). In 1996, the Surgeon General released a report entitled “Physical Activity and Health” that provided strong evidence for the many health benefits of an active lifestyle.
Also in 2000 the U.S. Department of Health and Human Services released Healthy People 2010, a document that provided specific health goals and objectives for the nation over a ten year period. Physical activity was the first leading area among the high priority concerns (HHS, 2000). The importance of physical activity in the health of all individuals has become a recent concern amongst the scientific community and the government.

Regular exercise leads to many overall physical health benefits through both improved physical fitness and psychological functioning. Physical activity has been shown to prevent the onset of chronic illness or disease in healthy children and adults (Bunker, 1998; Cooper, Quatrano, Axelton, Harlan, Stineman, Franklin, Krause, Back, Chambers, Chao, Alexander, & Painter, 1999; Ganley & Sherman, 2000; Sothern, Loftin, Suskind, Udall & Blecker, 1999). Also, physical activity has been shown to improve psychological functioning through elevated mood, energy levels and mental performance, and reduced tension, stress, anxiety, depression
and hostility (Bunker, 1999; Calfas & Wendell, 1994; Ganley & Sherman, 2000; Sothern et al., 1999). In recent years several studies have indicated the importance of physical activity for individuals that currently have a disability or a chronic disease (Durstine, Painter, Franklin, Morgan, Pitetti, & Roberts, 2000; Van der Ploeg, 2004). However, few research studies have examined both the physical and psychosocial benefits of an ongoing structured exercise program in children with a chronic health condition.

Children with chronic health conditions often experience many physical, psychosocial, educational and social difficulties as well as higher health care expenditures and increased family stress (Cadman, Boyle, Szatmari, & Offord, 1987; Cooper et al., 1999; Goldberg, 1990; Newacheck, Inkelas & Kim, 2004; Starfield, Forrest, Ryan, Riley, Ensminger, & Green, 1996). However, children with chronic health conditions that engage in physical activity indicate many benefits such as enhanced physical fitness, increased physical functioning, prevention of muscle wasting, reduced risk of heart disease, prevention of osteoporosis, improved blood flow and improved ability to perform activities of daily life (American Cancer Society, 2001; Modell & Cox, 1999). Physical activity can also play an important role in improving the psychosocial well-being of children with chronic health conditions through decreased incidence of anxiety and depression (Bunker, 1999; Calfas & Wendell, 1994; Ganley & Sherman, 2000; Goldberg, 1990; Modell & Cox, 1999; Smith, 1985; Sothern et al., 1999; Thornton, 1997). Also, children with chronic health conditions may experience a better overall quality of life and improved self-image, self-perception, self-confidence and/or self-esteem (Cooper et al., 1999; Ellickson, 1990; Goldberg, 1990; Kiernan, Gormley & MacLachlan, 2004; Robertson & Johnson, 2002; Sothern et al., 1999; Starfield et al., 1996; Twisk, 2001).

Statement of the Problem
Chronic health conditions including various cancers, congenital heart disease, lupus, diabetes, cystic fibrosis, renal disease, asthma, spina bifida, cerebral palsy, visual and auditory impairments, learning disabilities, attention deficit hyperactivity disorder and mental retardation affect approximately 10-20% of children aged 4-17 (Lanphear, Liptak & Weitzman, 1995; Cooper et al., 1999). Research indicates that chronically ill children who exercise experience many of the same health benefits as healthy children; therefore they should not be excluded from physical activity programs (Goldberg, 1990). However the availability of ongoing exercise programs is often limited for chronically ill children since most of the programs directed towards this population are weeklong, disease-specific camps (Preston, 2000; Buford, 2001; Kronkosky Charitable Foundation, 2001; Kiernan, Gormley & MacLachlan, 2004). Also the school systems frequently do not provide physical education for the chronically ill or disabled therefore contributing to their reduced participation (Goldberg, 1990; Newacheck & Taylor, 1992; Ganley & Sherman, 2000).

Purpose of the Study

A relatively large amount of literature exists documenting the physical benefits (American Cancer Society, 2001; Cohen & Walco, 1999; Durstine et al., 2000; Ganley & Sherman, 2000; Goldberg, 1990; Lanphear, Liptak & Weitzman, 1995; Modell & Cox, 1999; Robertson & Johnson, 2002; Small & Bar-Or, 1995; Smith, 1985; Thornton, 1997) or the psychosocial benefits (American Cancer Society, 2001; Applegate & Rohan, 1999; Cadman et al., 1987; Cooper et al., 1999; Ellickson, 1990; Ganley & Sherman, 2000; Goldberg, 1990; Kiernan, Gormley & MacLachlan, 2004; Modell & Cox, 1999; Robertson & Johnson, 2002; Smith, 1985; Sothern et al., 1999; Starfield et al., 1996; Thornton, 1997; Twisk, 2001; Young-McCaughan, Mays, Arzola, Yoder, Dramiga, Leclerc, Caton, Sheffler, & Nowlin, 2003) of
physical activity for children with chronic health conditions. Few studies have documented both the physical and psychosocial benefits of an ongoing structured physical activity program for children with chronic health conditions. Also physical self-efficacy has not been examined independently of self-concept in children with chronic health conditions. The purpose of this study was to determine if children with chronic health conditions, specifically those with a brain tumor, cancer and/or leukemia participating in Hoop Dreams Basketball Academy would score higher in physical self efficacy and the health-related physical fitness components than children with cancer that do not participate in Hoop Dreams Basketball Academy. Hoop Dreams Basketball Academy is a registered 501(c)(3) nonprofit organization located in Durham, North Carolina. “Hoop Dreams focuses on serving children with serious or chronic health conditions including cancer, obesity, asthma, diabetes, arthritis, and various immunological diseases” (Hoop Dreams Basketball Academy, n.d.). The results of this study will help Hoop Dreams Basketball Academy determine the efficacy of its programs and assist other exercise professionals in developing effective exercise programs for children with chronic health conditions. The study will also add to the general body of knowledge in this area.

**Definition of Key Terms**

Please see the definitions below for the important terms used in this study.

1. **Physical Activity** – any bodily movement produced by skeletal muscles that results in energy expenditure (Troiano, Macera & Ballard-Barbash, 2001).

2. **Exercise** - a subset of physical activity that is volitional, planned, structured, repetitive and aimed at improvement or maintenance of an aspect of fitness or health (Fox et al., 2000).
3. Sport - physical activity that involves structured competitive situations governed by rules (Fox et al., 2000).

4. Chronic Health Condition - lasting at least three months in a given year and include physical impairments, sensory impairments, cognitive impairments or a combination of the three (Cooper et al., 1999; Lanphear, Liptak & Weitzman, 1995). Examples of chronic health conditions in children include but are not limited to various cancers, congenital heart disease, lupus, diabetes, cystic fibrosis, renal disease, asthma, spina bifida, cerebral palsy, visual and auditory impairments, specific learning disabilities, attention deficit hyperactivity disorder and mental retardation (Lanphear, Liptak & Weitzman, 1995).

5. Chronic Illness - lifelong in duration, treatable but rarely cured completely, and require persistent self-management behaviors that are shared by the child and family (The National Institutes of Health, 2003). The literature often uses the terms chronic health conditions and chronic illnesses interchangeably since their definitions are similar. The term chronic health condition was used in this study.

6. Self-efficacy - the belief in one’s capabilities to organize and execute the sources of action required to manage prospective situations (Bandura, 1986).

7. Physical Self-efficacy - perceived competence in performing behaviors involving physical skill as well as confidence in one's physical self-presentation (Ryckman, Robbins, Thorton, & Cantrell, 1982).

8. Health-Related Physical Fitness - a state characterized by (a) an ability to perform and sustain daily activities and (b) demonstration of traits or capacities that are
associated with a low risk of premature development of diseases and conditions related to movement (Winnick & Short, 1999).

Research Questions

The research questions for this study are listed below.

1. Do children with cancer participating in Hoop Dreams Basketball Academy score higher on a physical self-efficacy survey than children with cancer not participating in Hoop Dreams Basketball Academy?

2. Do children with cancer participating in Hoop Dreams Basketball Academy score higher on health-related physical fitness components compared to children with cancer not participating in Hoop Dreams Basketball Academy?
   a. Children participating in Hoop Dreams Basketball Academy will score higher in aerobic functioning.
   b. Children participating in Hoop Dreams Basketball Academy will have a lower body mass index (BMI).
   c. Children participating in Hoop Dreams Basketball Academy will score higher on musculoskeletal strength and endurance.
   d. Children participating in Hoop Dreams Basketball Academy will score higher on flexibility.
Chapter 2

LITERATURE REVIEW

There are many physical and psychosocial benefits associated with physical activity. Many studies have focused on the role that physical activity and exercise plays in the prevention of chronic illness or disease in adults. Little research, however, has examined the psychosocial and physical improvements of a structured sports or exercise program in children that suffer from a chronic health condition or disease.

A review of the literature regarding the physical and psychosocial benefits of physical activity in children with chronic health conditions follows. Areas of discussion include benefits of physical activity for children, physical activity recommendations for children, children and chronic health conditions, benefits of physical activity for children with chronic health conditions, physical activity recommendations for children with chronic health conditions, prevalence of children with a chronic health conditions, availability of programs for children with chronic health conditions, cancer as a chronic health condition and constructs of physical self-efficacy and health-related physical fitness in the context of children with chronic health conditions.

Benefits of Physical Activity for Children

Regular physical activity can improve overall health through many physical and psychosocial benefits. It has long been proven that adults experience many positive effects from regular exercise, and research indicates that physically active children also see many benefits (Bunker, 1998; Calfas & Taylor, 1994; Ganley & Sherman, 2000; Licence, 2004; Sallis, 1996; Scully, Kremer, Meade, Graham & Dudgeon, 1998; Shephard, 1995; Sothern, Loftin, Suskind, Udall & Blecker, 1999; U.S. Surgeon General, 1996; Twisk, 2001). Regular exercise leads to
many overall physical health benefits through both improved physical fitness and increased physiological functioning (Bunker, 1998; Ganley & Sherman, 2000; Sothern et al., 1999; Twisk, 2000). Children who exercise experience health benefits in the short term and in the future.

Physical Benefits

Children who exercise also show improved fundamental movement skills, motor development, and health-related physical fitness levels. According to The Brockport Physical Fitness Test Manual (1999) health-related physical fitness is defined as:

“a state characterized by (a) an ability to perform and sustain daily activities and (b) demonstration of traits or capacities that are associated with a low risk of premature development of diseases and conditions related to movement” (p. 11).

The components of health-related physical fitness include aerobic functioning, body composition and musculoskeletal functioning. Aerobic functioning encompasses the physiological component of maximal oxygen uptake (VO2 max) and the functional component of aerobic behavior or the ability to perform and sustain exercise at specific intensities and durations. Body composition refers to the ratio between lean muscle tissue and body fatness and is usually expressed as a percentage of body fat. Musculoskeletal functioning measures muscular strength, muscular endurance, flexibility and range of motion (Winnick & Short, 1999).

Regular physical activity helps with the development of motor skills, increases both cardiovascular and anaerobic fitness levels, improves muscular strength, muscular endurance, flexibility and improves lean muscle mass to fat ratio (Bunker, 1998; Cooper, Quatrano, Axelson, Harlan, Stineman, Franklin, Krause, Back, Chambers, Chao, Alexander, & Painter, 1999; Durstine, Painter, Franklin, Morgan, Pitetti, & Roberts, 2000). Regular exercise in children also helps control weight, strengthen bones, and improve cardiovascular function.
Children that participate in regular physical activity can improve strength, prevent chronic health conditions and enhance overall health (Bunker, 1998; Cooper et al., 1999; Ganley & Sherman, 2000). From a physiological standpoint, physically active children often exhibit reduced cholesterol and blood pressure (Ganley & Sherman, 2000). Physically active children experience a reduction of low density lipoproteins (LDLs) or “bad cholesterol” and an increase in high density lipoproteins (HDLs) or “good cholesterol” (Sothern et al., 1999). Research indicates that moderate physical activity may have a beneficial effect on the immune system by stimulating the interleukin-2/natural killer cell system (Sothern et al., 1999). Children who exercise have lower rates of osteoporosis and increased bone mineral density later in life (Ganley & Sherman, 2000). Also children who do not participate in a regular exercise program have an increased chance of becoming overweight. Overweight children are at the risk of many health problems, including hypertension, hyperlipidemia, type 2 diabetes, growth hormone dysregulation and respiratory and orthopedic problems (Durstine et al., 2000; Ganley & Sherman, 2000).

**Psychosocial Benefits**

Physical activity has a positive impact on both the physical and psychosocial health of children. Biddle (1995) defines psychosocial health as a broad category that includes both psychological and social-psychological outcomes (p. 292). Currently there is not one definition accepted in the field, but psychosocial health includes the positive characteristics of high self-esteem, positive mood, reduced anxiety, and depression (Biddle, 1995).

Regular physical activity has been shown to improve a child’s mood, energy level, concentration, mental performance and can be attributed to reduced tension, stress, anxiety,
depression, and hostility (Bunker, 1999; Calfas & Taylor, 1994; Ganley & Sherman, 2000; Sothern et al., 1999). Calfas and Taylor (1994) reviewed 20 articles that indicated a relationship between physical activity in youth and the psychological variables of depression, anxiety, stress, self-esteem, self-concept, hostility, anger, intellectual functioning, and psychiatric disorders. The results of this study indicated that physical activity was “consistently related to improvements in self-esteem, self-concept, depressive symptoms, and anxiety/stress” (Calfas & Taylor, 1994, p. 406).

Physical exercise has a positive impact on depression, anxiety, stress, mood state, self-esteem, premenstrual syndrome (PMS) and body image (Scully et al., 1998). In a review of the literature, Biddle (1995) found that exercise “has a positive effect on measures of anxiety, depression, and measures of mood, self-esteem, and other indices of psychological well-being” (p. 292). Meta-analytic findings (McDonald and Hodgdon, 1991), narrative reviews (e.g. Morgan, 1994), and population surveys (e.g. Stephens, 1988) indicate that physical activity can reduce depression (in Biddle, 1995). In a meta-analysis McDonald and Hodgdon (1991) found an effect size (ES) of 0.56 (n = 41) for studies investigating the relationship between fitness training and self-concept. The ES represented the meaningfulness of the exercise effect and ESs below 0.39 were classified as small, 0.40 – 0.69 as moderate and 0.70 as large. Based on an ES of 0.56, there is a moderately positive effect for physical activity on the self-concept of children. Despite this extensive study, the review by Calfas and Taylor (1994) and the intuitive belief that exercise has a positive effect on a child’s mental health, Ganley and Sherman (2000) noted that there is little hard data in the area of self-concept (p. 3). Fox (2000) concluded that exercise has an effect on developing a positive self in children and it can be particularly important for children with low self-esteem.
Several studies that focused on females primarily found that their involvement in physical activity can lead to positive improvements in self-concept, self-esteem, social competence and emotional well-being (Bunker, 1998; Ganley & Sherman, 2000; Twisk, 2001). Brown and Lawton studied 220 adolescent girls during a very stressful time and reported that those that maintained a rigorous exercise program had less physical and emotional distress than those who exercised less (as cited in Ganley & Sherman, 2000). Females that exercise who experience PMS show reduced symptoms such as fatigue, depression, anxiety and decreased appetite (Scully et al., 1998).

There were few negative psychosocial effects of physical activity, but potential negative outcomes may include exercise abuse, eating disorders, overtraining, and staleness (Calfas & Taylor, 1994; Shephard, 1995). Women tend to participate in aerobics and other exercises to remain fit, whereas men develop exercise programs that are geared towards improving strength, coordination and speed. This emphasis on female form, femininity and thinness can lead to feelings of social-physique anxiety (SPA) (Scully et al., 2005). McAuley et al. reported that “SPA correlates with self-presentational motives for exercise such as weight control and attractiveness, and is higher among women” (as cited in Scully et al., 2005). Because of the clothing required to exercise and the fact that women tend to have higher feelings of SPA, measures should be taken to make women feel more comfortable with their body image during exercise (Scully et al., 1998). Further research is needed to determine any additional negative effects of physical activity on psychosocial health.

*Physical Activity Recommendations for Children*

There are many recommendations related to physical activity for children. Recent recommendations indicate that children should aim for approximately 60 minutes of moderate
physical activity every day (National Association for Sport and Physical Education, 2003; Troiano, Macera & Ballard-Barbash, 2001). The Surgeon General’s Report (1996) suggested that children’s physical activity should be enjoyable, their confidence towards physical activity should be promoted, they should be supported in their efforts to be physically active, and they should be encouraged to overcome obstacles to becoming physically active. Children’s physical activity programs should include a variety of different exercises and sports (Patrick, Spear, Holt, & Sofka, 2001). It is important to select activities that improve health-related components, are fun for the children, and are appropriate for his or her developmental level and ability (Ganley & Sherman, 2000; Patrick et al., 2001; Smith, 1985).

Children’s physical activity programs should include a proper warm-up prior to exercise and a stretching or flexibility routine after the exercise session to prevent any muscle strains or other injuries (Ganley & Sherman, 2000). Children’s exercise programs should include “life-long” sports or activities, provide both individual and group activities, be monitored by trainers or coaches with a background in exercise science and be conducted in a safe and non-threatening environment (Applegate, Rohan & Dubbert, 1999; Bunker, 1998; Ellickson, 1990; Nelson, Goldberg, Harris, Landry, & Risser, 1990; Kaplan & Campbell, 1996; Modell & Cox, 1999; Thornton, 1997). Goldberg (1990) suggested that “sport selection should take into account aerobic demands, collision potential, dynamic and static components of movement, and the areas of the body most stressed by the activity” (p. 56). Research suggests that moderate intensity and non-structured exercise programs facilitate many benefits such as disease prevention and health promotion (Ellickson, 1990; Goldberg, 1990; Modell & Cox, 1999; Nelson et al. 1990; Sothern et al., 1999).
Children and Chronic Health Conditions

In 1990 there were more than one million children suffering from a chronic disease and an additional 10 million with less significant chronic health disorders in the United States (Goldberg, 1990; Newacheck & Taylor, 1992). The incidence of children with chronic health conditions is steadily increasing and studies show that approximately 10 - 20% of children aged 4-17 suffer from a chronic health disorder (Cooper et al., 1999).

Children with chronic health conditions often experience many physical, psychosocial, educational, and social difficulties as well as higher health care expenditures and increased family stress (Cadman, Boyle, Szatmari, & Offord, 1987; Cooper et al., 1999; Goldberg, 1990; Ireys, Anderson, Shaffer & Neff, 1997; Newacheck, Inkelas & Kim, 2004; Starfield, Forrest, Ryan, Riley, Ensminger, & Green, 1996). Chronically ill children report lower levels of physical activity than other adolescents (Starfield et al., 1996). This reduction in physical activity occurs for a number of reasons. Some of these reasons include physical discomfort, limitations on their activity level, and dissatisfaction with their health (Starfield et al., 1996). Parents may be overprotective and not allow their child to participate in physical activities (Goldberg, 1990; Thorton, 1997).

Children with chronic health conditions generally require more health care services than other children leading to higher health care expenditures. The burden of higher costs can be difficult for all families, but there is an additional burden placed on low-income families (Newacheck, Inkelas & Kim, 2004). These increased health care expenditures trigger higher levels of stress within the family and therefore have an impact on the psychosocial development of the child (Goldberg, 1990; Newacheck, Inkelas & Kim, 2004). Other problems faced by families with a chronically ill child include increased time constraints caused by frequent health
care visits, hospitalizations, changes in insurance reimbursement, and the potential restrictions on friends and activities (Lanphear, Liptak & Weitzman, 1995).

In addition to these reasons, there are a limited number of programs that address the needs of children with chronic health conditions. Many pediatricians do not provide information or refer children with chronic health conditions to a regularly scheduled exercise program, and school systems frequently do not provide appropriate physical education for children with chronic health conditions (Ganley & Sherman, 2000; Goldberg, 1990; Newacheck & Taylor, 1992).

Benefits of Physical Activity for Children with Chronic Health Conditions

Physical Benefits

Research indicates that the physical benefits associated with regular exercise are equally important for children with chronic health conditions (Goldberg, 1990; Smith, 1985). The American College of Sports Medicine (ACSM) recommends 20-60 minutes of moderate physical activity three to five days a week in order to see significant health benefits in the chronically ill. Chronically ill children tend to be more sedentary than healthy children therefore, they are predisposed to related secondary health conditions such as obesity and diabetes (Goldberg, 1990; Keats, Courneya, Danielsen, & Whitsett, 1999; Lanphear, Liptak & Weitzman, 1995).

Chronically ill children that participate in regular physical activity exhibit some of the same physical benefits as healthy children (Goldberg, 1990; Smith, 1985).

There are many health-related benefits of physical fitness. Health-related physical fitness refers to the components of cardiopulmonary endurance, body composition, muscular strength, endurance and flexibility (Lanphear, Liptak & Weitzman, 1995). Children with chronic health conditions that exercise experience increased aerobic capacity, increased lean muscle to fat ratio,
increased muscular strength, endurance, stamina, and flexibility (Cohen & Walco, 1999; Cooper et al., 1999; Durstine et al., 2000; Ganley & Sherman, 2000; Goldberg, 1990; Lanphear, Liptak & Weitzman, 1995; Modell & Cox, 1999; Small & Bar-Or, 1995; Smith, 1985; Thornton, 1997). According to the American Cancer Society, the physical benefits of an active lifestyle on chronic health conditions include increased physical functioning, prevention of muscle wasting caused by inactivity, reduced risk of heart disease, prevention of osteoporosis, improved blood flow to the legs and reduced risk of blood clots (2001). Also physical activity can improve the chronically ill child’s ability to perform activities of daily life (American Cancer Society, 2001; Modell & Cox, 1999).

Children with chronic health conditions that exercise experience enhanced physical fitness and improved health related fitness that is particularly beneficial. A chronically ill child’s exercise program should include activities that address elements of health-related physical fitness such as cardiovascular endurance, body composition, muscular strength and endurance and flexibility (Cooper et al., 1999; Durstine, 2000; Goldberg, 1990; Lanphear, Liptak & Weitzman, 1995; Modell & Cox; 1999; Robertson & Johnson, 2002). Improved aerobic exercise capacity, increased cardiac output and increased oxygen capacity are some of the health benefits of improved cardiovascular endurance. In regards to body composition, children with chronic health conditions that exercise experience decreased obesity, decreased body fat and increased lean body mass. The musculoskeletal benefits include: prevention of muscle atrophy and injury, increased strength, and increased oxygen capacity. Physically active chronically ill children also show improved flexibility which leads to the prevention of muscle stiffness and joint contractures and decreased incidence of injury (Lanphear, Liptak & Weitzman, 1995). Because
of the many preventative health benefits of exercise in children with chronic health conditions they should not be restricted from physical activity (Goldberg, 1990).

Psychosocial Benefits

Children with chronic health conditions experience an increased incidence of psychosocial problems when compared to healthy adolescents (Cadman et al., 1987; Cooper et al., 1999; Goldberg, 1990; Modell & Cox, 1999; Starfield et al., 1996). Being diagnosed with a chronic health condition during childhood can be debilitating for the child and have an effect on normal development (Cooper et al., 1999). Goldberg (1990) found that children with chronic health conditions experience psychosocial problems at a rate two to three times higher than their healthy counterparts. Cadman et al. (1987) conducted several large population studies and found that there is an association between chronic health problems and mental or social adjustment problems. Starfield et al. (1996) found that chronically ill children scored .62 standard deviations (SD) lower on overall satisfaction within the health domain; a finding that indicates long term illness has a greater influence on a child’s well-being than a short term illness.

Researchers found that there is a relationship between chronic health condition and mental health and social adjustment. The most prevalent types of mental health disorders among chronically ill children were neuroses and attention deficit disorder-hyperactivity (Cadman et al., 1987). Although the rates of psychosocial problems are increased among children with chronic health conditions, the majority of these children do not have clinical mental health problems or social adjustment problems (Cadman et al., 1987). Starfield et al. (1996) found that the parents of children with chronic health conditions perceived their child more likely to have moderately severe behavior problems when compared to healthy children. Although a substantial amount of literature documents the relationship between chronic health conditions and psychosocial
dysfunction, it is still unclear as to whether this relationship is limited to children with a specific chronic health conditions or more generalized among all children with a chronic health conditions (Starfield et al., 1996).

There are many studies that suggest exercise improves psychosocial well-being in children with chronic health conditions (Ganley & Sherman, 2000; Goldberg, 1990; Modell & Cox, 1999; Smith, 1985; Thornton, 1997). Exercise has been shown to improve the chronically ill child’s overall quality of life (Goldberg, 1990; Modell & Cox, 1999; Robertson & Johnson, 2002; Young-McCaughan, Mays, Arzola, Yoder, Dramiga, Leclerc, Caton, Sheffler, & Nowlin, 2003). Children with chronic health conditions that exercise also exhibit improved self-image, self-perception, self-confidence and/or self-esteem (Cooper et al., 1999; Ellickson, 1990; Goldberg, 1990; Kiernan, Gormley & MacLachlan, 2004; Robertson & Johnson, 2002; Sothern et al., 1999; Starfield et al., 1996; Twisk, 2001). Another psychosocial benefit associated with exercise in chronically ill children is the reduced incidence of anxiety and depression (Goldberg, 1990; Sothern et al., 1999). Exercise participation by children with chronic health conditions has been shown to decrease behavior problems, improve relationships, lead to greater extroversion, increase cooperation with others, and enhance social skills (Applegate & Rohan, 1999; Cadman et al., 1987; Ellickson, 1990; Goldberg, 1990; Kiernan, Gormley & MacLachlan, 2004; Robertson & Johnson, 2002; Smith, 1985; Starfield et al., 1996).

Smith (1985) notes that sports teach important life lessons such as social skills, self-control and how to abide by the rules. Goldberg, Pappas & Cummings (1995) indicate that sports and exercise can have positive effects by improving physical fitness and potentially modifying the risks of secondary health disorders such as coronary artery disease, hypertension and obesity. In summary, children with chronic health condition that exercise are more likely to
lead a more normal life when compared to those that do not participate in any physical activity (Thornton, 1997).

Physical Activity Recommendations for Children with Chronic Health Conditions

Historically children with chronic health conditions have been discouraged from participation in sports or physical activity (Goldberg, 1990; Latinis-Bridges & Gifford Jorgensen, 1985). However, more recent research indicates that children with chronic health conditions should be encouraged to participate in physical activities in order to receive the physical and psychosocial benefits associated with exercise (Goldberg, 1990; Smith, 1985). Durstine et al. (2000) suggested that it is important to always consider safety first when creating exercise programs for individuals with chronic health conditions. Chronically ill children should exercise at a rate between 40-60% of their target heart rate in order to produce a training effect. However, the exercise should not be so difficult that the child experiences pain or other problems (Durstine et al., 2000; Latinis-Bridges & Gifford Jorgensen, 1985). It is recommended that children with chronic health conditions warm-up prior to exercise and cool down after exercise in order to prevent injury (Ganley & Sherman, 2000). Physical activity exercises for the chronically ill child must be monitored by adults, be age appropriate and should include “life-long” sports or activities (Applegate, Rohan & Dubbert, 1999; Bunker, 1998; Ellickson, 1990; Kaplan & Campbell, 1996; Latinis-Bridges & Gifford Jorgensen, 1985; Modell & Cox, 1999; Nelson et al., 1990; Thornton, 1997). In general the recommendations for exercise for children with chronic health conditions are similar to those for healthy children.

Prevalence of Children with Chronic Health Conditions

There is a limited amount of information that describes the actual number of children with chronic health conditions. Buescher, Whitmire, Brunssen, Nelson, Howell, & Kluttz-Hile,
(2005) noted that “the exact number of children with complex conditions is difficult to discern” (p. 2). Therefore Buescher et al. (2005) conducted a study to determine the prevalence of medically fragile children aged 0-4 years in North Carolina. The term medically fragile refers to children with serious and complicated medical conditions that require extensive medical treatment and lead to high medical care costs (Buescher et al., 2005). The results of this study indicated that there were 1,811 medically fragile children in North Carolina in 2002 (Buescher et al., 2005).

Benedict, Farel & Howell (1999) study estimated the number of children aged 3-17 that have special needs in North Carolina, the South and the United States. This study used a broad definition of children with special needs and included children with chronic conditions, functional limitations, developmental delays, dependence on compensatory means or need for service use (Benedict, Farel & Howell, 1999). This study determined that there are an estimated 45,000 children suffering from a chronic illness in North Carolina, approximately 316,000 children in the South (Alabama, Florida, Georgia, Kentucky, Mississippi, South Carolina, and Tennessee) excluding North Carolina with a chronic illness and 2,107,800 children in the United States with a chronic illness (Benedict, Farel & Howell, 1999).

The Hole in the Wall Gang Association conducted a study prior to establishing the Victory Junction Gang camp in Randleman, North Carolina. This study found that there are over 230,000 children within a five hour radius of the camp site with a chronic or serious illness (Victory Junction Gang, n.d.).

*Availability of Programs for Children with Chronic Health Conditions*

There are very few ongoing programs that focus on creating physical activity programs for children with a chronic health condition. Most of the programs available for children with
chronic health conditions are disease-specific weeklong camps (Buford, 2001; Kiernan, Gormely & MacLachlan, 2004; Kronkosky Charitable Foundation, 2001; Preston, 2000). For example, Camp Horizon located in Pennsylvania provides a camping experience for children with serious skin conditions (Preston, 2000). Camp Candy Lady, Jennifer’s Camp, Camp Spike and Wave, Camp Kaleidoscope, Camp Independence and Camp Can-Do are each disease specific and are directed towards burn survivors, HIV positive patients, children with epilepsy, diabetes and multiple sclerosis respectively (Kronkosky Charitable Foundation, 2001). There are also camps for children with conditions like muscular dystrophy and cancer, but there are few camping opportunities for children with a wide variety of chronic health conditions (Buford, 2001).

Camp TLC, located in Lake Tahoe, Nevada is a relaxation and mental healing camp for children with all chronic illnesses (Buford, 2001). Also Camp CAMP is located in Texas and provides a summer camp experience to children with a wide range of disabilities (Kronkosky Charitable Foundation, 2001). The Hole in the Wall Association supports several camps worldwide, including the Victory Junction Gang camp in North Carolina, that provide a camping experience for chronically ill children (Hole in the Wall Camps Association, n.d.). Research indicates that these camping experiences provide many of the same benefits to children with chronic health conditions as to healthy children. Although most of these camps do not focus on physical activity, they help increase self-confidence, raise self-esteem, develop self-concept, learn social skills, create a sense of normalcy and allow the chronically ill child to have fun (Buford, 2001; Kiernan, Gormely & MacLachlan 2004; Kronkosky Charitable Foundation, 2001; Preston, 2000).

Other programs that target chronically ill children were very limited in the review of literature. Most of these programs were not ongoing structured exercise programs directed
specifically towards chronically ill children. For example, Klepper (1999) studied arthritic children that were involved in an eight-week physical conditioning program. The results of this study indicated that the arthritic children exhibited improved muscular fitness, increased endurance for daily activities and greater self-efficacy (Klepper, 1999). Klepper (1999) also found that most subjects in the eight week study group indicated either no change in pain or decreased pain. Another study compared the mood states of university male wheelchair athletes and non-athletes (Paulsen, French & Sherrill, 1990). The results of this study indicated sports had a positive impact on the mental health of persons confined to a wheelchair (Paulsen, French & Sherrill, 1990). One study indicated that alternative, holistic treatments such as dance therapy have shown a positive relationship between physical activity and psychological improvement (Cohen & Walco, 1999). According to the review of the literature, The Yale Pediatric Fitness Clinic started by Dr. Barry Goldberg is the only facility that provides year round physical activity and exercise instruction to chronically ill children (Thornton, 1997).

Plante, Lobato, & Engel (2001) summarized the literature from 1970-2000 regarding group intervention for pediatric chronic conditions. Group intervention refers to programs that provide emotional support, psychoeducation, adaptation/skill development and symptom reduction. Summer camps were reviewed separately because of their unique setting (Plante, Lobato, & Engel, 2001). Despite the extensive review of literature, Plante, Lobato, & Engel’s (2001) research did not indicate that there were any ongoing structured exercise programs for children with chronic health conditions. The results of this descriptive study indicated that a variety of group intervention programs are available, but their benefits and the efficacy of their treatment require further research (Plante, Lobato, & Engel, 2001).
Cancer as a Chronic Health Condition

The five-year survival rates of all types of pediatric cancer are increasing such that approximately one in every 1,000 young adults ages 20-29 is a survivor of pediatric cancer (American Cancer Society, 1999). Because of the increasing survival rates, many forms of childhood cancer are becoming more like chronic health conditions than terminal diseases (Haluska, Jessee & Nagy, 2002). Physical activity has shown to be beneficial in the prevention, treatment and rehabilitation of chronic health conditions, but little is known about the influence of exercise in cancer patients specifically (Thune, 1998). Most of the current research focuses on the benefits of exercise in adult cancer patients with little attention to the impact of exercise in children with cancer.

Friedenreich and Courneya (1996) reviewed qualitative data and found that exercise appears to improve the physiologic and psychologic well being of breast cancer patients. Galvao & Newton (2005) summarized 26 studies and found that the majority had been conducted on breast cancer patients using cardiovascular training rather than resistance exercise. Peters, Schulz & Michna (2002) conducted a meta-analysis of the literature to determine the increases in physical fitness of cancer patients in comparison to non-training control groups during and after medical treatment. Out of 14 studies, the authors reported only one study that tested children with cancer. Also a significant amount of research has been done on the influence of physical activity in preventing cancer risk however there is limited information on the advantages of exercise once a patient has been diagnosed with cancer (Courneya, 2003; Peters, Schulz & Michna, 2002).

Research indicates that children with cancer experience many of the same physical and psychosocial problems as children with other chronic health conditions (Peters, Schulz &
Michna, 2002). Cancer patients report physical symptoms such as increased incidence of fatigue, nausea, vomiting and pain as well the psychosocial symptoms of reduced quality of life, increased depression, greater anxiety, changes in body perception and decreased self-esteem (Baldwin & Courneya, 1997; Peters, Schulz & Michna, 2002; Woodgate & Degner, 2003; Wright, Galea & Barr, 2003). Peters, Schulz & Michna (2002) noted that there is a great deal of physical and psychosocial stress associated with a cancer diagnosis that can lead to reduced physical functioning. Adolescent cancer patients often experience limitations in running speed, balance, strength and flexibility (Wright, Galea & Barr, 2003). Adolescents diagnosed with cancer may be socially devastated and experience physical and emotional isolation from their peers (Haluska, Jessee & Nagy, 2002).

Physical Benefits

Physical activity is beneficial for cancer patients. The literature suggests that there is a “training-induced” increase in physically active cancer patients compared to non-trained cancer patients (Peters, Schulz, & Michna, 2002). In a summary of studies, Peters, Schulz & Michna (2002) found that physical activity has many physical benefits for cancer patients such as reducing body fat, increasing immune function, improving leg strength, diminishing the incidence and onset of fatigue, enhancing physical performance and increasing overall strength and endurance. In a review of the literature, Courneya (2003) noted that physical activity had significant beneficial effects on exercise capacity, body weight and composition, flexibility, fatigue, nausea and general physical well-being. Adolescent cancer patients that participate in physical activity may develop exercise habits that extend into adulthood therefore reducing the risk of adult-onset disorders (Wright, Galea & Barr, 2003).

Psychosocial Benefits
Physically active cancer patients also exhibit improved psychosocial health. Breast cancer patients that participated in an exercise program indicated improved locus of control, mood states, self-esteem, quality of life as well as reduced incidence of depression and anxiety (Courneya, 2003; Friedenreich & Courneya, 1996). In a meta-analysis of the literature Peters, Schulz & Michna (2002) found that patients diagnosed with cancer predominantly indicated increased quality of life, reduced anxiety and reduced depression, and that there is a positive correlation between training frequency and satisfaction of life. Only one study suggested that there was no change in quality of life between trained and untrained cancer patients (Peters, Schulz & Michna, 2002). Keats et al. (1999) found that adolescents diagnosed with cancer who maintained some form of physical activity, especially those that participated in organized sports, during or after their treatment reported better psychosocial well being, general self-concept, parental relations, same sex relations and opposite sex relations compared to those that did not.

Regular physical activity should be recommended to cancer patients (Peters, Schulz & Michna (2002). Physical activity programs for cancer patients should include regular, moderately intense cardiovascular and resistance training (Galvao & Newton, 2005). Epidemiological data suggests that cancer patients should have and ongoing exercise program with a frequency of two to three times per week (Peters, Schulz & Michna, 2002). It is also suggested that exercise professionals take a holistic approach when prescribing exercise and develop a physical activity program that can be adapted to the patients’ changes in physical fitness (Peters, Schulz & Michna, 2002).

Construct of Physical Self-Efficacy

Although several studies have examined self-concept (Bunker, 1998; Ganley & Sherman; McDonald and Hodgdon, 1991; Twisk, 2000) as a universal term that included self-perception,
self-esteem and self-efficacy, to date there are no studies that have examined self-efficacy independently. Self-efficacy, coined by Albert Bandura is an extension of the social learning theory (Pajares, 2002). “Self-efficacy is the belief in one’s capabilities to organize and execute the sources of action required to manage prospective situations” (Bandura, 1986). People with high self-efficacy perceive difficult tasks as challenges rather than threats; whereas, people with low self-efficacy avoid difficult tasks and perceive them as personal threats (Bandura, 1994). An individual’s belief about his or her self-efficacy is developed through several main sources of influence: mastery experience, observing other people similar to oneself being successful, modeling the behavior of a person perceived to be competent, social persuasion and a person’s emotional state and mood towards his or her own success (Bandura, 1994).

Ryckman, Robbins, Thornton, & Cantrell (1982) realized the importance of assessing each aspect of self-efficacy independently; therefore the researchers conducted six studies in order to determine a psychometrically sound instrument to measure physical self-efficacy. The Physical Self-Efficacy Scale (PSE) includes a ten-item Perceived Physical Ability (PPA) subscale and a 12-item Physical Self-Presentation Confidence subscale (PSPC) (Ryckman et al., 1982). The PPA measures the perceived confidence an individual has when completing tasks that require physical skills, and the PSPC measures the confidence an individual has in exhibiting these physical skills and being evaluated in them (King, n.d.).

The PSE has proven to have high validity and reliability. The scale indicated high convergent validity with the Tennessee Physical Self Concept (TPSC) scale and strong concurrent validity since subjects that scored high on their physical self-efficacy also indicated higher self-esteem, less self-consciousness, less anxiety and higher perceived control of their outcomes (Ryckman et al., 1982). The PSE scale was also found to have strong predictive
validity (King, n.d.; Ryckman et al., 1982). Both the PPA and PSPC indicated moderately strong test-retest and alpha reliabilities with \( r = .85 \) \((p < .001)\) for the PPA subscale and \( r = .69 \) \((p < .001)\) for the PSPC subscale. The PSE scale showed strong internal consistency with a test-retest reliability of \( r = .80 \) \((p < .001)\) (King, n.d.; Ryckman, et al., 1982).

Previous studies have neglected to measure physical self-efficacy in the context of physical activity, rather the focus has been on the constructs self-esteem, self-concept, anxiety, depression, stress, social competence, emotional well-being, mood and energy levels. Klepper (1999) noted improvements in self-efficacy in children with chronic arthritis as a result of an eight week physical conditioning program. “Multivariate analysis of variance indicated that athletes higher in perceived physical ability considered skill development, team affiliation, and having fun as more important reasons for their participation in sports than athletes lower in perceived physical ability” (Ryckman & Hamel, 1993, p. 270). A six-year longitudinal study on cancer patients indicated that those with higher physical self-efficacy were more likely to survive and less likely to develop a recurrence (De Boer, Van den Borne, Pruyn, Ryckman, Volovics, Knegt, Meeuwis, Mesters, & Verwoerd, 1998).

The PSE scale was chosen for this research because of the limited amount of research on physical self-efficacy in the past. To date, few studies have examined the impact physical activity has on physical self-efficacy in children, and no studies have linked physical self-efficacy and chronic health conditions. This research will provide beneficial information on the constructs of physical self-efficacy and physical activity in children with chronic health conditions.
Construct of Health-Related Physical Fitness

Because of the many physical benefits associated with physical activity, it is necessary to develop objective standards to measure improvements in health related fitness. In 1982 The Cooper Institute created the FITNESSGRAM test to provide objective criterion to measure aerobic capacity, body composition and the musculoskeletal components of muscular strength, endurance and flexibility (The Cooper Institute for Aerobics Research, 1999). In the mid-1990s the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) adopted the FITNESSGRAM as its source to measure health-related physical fitness. The FITNESSGRAM manual contained a section on special populations, but there were no indications for children with disabilities (Winnick & Short, 1999).

As a part of Project Target, the Office of Special Education and Rehabilitative Services and the U.S. Department of Education funded researchers at the State University of New York, College of Brockport to develop a health-related criterion-referenced physical fitness test for adolescents aged 10-17 with disabilities (Winnick & Short, 1999). The researchers created The Brockport Physical Fitness Test (BPFT), a test that measures the health-related fitness of children with mental retardation, spinal cord injury, cerebral palsy, blindness, congenital anomalies and amputations (Winnick & Short, 1999). Although the project was directed towards a specific population the resulting physical fitness test can be used to measure adolescents with other disabilities as well as those in the general population (Winnick & Short, 1999).

The BPFT consists of 27 test items, however only four to six items are needed to assess a child’s health-related physical fitness (Winnick & Short, 1999). Before administering the BPFT the researcher can select from a battery of tests in each category (aerobic functioning, body
composition and musculoskeletal fitness) in order to provide the most personalized measure (Winnick & Short, 1999).

The BPFT has proven to be a valid measure of health-related physical fitness. The test has moderately strong to strong concurrent, construct and content validity. In most test items, concurrent validity proved to be moderately strong (r = .70-.89). Construct validity was established through previous factor-analysis work by Winnick and Short (1982) that defined the constructs of strength, body composition and muscular endurance. Content validity is strong for the items in the BPFT because the constructs rationally measure the implied criterion. For example, the curl-up test assesses strength and endurance of the abdominal muscles and the back-saver sit and reach measures hamstring flexibility (Winnick & Short, 1999).

The BPFT has proven to be reliable on a test-retest basis through the interclass r (the Pearson product-moment coefficient), the intraclass R, and Cronbach’s alpha. Most items in the BPFT have indicated that they were acceptable with a reliability coefficient of at least .70. Some items show a high degree of reliability with coefficients of .90 or greater. The reliability statistics on six items in the test battery are unavailable; however, because the scoring for these items is objective, measurement error is controlled (Winnick & Short, 1999).

Because of its versatility and ability to include children with disabilities and those in the general population, the BPFT was chosen to measure the health-related physical fitness of children with chronic health conditions. Also the BPFT allows for a personalized approach when selecting test items within each construct. This approach is important since the study population consisted of individuals with a variety of cancer diagnoses and fitness levels.

Purpose of the Study
Research indicates that there are positive improvements in the psychosocial and physical health of children with chronic health conditions who participate in physical activity. Currently, there are few programs that provide ongoing physical activity for children with chronic health conditions. The purpose of this study was to determine if children with chronic health conditions, specifically those with a brain tumor, cancer and/or leukemia participating in Hoop Dreams Basketball Academy would score higher on physical self efficacy and on health-related physical fitness components than chronically ill children not participating in Hoop Dreams Basketball Academy. Durstine et al. (2000) concluded, “greater emphasis is needed in determining the risks and benefits of increased physical activity programming for persons with chronic diseases and disabilities” (p. 218). Many studies have indicated a need for further study on the psychosocial and physical effects of exercise and physical activity on children with chronic health conditions (Cadman et al., 1987; Cooper et al., 1999; Durstine et al., 2000; Goldberg, 1990; Kaplan & Campbell, 1996; Keats et al., 1999; Klepper, 1999; Plante et al., 2001; van der Ploeg, van der Beek, van der Woude, & van Mechelen, 2004). The results of this study will assist exercise professionals in developing effective exercise programs for children with chronic health conditions.
Chapter 3

METHODS

Research is needed to determine the physical and psychosocial benefits of an ongoing structured physical activity program for children with chronic health conditions. To date, most research studies have examined the physical benefits or the psychosocial benefits but failed to observe both constructs together (Cooper et al., 1999). Most of the research about the benefits of exercise on disabilities has focused on adults (Cooper et al., 1999). One of the five focal points for future research identified by Durstine et al. (2000) called for more information on children with disabilities.

The results of this study will provide pertinent information for the parents of children with chronic health conditions and exercise professionals that create physical activity programs for chronically ill children. For this study, a control group and an experimental group were established, and both groups completed a physical self-efficacy survey and a health-related physical fitness assessment. The control group consisted of children with cancer that were not involved in Hoop Dreams Basketball Academy (HDBA), and the experimental group was comprised of children with cancer that were involved in Hoop Dreams Basketball Academy.

Once the groups of children were identified, parental consent forms and explanations about the study were sent to the involved children’s parents. The children were also asked for their verbal consent to participate in the study. The children in the experimental group received a small incentive of North Carolina State University lapel pins and a jump rope for participating in the research study. Also HDBA provides services free of charge. The subjects in the control group received a small Nalgene bottle for their participation. The data for the experimental group were collected over the course of six weeks during the regularly scheduled Saturday
morning HDBA fitness training session. The data for the control group were collected over the
course of 6 weeks in connection with the child’s follow up appointment at Duke Children’s
Clinic.

Participants

Permission from the North Carolina State University Institutional Review Board was
needed since this study involved human subjects. The researcher completed an application
packet and a letter to the participant’s parents describing the study. The North Carolina State
University Institutional Review Board gave approval to conduct this research (Appendix A).

Convenience sampling was used to select the control and experimental groups in order to
obtain a sample of children with a chronic health condition (cancer) to participate in the study.
For the control group (N = 7), Dr. Henry Friedman and Nancy Butters of The Brain Tumor
Center at Duke recruited patients that were being treated at Duke University Medical Center for
cancer and/or a brain or spinal cord tumor for participation in the study. Each subject in the
control and experimental group was diagnosed with a form of cancer in the last five years. Hoop
Dreams Basketball Academy (HDBA) was contacted for permission to recruit participants from
their program for the experimental group (N = 10). Approximately 57% of the participants
enrolled in HDBA have been diagnosed with a form of cancer in the last five years (M. Zeillman,
personal communication, June 17, 2005).

Seventeen children aged nine to seventeen participated in the study. The control group
consisted of seven subjects (three boys and four girls), and the experimental group consisted of
ten subjects (four boys and six girls). One female subject in the control group and one female
subject in the experimental group opted not to participate in the health-related physical fitness
portion. Both subjects, however, did complete the physical self-efficacy survey. The children in
the control group (mean age = 13.57 years, SD = 1.902 years) were 14.3% Black or African American, 85.7% White. The children in the experimental group (mean age = 13.80 years, SD = 3.011 years) were 30% Black or African American, 60% White and 10% Other.

A parental consent form was distributed to the parents of both the control group and the experimental group (Appendix B). Children who returned the parental consent form and signed their own assent form (Appendix C) were tested during March, April and May, 2005.

**Procedures**

The research study consisted of two parts, a physical self-efficacy survey and a health-related physical fitness assessment. The instructions (Appendix D) for the physical self-efficacy survey were read to the subjects. The control group completed the physical self-efficacy survey (Appendix E) in conjunction with one of their regularly scheduled clinical appointments. Item nine was omitted from the survey because of its inappropriateness for this population. After completing the survey the subjects in the control group met with the researcher individually to conduct the fitness assessment from The Brockport Physical Fitness Manual (Appendix F). The researcher is a well trained professional with an extensive background in exercise science, holding an undergraduate degree in Physical Education, Exercise and Sports Science and numerous industry certifications.

The appropriate tests were determined to measure aerobic functioning, body composition and musculoskeletal functioning. Next, the instructions for the fitness assessment were read to the subjects (Appendix D). The subjects warmed-up prior to the exercise session and cooled down at the completion of the session. The subjects were able to practice several of the test items to make sure he or she was proficient and the correct test items had been chosen.
The subjects in the experimental group completed the physical self-efficacy survey during one of the regularly scheduled HDBA fitness sessions. A few children (N = 2) were emailed the instructions and the survey and completed the survey at home. The parents were given the instructions and they were reminded that they should encourage their child to answer the survey questions based on how he or she feels. Only children with a disability, such as blindness, or a conflict completed the survey at home.

The fitness assessment was conducted on another day as part of one of the regularly scheduled HDBA fitness session. The same protocol for the control group was followed for the experimental group. Both groups were reminded that they were taking a survey, therefore there were no right or wrong answers and the researcher was interested in their opinions. They were encouraged to do the best they could on the fitness assessment but to not overexert themselves. The subjects were encouraged to stop participation if he or she felt increased pain or discomfort. In addition to the physical self-efficacy survey and the fitness assessment the subjects were asked to provide demographical information about themselves such as age, grade, gender, family structure and race/ethnicity.

Instrumentation

The physical self-efficacy instrument (Appendix E) was a 22-item survey that consisted of a 10-item Perceived Physical Ability (PPA) subscale and a 12-item Physical Self-Presentation Confidence (PSPC) subscale (Ryckman et al., 1982). Participants responded to a 6-point Likert scale where 1 = strongly disagree and 6 = strongly agree. Item scores were reversed for the questions marked ***. The PPA subscale refers to the perceived confidence an individual has in performing tasks using physical skills and has a possible range of 10 to 60 points. The PSPC subscale refers to the confidence an individual has in displaying physical skills and being
evaluated in them and has a range from 12 to 72 points. Higher scores on the PPA indicated higher perceived physical ability and higher scores on the PSPC showed greater confidence in the presentation of physical skills. The sum of the two subscales yielded an overall Physical Self-Efficacy (PSE) score. The PSE ranges from 22 to 132 points with higher scores reflecting higher physical self-efficacy.

The Brockport Physical Fitness Test (BPFT) (Appendix F) was developed as a part of Project Target to create a health-related, criterion referenced test for youths with physical and mental disabilities (Winnick & Short, 1999). The Prudential FITNESSGRAM, (Cooper Institute for Aerobics Research, 1999) established in the mid-1990s by the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), was established as the fitness industry’s recommended health-related, criterion referenced physical fitness test. The FITNESSGRAM test included a section on special populations, however, the test items were not modified for children with specific disabilities. The BPFT was chosen because of its flexibility to allow different test items to be chosen depending on the child’s specific ability. The BPFT can also be used on children in the general population.

The Brockport Physical Fitness Test consisted of 27 items, however, the researcher chose only four to six items to assess a child’s health-related physical fitness (Winnick & Short, 1999). In order for testing to run smoothly and efficiently, the same exercises were chosen for all subjects in the control and experimental groups. The participants completed a short warm-up prior to exercise and a cool-down at the completion of the fitness test. The one/mile run walk was established as the test for aerobic functioning. Body mass index (BMI) was chosen to determine the subjects’ body composition. The musculoskeletal tests consisted of the curl-up, trunk lift, isometric push up and the back-saver sit and reach.
One-mile Run/Walk

The one-mile run/walk was chosen to measure aerobic functioning (Winnick & Short, 1999). The participants were encouraged to run or walk one mile in the shortest time possible. The test was conducted on either the walking track in Duke University’s Wilson Gym where one mile was equivalent to 10.5 laps or at a local high school track where one mile is equivalent to one mile. The test was scored in minutes and seconds and only one test trial was given. Six participants in the control group and nine participants in the experimental group completed the one-mile run/walk test.

Body Mass Index

Body mass index (BMI) reflects fat, muscle and bone mass and is an indication of the appropriateness of an individual’s weight for his or her height (Winnick & Short, 1999). In order to determine BMI the participants’ height and weight were determined. The participants were encouraged to wear lightweight clothing and remove their shoes. Height was rounded to the nearest ½ inch and weight was rounded to the nearest pound. Six participants in the control group and ten participants in the experimental group completed the BMI test.

Isometric Push-Up

The isometric push-up test was chosen to measure upper body strength and endurance (Winnick & Short, 1999). The participants were encouraged to hold a raised push-up position for up to 40 seconds. The correct raised position was described as “a front--leaning rest position with the hands directly below the shoulders, arms extended, the whole body in a straight line and toes touching the floor or mat” (Winnick & Short, 1999, p. 98). One test trial was given, and the test was terminated when the correct raised position was no longer held. Six participants in the
control group and nine participants in the experimental group completed the isometric push-up test.

Curl-Up

The curl-up test was chosen to measure abdominal strength and endurance (Winnick & Short, 1999). The participants were positioned flat on their backs with their knees bent to approximately 140 degrees, feet flat on the floor and legs slightly apart. Their arms were held straight by their side, palms facing down and fingers outstretched. The participants curled up four and one-half inches at a cadence of about one curl every three seconds. The participants continued without pausing until the pace could not be maintained or they completed 75 repetitions. Six participants in the control group and nine participants in the experimental group completed curl-up test.

Trunk Lift

The trunk lift test was chosen to measure trunk extension, strength and flexibility (Winnick & Short, 1999). The participants were in a prone position on the mat with their toes pointed and hands under their thighs. Each participant was asked to lift their upper body off the floor in a very slow and controlled manner and hold their chin parallel to the floor. The researcher measured the distance from the floor to their chin and recorded the measurement to the nearest inch. Participants were encouraged not to lift their chin greater than 12 inches off the floor. Each participant was given two test trials and the better score was recorded. Six participants in the control group and nine participants in the experimental group completed trunk lift test.

Back-saver Sit and Reach
The back-saver sit and reach test was chosen to measure hamstring flexibility (Winnick & Short, 1999). A flexibility testing apparatus was not available so a suggested test modification was made to obtain the back-saver sit and reach test. A ruler extended over a bench turned on its side was used instead. Participants were asked to fully extend one leg with their foot against the testing bench and the sole of the other foot flat on the floor approximately two to three inches to the side of the straight knee. The participants placed one palm on top of the other and extended their arms forward over the measuring scale four times. On the fourth trial the participants held the position for at least one second to the measurement could be obtained. The nine-inch mark was even with the bench. After measuring one side, the participant switched to their other leg and completed the same procedure. The measurement was recorded to the nearest whole number of inches. Six participants in the control group and nine participants in the experimental group completed the back-saver sit and reach test.

Analysis

Data from 17 participants were entered into SPSS. There were several cases of missing data. One subject in the experimental group omitted one question on the PSE survey. One subject in the experimental group and one subject in the control group opted not to participate in the health-related physical fitness test. Because omitting these cases would result in a smaller sample size and therefore be less statistically powerful the missing cases were not omitted from the study. Also missing data does not reflect randomness so it is dangerous to delete these cases and create potential bias (Little & Rubin, 1987 as cited in Garson, n.d.). The missing values on the PSE survey and the health-related physical fitness tests were replaced with the number 99, and the number 99 was defined in the variable set as an indicator of missing data. The number
99 was chosen since 99 was not a possible number for any of the PSE or health-related physical fitness variables.

Composite scores for the PPA and PSPC subscales were computed. The subtotals of the PPA scale and the PSPC scale were totaled to determine the participants’ overall PSE score.

Descriptive statistics including mean, standard deviation and frequencies were calculated for the PPA scale, PSPC Scale and PSE scale. Descriptive statistics were also computed for each variable (one-mile run/walk, BMI, curl-up, trunk lift and sit-and-reach) on the health-related physical fitness assessment.

A t-test was calculated to compare the means of two independent samples that with fewer than 30 subjects (Garson, n.d.). A t-test was used to answer the research questions because the data indicated a normal distribution (Garson, n.d.). In the analysis of physical self-efficacy, a t-test was used to compare the means and determine if there was a significant difference in physical self-efficacy between the control group and the experimental group. A t-test was also used to compare the means of both groups on each variable of the health-related physical fitness assessment.

Pearson’s product moment correlation was used to determine if there were any linear relationships between the variables. The research questions did not address if there were any correlations between the subjects’ performance on the PSE survey compared to his or her performance on each aspect of fitness, however the researcher wanted to determine if there were any linear relationships between the variables. Because the study contained quantitative variables that were scored in different units the Pearson correlation was an appropriate measure to determine linear relationships between the variables (Agresti & Finlay, 1997)
Limitations

In order to collect data on a sample of chronically ill children, convenience sampling was used in selecting the groups. The experimental group was chosen from HDBA because there were a significant number of participants that had cancer. Participants in the control group were chosen from patients that were being treated at Duke Hospital. Both the control and the experimental group had been diagnosed with a form of cancer in the last five years. Since the children in this study were aged 9 - 17, the findings may not be readily generalized to other populations. Convenience sampling is appropriate in this study since it is primarily exploratory and intended to gather information about Hoop Dreams Basketball Academy. It is important to note that convenience sampling is not representative of the population as a whole and therefore it is not safe to make generalizations.

There are several possible limitations to the research design. The children may have participated because their friends were taking part. The children in the experimental group may have provided socially desirable answers since they work with the researcher. Parents with a specific interest in the benefits of HDBA or the benefits of physical activity for their child may have encouraged their children to take part in the study. A self-report measure was used for the physical self-efficacy survey and although their parents and/or the researcher were available to define terms the younger children may have had difficulty understanding the questions. Some of the subjects in the control group were too sick to participate therefore they were excluded from the study. In turn, other subjects in the control group participated in more regular and intense physical activities and indicated higher levels of physical fitness. It is also important to note that there are many personal, behavioral and environmental predictors of physical self-efficacy that were not addressed in this study.
Chapter 4

RESULTS

The results of this study will be presented in the following pages. This chapter is divided into subsections that provide information about the sample population and the descriptive results addressing the research questions. The frequencies and percentages for age, gender, grade, ethnicity, number of siblings, and live with both parents were calculated for both the control and the experimental groups. The means and standard deviations for the psychosocial and physical outcomes for each group were calculated. A t-test for Equality of Means was used to test the significance of the relationships between the control and the experimental groups. Pearson correlation matrices were created to determine if certain variables were strongly or weakly correlated with one another.

Descriptive Statistics

The frequencies and percentages for the sample population of 17 children are included in Table 1. Most of the children completing the PSE survey and the fitness assessment were female (58.8%), with a mean age of 13.81 years (SD = 2.544), with one to two siblings (64.7%), living with both parents (82.4%). The sample mean for grade level was 8.06 (SD = 2.817). The demographical questions were asked in order to get a clearer picture of the sample population.

Ethnicity is difficult to measure since it implies cultural significance and is not synonymous with race (Senior & Bhopal, 1994). A self-classification format was used in this study to identify ethnicity. The subjects were asked the question, “How do you describe yourself?”, and were given the option to choose from, “American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Pacific Islander, Hispanic or Latino, White, or Other.” The “Other” category contained a blank so each subject could write in his or
her perception of their own ethnicity. This self-classification method is the accepted method of the United States census (Senior & Bhopal, 1994). From the sample population, 23.5% classified themselves as “Black/African American,” 70.6% classified themselves as “White,” and 5.9% classified themselves as “Other.”

The frequencies and percentages for both the experimental group and the control group are presented in Table 2. Both groups were similar in that the experimental group was comprised of 40% males and 60% females and the control group was made up of 42.9% males and 57.1% females. The mean age was 13.80 years (SD = 3.011) for the experimental group and 13.57 (SD = 1.902) for the control group. The mean grade for the experimental group was 8.30 grade (SD = 3.199) and 7.71 grade (SD = 2.360) for the control group. Eighty percent of the experimental group and 85.7% of the control group indicated that they lived with both parents.

The groups did differ on the number of siblings and their ethnicity. Out of the experimental group 20% had one sibling, 30% had two siblings, 30% had three siblings and 20% had four or more siblings. In the control group 57.1% reported one sibling, 28.6% reported two siblings, and 14.3% reported four or more siblings. The experimental group was 30% Black or African American, 60% White and 10% Other and the control group was 14.3% Black or African American and 85.7% White.

The means and the standard deviations for the psychosocial outcomes and the physical outcomes of each group are presented in Table 3. Results of the significance test performed to assess physical self-efficacy and health-related physical fitness are presented in Table 4. A t-test for Equality of Means was used to test the significance of the relationships between the experimental and the control group. The t-test revealed no significant difference between the
experimental group and the control group on any variable at the 95% confidence interval when equal variances were assumed and when equal variances were not assumed.

Although the findings were not significant it is important to note the difference in means for each group. The means for the PSE scale were similar for both groups. However the mean for the experimental group was a little lower at 83.60 points (SD = 13.525) versus 89.86 points (SD = 14.656) for the control group. Based on the means, the control group outperformed the experimental group on the one mile walk/run (control mean = 714.50, SD = 326.135 and experimental mean = 950.67, SD = 208.426), isometric push-up (control mean = 34.17, SD = 14.289 and experimental mean = 25.11), curl-up (control mean = 34.33, SD = 25.508 and experimental mean = 25.33, SD = 13.784), and the left sit and reach test (control mean = 10.00, SD = 5.099 and experimental mean = 9.00, SD = 3.841).

A Pearson correlation matrix was performed in an effort to identify the relationships between the psychosocial variables and the physical variables. The PPA subscale was strongly correlated with overall PSE scale (r = .849, p<.01), however there was virtually no association between the PPA subscale and the PSPC subscale (r = -.080). There was a weak negative association between physical self-efficacy and the one mile run/walk (r = -.623, p<.05) and BMI (r = -.648, p<.01). The push-up test had strong positive relationship with both the left sit and reach test (r = .777, p<.01) and the right sit and reach test (r = .807, p<.01). The left sit and reach and the right sit and reach tests were also strongly positively correlated with each other (r = .901, p<.01). The results are summarized in Table 5.

A Pearson correlation matrix was also performed to determine if there were any relationships between the psychosocial outcomes and the demographic variables (Table 6) and the physical outcomes and the demographic variables (Table 7). A strong positive correlation
was found between physical self-efficacy and the subject’s sex ($r = .760$, $p < .01$) with males indicating a higher mean score ($mean = 98.43$, $SD = 7.502$) on the PSE scale. Significant difference when equal variances were assumed ($t = 2.423$, $p = .046$) and when equal variances were not assumed ($t = 2.530$, $p = .040$) was found between the mean PSE scores of children aged 11 compared to children aged 16. The younger children indicated a higher PSE score ($mean = 97.50$, $SD = 9.327$) compared to the older children ($mean = 78.40$, $SD = 13.278$). As expected, the results also indicate a strong positive association between the subject’s grade and his or her age. There were no strong positive correlations between any of the physical variables and the demographic variables.
Table 1

*Descriptive Statistics (Frequencies and Percentages) For Sample Population (N=17)*

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Table 2

*Descriptive Statistics (Frequencies and Percentages) for Both Groups*

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Table 3

Means and Standard Deviations Psychosocial Outcomes and Physical Outcomes

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Table 4

Independent Samples Test for Psychosocial Outcomes and Physical Outcomes

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Note – p<.05
### Table 5

**Pearson Correlations Among Psychosocial Outcomes and Physical Outcomes**

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<td>4. One Mile</td>
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<td>-0.730**</td>
<td>-0.211</td>
<td>-0.896**</td>
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<tr>
<td>5. BMI</td>
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<tr>
<td>6. Push-Up</td>
<td>-0.151</td>
<td>0.323</td>
<td>0.807**</td>
<td>0.777**</td>
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<tr>
<td>7. Trunk Lift</td>
<td>0.161</td>
<td>0.371</td>
<td>0.240</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>8. Curl Up</td>
<td>0.531*</td>
<td>0.584*</td>
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<td></td>
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<td></td>
<td></td>
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<td>9. Right Sit and Reach</td>
<td>0.901**</td>
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<td>10. Left Sit and Reach</td>
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</tbody>
</table>

*Note – ** Correlation is significant at the 0.01 level (2-tailed)
  * Correlation is significant at the 0.05 level (2-tailed)*
Table 6

*Pearson Correlations Among Psychosocial Outcomes and Demographic Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
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<tr>
<td>1. PPA</td>
<td>-0.080</td>
<td>0.849**</td>
<td>-0.449</td>
<td>-0.405</td>
<td>-0.599*</td>
<td>0.324</td>
<td>-0.529*</td>
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<td>2. PSPC</td>
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<td>-0.561*</td>
<td>-0.533*</td>
<td>-0.425</td>
<td>-0.061</td>
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<td>3. PSE</td>
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<td>-0.643**</td>
<td>0.760**</td>
<td>0.257</td>
<td>-0.299</td>
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</tr>
<tr>
<td>4. Age</td>
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<td>0.627**</td>
<td>-0.132</td>
<td>0.140</td>
<td>-0.003</td>
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<td>5. Grade</td>
<td>0.674**</td>
<td>-0.010</td>
<td>0.254</td>
<td>0.095</td>
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</tr>
<tr>
<td>6. Sex</td>
<td>0.074</td>
<td>0.403</td>
<td>0.026</td>
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<td>7. Live with both parents</td>
<td>-0.123</td>
<td>0.207</td>
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<td>8. Ethnicity</td>
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<td></td>
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<tr>
<td>9. Number of siblings</td>
<td></td>
<td></td>
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</table>

*Note* – **Correlation is significant at the 0.01 level (2-tailed)  
*Correlation is significant at the 0.05 level (2-tailed)*
Table 7

Pearson Correlations Among Physical Outcomes and Demographic Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. One mile run/walk</td>
<td>.308</td>
<td>-.730**</td>
<td>-.211</td>
<td>-.896**</td>
<td>-.757**</td>
<td>-.735**</td>
<td>.118</td>
<td>.244</td>
<td>.119</td>
<td>-.365</td>
<td>.184</td>
<td></td>
</tr>
<tr>
<td>2. BMI</td>
<td>-.151</td>
<td>.317</td>
<td>-.066</td>
<td>-.155</td>
<td>-.160</td>
<td>.512</td>
<td>.590*</td>
<td>-.294</td>
<td>-.312</td>
<td>.092</td>
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<td></td>
</tr>
<tr>
<td>3. Isometric Push-Up</td>
<td>.150</td>
<td>.323</td>
<td>.807**</td>
<td>.777**</td>
<td>-.439</td>
<td>-.050</td>
<td>-.290</td>
<td>.268</td>
<td>.126</td>
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</tr>
<tr>
<td>4. Trunk Lift</td>
<td>.161</td>
<td>.371</td>
<td>.240</td>
<td>.345</td>
<td>.395</td>
<td>-.236</td>
<td>.067</td>
<td>-.033</td>
<td></td>
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<tr>
<td>5. Curl-Up</td>
<td>.531*</td>
<td>.584*</td>
<td>.112</td>
<td>-.156</td>
<td>.103</td>
<td>.274</td>
<td>-.234</td>
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</tr>
<tr>
<td>6. Left sit and reach</td>
<td>.901**</td>
<td>-.240</td>
<td>-.007</td>
<td>.132</td>
<td>.236</td>
<td>.075</td>
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<tr>
<td>7. Right sit and reach</td>
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<td>-.197</td>
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<td>.233</td>
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<td>8. Age</td>
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<td>.627**</td>
<td>-.003</td>
<td>-.132</td>
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<td>9. Sex</td>
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<td>.026</td>
<td>.074</td>
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<td>10. Siblings</td>
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<td>.207</td>
<td>-.002</td>
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<td>11. Parents</td>
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<td>-.123</td>
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<td>12. Ethnicity</td>
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</table>

*Note – ** Correlation is significant at the 0.01 level (2-tailed)
  * Correlation is significant at the 0.05 level (2-tailed)
Chapter 5

DISCUSSION

Over the last ten years there has been an increase in research regarding the benefits of physical activity. It has long been proven that adults experience many positive benefits from physical activity, but recent research indicates that children can also benefit from regular exercise (Bunker, 1998; Calfas & Taylor, 1994; Ganley & Sherman, 2000; Licence, 2004; Sallis, 1996; Scully et al., 1998; Shephard, 1995; Sothern et al., 1999; U.S. Surgeon General, 1996; Twisk, 2001). Although much of the past research focused on the preventative effects of physical activity for children with chronic health conditions, it is also important to study the benefits of physical activity in children that presently suffer from a chronic health condition (Cooper et al., 1999). A large percentage of children with chronic health conditions are restricted from physical activity programs because of overprotective parents, lack of information from their primary care physician, and failure by the schools to provide appropriate programs (Goldberg, 1990). Physical education teachers and other exercise professionals exclude children with chronic health conditions from planned activities because of their specific condition or ability level (Lanphear, Liptak & Weitzman, 1995). Exercise professionals also reported little interest in working with children with chronic health conditions (Lanphear, Liptak & Weitzman, 1995).

Research indicates that physical activity is equally important for the physical and psychosocial health of children with chronic health conditions (Goldberg, 1990; Smith, 1985). Children with chronic health conditions experience improved health-related physical fitness (American Cancer Society, 2001). Regular physical activity can lead to increased aerobic capacity, increased lean muscle to fat ratio, increased muscular strength, endurance, stamina and
flexibility (Cohen & Walco, 1999; Cooper et al., 1999; Durstine et al., 2000; Ganley & Sherman, 2000; Goldberg, 1990; Lanphear, Liptak & Weitzman, 1995; Modell & Cox, 1999; Small & Bar-Or, 1995; Smith, 1985; Thornton, 1997).

Past research also suggested that physical activity improved the psychosocial well-being in children with chronic health conditions (Ganley & Sherman, 2000; Goldberg, 1990; Modell & Cox, 1999; Smith, 1985; Thornton, 1997). Children with chronic health conditions that exercised indicated improved self-image, self-perception, self-confidence and/or self-esteem (Cooper et al., 1999; Ellickson, 1990; Goldberg, 1990; Kiernan, Gormley & MacLachlan, 2004; Robertson & Johnson, 2002; Sothern et al., 1999; Starfield et al., 1996; Twisk, 2001). Physical activity was indicated to play an important role in reducing the incidence of anxiety and depression in children with chronic health conditions (Goldberg, 1990; Sothern et al., 1999).

The goal of this research was to determine if children with the chronic health condition cancer participating in Hoop Dreams Basketball Academy indicated improved psychosocial health and physical health. Research questions were designed to determine if the children with cancer that participated in the ongoing physical activity programs provided by Hoop Dreams Basketball Academy indicated any difference in physical self-efficacy and/or the components of health-related physical fitness compared to children with cancer that did not take part in Hoop Dreams Basketball Academy. Independent sample t-tests were used to compare the means between the two groups and provide insight to these questions. A Pearson correlation was also used to determine if any variables were correlated with each other. The results of this exploratory study can be used as a foundation for future research on the benefits of physical activity for children with chronic health conditions.
Although the current published research indicates that there are benefits of physical activity for children with chronic health conditions, the results of this study indicated that there were no significant differences between the means of the control and the experimental groups on any variable. In contrast to the significance tests, the normative data indicated that the control group outperformed the experimental group on several variables. Higher scores on the PPA and PSPC subscales and the overall PSE survey indicated higher levels of physical self-efficacy, and the control group reported higher mean scores on all three scales. The control group also indicated a faster one mile walk/run, a higher score on the isometric push-up and on the curl-up. The experimental group had a lower BMI, and there were virtually no differences on the trunk lift, right sit and reach, and left sit and reach. It was expected that the children in the experimental group would indicate reduced body fat since previous findings by Lanphear, Liptak & Weitzman (1995) stated physically active children with chronic health conditions experience decreased obesity, body fat, and increased muscle mass. However the current findings are in contrast to the previous research that indicated children with chronic health conditions that participated in physical activity had improved cardiovascular endurance, increased strength, and increased muscular endurance and flexibility (Lanphear, Liptak & Weitzman, 1995).

There is currently no research that indicates that physical self-efficacy is correlated with improved health-related physical fitness. However, this study indicated that there was a negative relationship between physical self-efficacy and the one mile run/walk, BMI and the trunk lift. A positive relationship was found between physical self-efficacy and the push-up the curl-up, the right sit and reach, and the left sit and reach. Previous research did indicate improved physical self-efficacy on a posttest by adolescent girls involved in a strength training program (Holloway, Beuter & Duda, 1988). Also a previous study found that there was no statistical difference on
the mean PSE score between a sample of athletes with a chronic injury compared to a sample of athletes with an acute injury (Clayton, 1998).

Previous research indicated that physical self-efficacy was correlated with various demographic variables. Although the findings were not significant in this study, males indicated higher mean scores on the PSE compared to females. This finding is consistent with previous findings (Duncan & McAuley, 1987; Robbins, 1985 & Ryckman, Robbins, Thornton & Kaczor, 1983). A study by Thornton and Ryckman (1991) found that males and females in the 11\textsuperscript{th} grade as opposed to students in the 7\textsuperscript{th} grade both indicated higher mean scores on the PSE survey. The results of the current study provided different results with the older children scoring lower on the PSE survey compared to the younger children.

This study intended to indicate a significant difference in physical self-efficacy and health-related physical fitness components for children with cancer involved in Hoop Dreams Basketball Academy compared to children with cancer that did not participate in the programs offered by Hoop Dreams Basketball Academy. Although there was no significant difference in the means of the experimental group compared to the control group, the findings of this study are still important for exercise and research professionals.

As with most studies, there are weaknesses that should be noted. The sampling method was not a random sample, however convenience sampling was used to gather subjects in both the control and the experimental groups. The data may have been skewed since the objective of the study was to determine if children with chronic health conditions that participated in the ongoing structured physical activity program Hoop Dreams Basketball Academy experienced improved physical and psychosocial health. Although the subjects in the control group did not attend the regularly scheduled programs provided by HDBA, several of them indicated that were involved
in other physical activities such as a fitness, exercise or sport’s programs. A speculative 
explanation why the control group outperformed the experimental group on several variables is 
because of their regular involvement in physical activity. Also, several of the subjects in the 
control group indicated that they would like to participate in HDBA but were unable to because 
of previous commitments, time, or location constraints.

Another weakness of the current study is the small sample size for both the control and 
the experimental group. It was originally thought that the researcher would have access to a 
much larger sample of children with chronic health conditions. However, it was determined that 
a specific chronic health condition should be chosen in order to compare similar groups. 
Because children with a cancer diagnosis comprised a large percentage (57%) of the HDBA 
participants, only children that had a cancer diagnosis in the last five years were selected for the 
experimental group. Because this research was limited to a few months and since participation 
in HDBA is completely voluntary it was difficult to test all the children that had a cancer 
diagnosis. A few of the regular attendees opted not to participate in the study, and some of the 
children that are enrolled in HDBA did not attend a testing session. The data could have been 
skewed due to this over-representation of individuals that were interested in completing the 
research study. However there may have been under-representation since all of the children that 
attend HDBA that had a cancer diagnosis in the last five years were not tested.

The control group was chosen by the contacts that Dr. Henry Friedman and Nancy 
Butters had to a population of children with a cancer diagnosis in the last five years that did not 
participate in the programs provided by HDBA. It was difficult to obtain a sample of children 
with a cancer diagnosis in the last five years because many of the contacts did not live in the 
area. The subjects in the control group only came to Durham for their regularly scheduled
doctor’s appointment or treatment. Also a few of the families that were contacted to participate as a member of the control group indicated that their child was too sick to participate in the physical fitness portion. One subject in the control agreed to complete the PSE survey but was not interested in completing the health-related physical fitness assessment. The study would have been much stronger if a larger sample size was obtained for both the control and the experimental groups.

Another limitation of the current research design was the failure to obtain important medical information. It may have been useful to know the exact length of time since diagnosis, the stage of cancer, the type of treatment administered, whether the subject had surgery, radiation and/or chemotherapy and if so how long since the last treatment. Children that had completed their treatment may have scored higher on the PSE survey or the health-related physical fitness variables than those that were currently in treatment. Also children that received a diagnosis five years ago may have performed differently than those that had a recent diagnosis.

There are many issues that should be addressed in future research regarding the physical and psychosocial benefits of physical activity for chronically ill children. It may be helpful to conduct a pretest as the children enroll in HDBA and a posttest after several months of involvement in the program to determine if the participants experience any physical and/or psychosocial benefits. Future research may also include a longitudinal design to examine the long-term effects of a physical activity program for children with chronic health conditions.

Because past research indicated that children with chronic health conditions show improved physical and psychosocial health, further research is also needed to determine how these children can establish and maintain an exercise program (Cooper et al., 1999). The type of physical activity and the participant’s choices for physical activity should also be investigated
Most of the past research has focused on either the physical or the psychosocial benefits of physical activity however few studies have examined the two constructs together. More research is needed to determine how physical activity affects psychosocial health and physical health.

Very little research has focused on the benefits of physical activity for children with cancer. Most of the previous research has been in regards to adults with cancer, specifically women with breast cancer. More research is needed to determine the protective and rehabilitative functions of physical activity for children with cancer (Culos-Reed, 2002). Future research should also focus on the effect physical activity has on cancer recurrence and overall survival rates (Courneya, 2003).

To date there are no published studies that examined physical self-efficacy as a psychosocial construct in regards to children with chronic health conditions. Most studies focused on self-esteem, self-confidence, self-perception, quality of life, depression and/or anxiety. It is important to examine the construct of self-efficacy independent of self-esteem and self-confidence as a determinant of psychosocial health (Ryckman et al., 1982). The Physical Self-Efficacy scale (Ryckman et al., 1982) should be used to further explore the relationship between physical activity and psychosocial health in children with chronic health conditions.

In summary, the current study attempted to combine the constructs of physical self-efficacy and health-related physical fitness in support of previous research. Although the findings were not statistically significant, the information gained through this study is beneficial. Research is most beneficial when it is translated into practice. The results of this study can be used to initiate new programs and improve existing physical activity programs for children with chronic health conditions. Also this study provided useful information for fitness and exercise
professionals that work with children with chronic health conditions. This study was exploratory in nature and was intended to open the door for more research about Hoop Dreams Basketball Academy. Continuing to research Hoop Dreams Basketball Academy will provide valuable insight that will enhance the program and ultimately provide many benefits for the participants.
REFERENCES


APPENDICES

APPENDIX A

IRB Approval

From: Debra A. Paxton, IRB Administrator
North Carolina State University
Institutional Review Board

Date: March 28, 2005

Project Title: The Physical and Psychological Benefits of a Structured Exercise Program on Children and Adolescents with Chronic Disease

IRB#: 058-05-3

Dear Ms. Michaels -

The project listed above has been reviewed in accordance with expedited review procedures under Addendum 46 FR8392 of 45 CFR 46 and is approved for one year. This protocol expires on March 28, 2006, and will need continuing review before that date.

NOTE:
1. This board complies with requirements found in Title 45 part 46 of The Code of Federal Regulations. For NCSU the Assurance Number is: FWA00003429; the IRB Number is: IRB00000330.

2. The IRB must be notified of any changes that are made to this study.

3. Your approval for this study lasts for one year from the review date. If your study extends beyond that time, including data analysis, you must obtain continuing review from the IRB.

Please provide your faculty sponsor with a copy of this letter. Thank you.

Sincerely,

Debra Paxton
NCSU IRB
APPENDIX B
North Carolina State University
INFORMED CONSENT FORM for RESEARCH

Benefits of an Ongoing Structured Physical Activity Program for Children with Chronic Health Conditions

Ronda Michaels, Dr. Michael Kanters and Dr. Judy Peel, Department of Parks, Recreation and Tourism Management

We are asking for your permission to allow your child to participate in a research study. The purpose of this study is to determine the physical and psychological benefits of a structured exercise program on children with chronic disease. We also hope this research will be a valuable feedback tool to determine the success and effectiveness of Hoop Dreams Basketball Academy.

INFORMATION
If you agree for your child to participate in this study, your child will be asked to perform an adaptive physical fitness assessment and answer a short questionnaire on physical self-efficacy. A member of Empower Personal Training’s staff will conduct and record the results of this assessment. The fitness assessment will measure aerobic capacity, body composition, muscular strength, muscular endurance and flexibility. Physical self-efficacy refers to the belief that one is capable of accomplishing a specific task that is enhanced through physical activity. First, your child will complete a battery of tests from The Brockport Physical Fitness manual in order to determine his or her fitness level. This fitness assessment will take approximately 30 minutes, and it will be adapted to your child’s ability. Also, the fitness assessment will be held in an open yet private location to ensure your child’s safety and confidentiality. Secondly, your child will be asked to complete a short questionnaire that addresses physical self-efficacy. Your child can either complete the questionnaire before or after the fitness assessment or at another time if he or she does not feel up to completing the questionnaire on the same day. We anticipate that the total time required by your child will be no more than one hour. For your convenience we plan to conduct this assessment before, during or after the regularly scheduled Hoop Dreams session. You will be able to review your child’s results on both the fitness assessment and the physical self-efficacy questionnaire.

RISKS
The potential for injury exists since your child will be completing a physical fitness test that may require a combination of the following tasks: fast walking, jogging, supporting his or her body weight, lifting weights, abdominal curls and stretching. Your child will be under direct adult supervision from a member of the Empower Personal Training staff throughout the entire assessment to ensure safety. Your child will be allowed to discontinue participation if he or she feels uncomfortable or unable to complete the fitness assessment.

The Physical Self-Efficacy questionnaire does not present any inherent risks to your child’s safety. However this test is a psychological measure and may elicit certain feelings such as happiness, sadness or confusion. Your child will be able to withdraw from participation if he or she feels uncomfortable during the Physical Self-Efficacy questionnaire.

BENEFITS
Your child will benefit by learning his or her current level of fitness. Also as he or she continues with the basketball portion and/or the fitness portion he or she may experience even greater physical and psychological benefits associated with a structured exercise program. These benefits include: improved fitness, decreased incidence of related secondary health disorders, decreased obesity, increased self-esteem, increased quality of life, improved mood and other physical and psychological benefits.

This research may be valuable since it will provide feedback regarding the success of the basketball and personal training component of Hoop Dreams Basketball Academy. Such feedback may lead to more funding, the expansion of existing programs, and the extension of current programs.
CONFIDENTIALITY
The information in the study records will be kept strictly confidential. Data will be stored securely in a file cabinet at Empower Personal Training. Also a numerical identification system has been identified for the participants; therefore your child’s name or personal information will not be connected to the study in any way. One year after the completion of the study and data analysis this confidential information will be destroyed. No reference will be made in oral or written reports which could link your child to the study.

EMERGENCY MEDICAL TREATMENT
In the event of an injury your child will be treated according to the Emergency Management Plan set forth by Hoop Dreams Basketball Academy. You will also be contacted immediately if your child experiences any discomfort or sustains an injury during the research study.

CONTACT
If you have questions at any time about the study or the procedures, you may contact the researcher, Ronda Michaels, at 105 Harrier Court, Durham, NC 27713, or (919) 724-7600. If you feel your child has not been treated according to the descriptions in this form, or your child’s rights as a participant in research have been violated during the course of this project, you may contact Dr. Matthew Zingraff, Chair of the NCSU IRB for the Use of Human Subjects in Research Committee, Box 7514, NCSU Campus (919/513-1834) or Mr. Matthew Ronning, Assistant Vice Chancellor, Research Administration, Box 7514, NCSU Campus (919/513-2148)

PARTICIPATION
Your child’s participation in this study is voluntary; you may decline for your child to participate without penalty. If you decide to allow your child to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which he/she is otherwise entitled. If your child withdraws from the study before data collection is completed, your child’s data will be returned to you or destroyed at your request.

CONSENT
I have read and understand the above information. I have received a copy of this form. I agree for my child to participate in this study with the understanding that he or she may withdraw at any time.

Subject Parent’s Guardian’s signature_______________________________________ Date _________________

Investigator’s signature__________________________________ Date _________________
I, ___________________________________, understand that my parents have said that it is ok for me to take part in a research project about Hoop Dreams Basketball Academy. I understand that I will be asked to complete a few exercises and answer a short questionnaire about how I feel after participating in Hoop Dreams.

I am taking part because I want to, and I have been told that I can stop at any time and I will not get in trouble.

___________________________________
Signature
APPENDIX D

Instructions for Survey Administration

1. Introduction
   - Names/NC State University
   - Thank you for participating
   - I am doing a project about Hoop Dreams Basketball Academy.
   - You will receive free NC State pencils for participating

2. Test vs. Survey
   - In school you take tests where you want to know the right answer.
   - There are no “right or wrong” answers to this survey so I want you to circle the words that describe how you feel about the statement.

3. Assent form
   - Your parents signed a form but I want you to sign a form that says you would like to participate.

4. Survey
   - Please answer the survey questions.
   - Let me know if you have any questions.

Instructions for Fitness Assessment

1. Classify or subclassify each participant depending on condition.
2. Select the appropriate test items.
3. Conduct a brief warm-up.
4. Measure physical fitness status by administering test items.
5. Conduct a brief cool-down.

Aerobic Functioning Tests – Choose one

- **PACER (20m)** – participants run as long as possible back and forth across a 20-m distance at a specified pace, which gets faster each minute. The participant is directed through the test by a series of beeps. Once the participant can no longer reach the line before the beep, he or she will be given two more beeps before they are withdrawn. One test trial is given and the participant’s score is the number of completed laps.
- **PACER (16m)** – conducted the same as above but the distance to be run is 16-m rather than 20-m
- **One-mile run/walk** – participants run or walk one mile in the shortest time possible. One test trial is given and the one-mile run/walk is scored in minutes and seconds.

Body Composition Test
• **Body mass index** – determine the height and weight of each participant

**Musculoskeletal Functioning – must complete all four tests unless the participant is unable**

• **Curl-up** – participants complete as many curl-ups as possible, up to a maximum of 75, at a cadence of one curl every three seconds. The participant’s knees are bent at a 140 degree angle with the feet flat on the floor and the legs slightly apart. The arms are held straight parallel to the trunk, with the palms facing down toward the mat and the fingers outstretched. The participant must move the fingertips 4.5 inches. (The participant can conduct a modified curl-up with their hands along their thighs until the fingertips touch the patellae).

• **Trunk lift** – participants are in a prone position and attempt to lift the upper body up to 12 inches off the floor using the muscles of the back. The participants should hold the position long enough to take the measurement. Allow for two trials and record the better score.

• **Isometric Push-up** – participants attempt to hold a raised push-up position for up to 40 seconds. The test is terminated when the correct up position is no longer held.

• **Back-saver sit and reach** – participants begin the test by removing his or her shoes. One leg is fully extended with the foot flat against the testing instrument. The other knee is bent, with the sole of the foot flat on the floor two to three inches to the side of the straight knee. The hands are placed palms down one on top of the other. The participant reaches directly forward with both hands along the scale four times and holds the position on the fourth reach. After measuring one side the participant switches the position of the legs and reaches again.

Note: Instructions for the fitness assessment were adapted from The Brockport Physical Fitness Test Manual (Winnick & Short, 1999).
APPENDIX E

Personal Value Survey

This questionnaire is a series of attitude statements about you. We are interested in the extent to which you agree or disagree with them.

Please read each statement carefully. Then indicate the extent to which you agree or disagree by circling the appropriate number on your answer sheet. The numbers and their meaning are indicated below:

- If you agree strongly: 1
- If you agree somewhat: 2
- If you agree slightly: 3
- If you disagree slightly: 4
- If you disagree somewhat: 5
- If you disagree strongly: 6

If you find that the numbers to be used in answering do not adequately indicate your opinion, please circle the number which is closest to describing the way you feel.
# Answer Sheet

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<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tr>
<td>If you disagree slightly</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>If you disagree somewhat</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you disagree strongly</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

1. I have excellent reflexes. ***
   
   1 2 3 4 5 6

2. I am not agile and graceful.
   
   1 2 3 4 5 6

3. I am rarely embarrassed by my voice. ***
   
   1 2 3 4 5 6

4. My physique is rather strong. ***
   
   1 2 3 4 5 6

5. Sometimes I don’t hold up well under stress.
   
   1 2 3 4 5 6

6. I can’t run fast.
   
   1 2 3 4 5 6

7. I have physical defects that sometimes bother me.
   
   1 2 3 4 5 6

8. I don’t feel in control when I take tests involving physical dexterity.
   
   1 2 3 4 5 6

9. People think negative things about me because of my posture.
   
   1 2 3 4 5 6
10. I am not hesitant about disagreeing with people bigger than me. ***

1  2  3  4  5  6

11. I have poor muscle tone.

1  2  3  4  5  6

12. I take little pride in my ability in sports.

1  2  3  4  5  6

13. Athletic people usually do not receive more attention than me. ***

1  2  3  4  5  6

14. I am sometimes envious of those better looking than myself.

1  2  3  4  5  6

15. Sometimes my laugh embarrasses me.

1  2  3  4  5  6

16. I am not concerned with the impression my physique makes on others. ***

1  2  3  4  5  6

17. Sometimes I feel uncomfortable shaking hands because my hands are clammy.

1  2  3  4  5  6

18. My speed has helped me out of some tight spots. ***

1  2  3  4  5  6

19. I find that I am not accident prone. ***

1  2  3  4  5  6

20. I have a strong grip. ***

1  2  3  4  5  6
21. Because of my agility I have been able to do things which many others could not do.

***

1  2  3  4  5  6

Please answer a few questions that describe you.

1. Age:_______________ Grade:_______________

2. Boy:_______________ Girl:_______________

3. How many brothers and sisters do you have? (Circle one)

1  2  3  4 or more

4. How many brothers do you have? _______________ How many sisters do you have? _______________

5. Do you live with both of your parents? YES NO

6. How do you describe yourself? (Please check one or more blanks).

_____ American Indian or Alaska Native  _____ Native Hawaiian or Pacific Islander

_____ Asian  _____ Hispanic or Latino

_____ Black or African American  _____ White

_____ Other  __________________________
APPENDIX F

Sample Brockport Physical Fitness Test Form

Form 3.1 Sample Brockport Physical Fitness Test Form

Student's name: ___________________________ Sec: □ M □ F Age (yr):_____

Height:_________________________ Weight:_________________________ Date:______________

Classification:_________________________ Subclassification:_________________________

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<tr>
<th>Test Item</th>
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<th>Test score</th>
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<th>General standards</th>
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<td>Pref.</td>
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<td>Aerobic capacity</td>
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<td>Aerobic behavior</td>
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<td>Body Composition</td>
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<td>Skinfold(s):</td>
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<td>Flexibility/range of motion</td>
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<tr>
<td>Sit &amp; reach</td>
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Interpretation: ___________________________