ABSTRACT

HICKERSON, BENJAMIN DANIEL. Individual, Social, Physical Environmental, and Organizational Correlates of Children’s Summer Camp-Based Physical Activity. (Under the direction of Dr. Karla A. Henderson.)

Physical inactivity is a concern of public health as many children are not participating in enough physical activity to maintain a healthy profile. Evidence has also indicated that physical inactivity may be exacerbated during the summer months. To address these issues, researchers have begun exploring settings such as parks and schools to determine their role in facilitating physical activity. The purpose of this exploratory study was to examine 8- to 12-year-old children’s physical activity in summer camps and determine correlates of their physical activity participation. The social ecological framework was used to arrange variables into conceptual factors including individual characteristics (i.e., age, gender, race, Body Mass Index, pre-camp physical activity), and social (i.e., counselor and peer physical activity), physical (i.e., size and number of facilities), and organizational (i.e., camper-staff ratio and programming) environments.

Data were collected from 157 campers at four day camps and 132 campers at four resident camps. Campers at resident camps took 19,699 pedometer-recorded steps during full camp days while day campers took 11,916 steps during half camp days. Male gender, non-minority race, BMI below the 85th percentile, high peer group and counselor stepcounts, and larger and more physical activity facilities were positive bi-variate correlates of day camper physical activity. Male gender, non-minority race, BMI below the
85th percentile, high peer group stepcount, more physical activity facilities, more camp acreage, longer walking distance between programming areas, low camper-staff ratio, and intentional physical activity programming were positive bi-variate correlates of resident camper physical activity. Further analyses using ordinary least squares regression for factor level and full day and resident camp models indicated that individual characteristics may have the greatest influence on camper physical activity participation. In full models of camp physical activity, social, physical environmental, and organizational factors were also associated with resident camper physical activity, but physical and organizational factors were not significantly related to day camper physical activity. The findings from this study suggest that camp administrators can modify a range of variables to increase physical activity participation in camps.
Individual, Social, Physical Environmental, and Organizational Correlates of Children’s Summer Camp-Based Physical Activity

by

Benjamin D. Hickerson

A dissertation submitted to the Graduate Faculty of North Carolina State University
In partial fulfillment of the Requirements for the degree of Doctor of Philosophy

Parks, Recreation and Tourism Management

Raleigh, North Carolina

2009

APPROVED BY:

Karla A. Henderson
Committee Chair

Myron F. Floyd

G. David Garson
BIOGRAPHY

Benjamin Daniel Hickerson was born May 13, 1981 in Alton, Illinois. He attended Alton public schools during his youth and graduated from Alton High School in 1999. To earn money and keep busy during adolescence, Ben held many positions with Alton Parks and Recreation Department. Some of these jobs were soccer and baseball umpiring, concession stand service, park and sport field maintenance, and day camp activity coordinator. During that period of time, he recognized the role of leisure and parks in contributing to individual and community well-being.

Although he was highly interested in studying parks, Ben began his post-secondary education in business administration at Lewis and Clark Community College in 1999. He continued to study business at Illinois State University and graduated with a Bachelor of Science in Business Administration in 2003. The foundational knowledge of business he acquired was enlightening, but Ben wanted to apply those skills in the field he was most interested in: parks and recreation. Ben decided to continue his education at Illinois State University and earned a Master of Science in Park and Recreation Administration in 2005. During that time, he served as a Graduate Assistant Instructor and taught Tennis, Billiards, Golf, and an Introduction to Leisure Lab to undergraduate students.

Ben recognized that he enjoyed both teaching students and researching people’s leisure pursuits. He completed his Master’s thesis, Leisure Boredom and Activity Patterns in College Students, and chose to pursue Ph. D. Ben then continued his educational
journey at North Carolina State University in Raleigh, North Carolina. He was awarded a Hofmann Graduate Fellowship in the Department of Parks, Recreation and Tourism Management. Faculty members and public need introduced him to a research topic of study, examining the relationship between leisure and health. He focused on that topic, including interdisciplinary studies in public administration, and worked with colleagues to publish journal articles in *Journal of Leisure Research* and *Journal of Park and Recreation Administration*.

As of 2009 Ben lives in State College, Pennsylvania and is beginning a job as an Assistant Professor in the Department of Recreation, Park and Tourism Management at The Pennsylvania State University. He plans to continue studying associations between leisure and health, especially in relationship to youth summer camps.
ACKNOWLEDGEMENTS

I would like to extend recognition and thanks to many people for helping me complete this project. I am proud of this accomplishment and couldn’t have made it without assistance. North Carolina State University and the Department of Parks, Recreation, and Tourism Management (PRTM) were the best choices I could have made for my career. The Hofmann Graduate Fellowship was greatly appreciated as it provided financial stability and an opportunity to pursue my studies independently.

To my committee, thank you for guiding me through this project and encouraging me to do my best. I appreciate the time and effort you invested. To my advisor Dr. Karla Henderson, thank you for everything. It is hard for me to express all of the things you have taught me. Although it took me awhile to realize, you always guided me in the right direction or helped me find my own path. I appreciate your persistence to make me be the best that I can be. To Dr. Jason Bocarro, thank you for all of the time you spent with me. You helped me develop my philosophy as an academic and your enthusiasm was contagious. To Dr. Myron Floyd, thank you for introducing me to the topic of leisure and health and pushing me to improve my analytical skills. And to Dr. G. David Garson, thank you for always being available and providing statistical guidance.

Many other people in PRTM were also helpful. Dr. Beth Wilson, thank you for your diligence to construct a wonderful department and making me feel like I was part of the family. Faculty members: Dr. Doug Wellman, Dr. Michael Kanters, Dr. Roger Moore, Dr.
Jonathan Casper, Dr. Yu-Fai Leung and Dr. Judy Peel, thank you for teaching and listening to me. Administrative staff: Debbie Hurst, Felicia Mangum, Susan Colby, and Anju Singh thank you for helping me stay compliant and keeping me on track. Fellow students: Annette Moore, Mike Edwards, Linda Oakleaf, Jessica Robinson, Mike Naber, Brian and Jerusha Greenwood, Timia Thompson, Ines Palacios, Raj Butali, Penny James, and Chad Menefee – thank you for your unique insights and constant support. And to Larissa Witmer, I don’t know what I would’ve done without you. I will be forever indebted to you for being the most qualified, lowest paid research assistant ever and a loving friend.

Friends and family were always there to either remind me to keep working or help me escape. Mom (Janice Garee) and Dad (Daniel Hickerson), soon you will be able to ask me if I am finished with my dissertation and the answer will be yes! Thank you for raising me to keep trying when times are tough and finish whatever I start. I love you both and your guidance has been integral. Bob Garee, you have been good to me as well. Next year the family vacation won’t include writing (maybe). Friends, especially North Carolina State Hockey players, thank you for being there even when you weren’t aware of the stress relief you were providing. And to Leslie Baldwin, thank you for instilling me with the confidence I needed to get my education on the right track and moving forward.
TABLE OF CONTENTS

LIST OF TABLES........................................................................................................... x

LIST OF FIGURES......................................................................................................... xii

CHAPTER I: INTRODUCTION....................................................................................... 1
  Purpose of the Study ................................................................................................. 4
  Theoretical Framework .......................................................................................... 5
  Significance of the Study ....................................................................................... 7
  Scope and Delimitations of the Study ................................................................. 8
  Definition of Terms .............................................................................................. 9
  Chapter One Summary .......................................................................................... 12

CHAPTER II: LITERATURE REVIEW.......................................................................... 13
  The History and Development of Physical Activity Research ......................... 13
  Theoretical Framework – Ecological Models ..................................................... 17
  Social Ecological Correlates of Children’s Physical Activity ........................... 25
    Individual Characteristics and Physical Activity Participation .......... 29
    Physical Activity Participation Patterns ...................................................... 29
    Age and Physical Activity Participation .................................................... 31
    Gender and Physical Activity Participation .............................................. 32
    Race, Ethnicity, and Physical Activity Participation .................................. 36
    Body Mass Index and Physical Activity Participation ................................ 39
  The Social Environment and Physical Activity Participation ..................... 41
    Parents, Guardians and Physical Activity Participation ............................ 42
    Peer Group Influence on Physical Activity Participation ......................... 44
    Summer Camp Social Relationships and Physical Activity Participation .... 45
  The Physical Environment and Physical Activity Participation ................. 47
    Physical Activity in Neighborhoods ............................................................. 49
    Physical Activity in Parks ............................................................................. 51
    Park Proximity and Physical Activity ......................................................... 51
    The Availability of Park Facilities and Physical Activity Participation ....... 52
  Physical Activity in Schools ............................................................................. 55
  The Organizational Environment and Physical Activity Participation .......... 57
    Camper-Staff Ratio and Physical Activity Participation ............................. 58
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intentional Programming and Physical Activity</td>
<td>59</td>
</tr>
<tr>
<td>Outcome-Based Camp Research</td>
<td>62</td>
</tr>
<tr>
<td>Camp Outcomes Research</td>
<td>62</td>
</tr>
<tr>
<td>Physical Activity and Health Behavior Camps Research</td>
<td>64</td>
</tr>
<tr>
<td>Chapter Two Summary</td>
<td>65</td>
</tr>
<tr>
<td>CHAPTER III: METHODS</td>
<td>66</td>
</tr>
<tr>
<td>Design</td>
<td>66</td>
</tr>
<tr>
<td>Sample</td>
<td>67</td>
</tr>
<tr>
<td>Sample of Camps</td>
<td>67</td>
</tr>
<tr>
<td>Sample of Participants</td>
<td>68</td>
</tr>
<tr>
<td>Data Collection Procedures</td>
<td>73</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>75</td>
</tr>
<tr>
<td>Pedometers</td>
<td>76</td>
</tr>
<tr>
<td>Pedometer Validity and Reliability</td>
<td>78</td>
</tr>
<tr>
<td>Camp Physical Activity Questionnaire for Older Children</td>
<td>81</td>
</tr>
<tr>
<td>Camper and Counselor Demographic Information</td>
<td>83</td>
</tr>
<tr>
<td>Body Mass Index (BMI) Measurement</td>
<td>84</td>
</tr>
<tr>
<td>End of Camp Questionnaire</td>
<td>88</td>
</tr>
<tr>
<td>Program Data Collection</td>
<td>89</td>
</tr>
<tr>
<td>Missing or Unspecified Activity Data</td>
<td>93</td>
</tr>
<tr>
<td>Camp Environment Audit Instrument</td>
<td>94</td>
</tr>
<tr>
<td>Pilot Test</td>
<td>97</td>
</tr>
<tr>
<td>Data Entry</td>
<td>102</td>
</tr>
<tr>
<td>Data Separation</td>
<td>102</td>
</tr>
<tr>
<td>Data Preparation</td>
<td>103</td>
</tr>
<tr>
<td>Adding Non-Ambulatory Stepcount Data</td>
<td>104</td>
</tr>
<tr>
<td>Missing Data</td>
<td>107</td>
</tr>
<tr>
<td>Aggregation of Categorical Demographic Variables</td>
<td>110</td>
</tr>
<tr>
<td>Standardization of Variables with High Multicollinearity</td>
<td>111</td>
</tr>
<tr>
<td>Statistical Analyses</td>
<td>112</td>
</tr>
<tr>
<td>Independent T-tests</td>
<td>115</td>
</tr>
<tr>
<td>Pearson Correlation Coefficients</td>
<td>116</td>
</tr>
<tr>
<td>Multiple Regression</td>
<td>116</td>
</tr>
<tr>
<td>Exploratory Analysis and Setting an Alpha Level</td>
<td>117</td>
</tr>
<tr>
<td>Chapter Three Summary</td>
<td>118</td>
</tr>
</tbody>
</table>
 CHAPTER IV: RESULTS .................................................................................................. 119

Descriptive Statistics ............................................................................................ 120
  Descriptive Statistics for Day Camp Participants ........................................... 120
  Descriptive Statistics for Resident Camp Participants .............................. 120
Survey Data Descriptive Statistics ..................................................................... 122
Stepcounts by Camp Site ..................................................................................... 125
Statistical Tests for the Four Conceptual Factors of the Social Ecological
Framework ........................................................................................................ 126
  Individual-Level Variables and Camp Physical Activity ........................... 126
  Social-Level Variables and Camp Physical Activity .................................. 132
  Physical Environment-Level Variables and Camp Physical Activity ........... 134
  Organizational-Level Variables and Camp Physical Activity .......................... 140
Four-Factor Day and Resident Camp Multiple Regression Models ............................ 144
  Day Camp Full Regression Model ............................................................... 145
  Resident Camp Full Regression Model ......................................................... 147
Chapter Four Summary ..................................................................................... 150

 CHAPTER V: DISCUSSION .......................................................................................... 152

Conclusions ........................................................................................................ 156
Interpretation of Findings ................................................................................... 157
  Baseline Levels of Camp PA Participation ................................................. 158
Interpreting Individual-Level Correlates of Camp Physical Activity .............. 159
  Pre-camp Physical Activity Participation ..................................................... 159
  Age ................................................................................................................. 160
  Gender ............................................................................................................ 161
  Race and Ethnicity ......................................................................................... 162
  Body Mass Index ............................................................................................ 164
Interpreting Social-Level Correlates of Camp Physical Activity .................... 166
  Counselors .................................................................................................. 167
  Peer Groups ................................................................................................. 168
Interpreting Physical Environment-Level Correlates of Camp Physical
Activity .............................................................................................................. 170
  Day Camp Physical Environments ........................................................... 170
  Resident Camp Physical Environments ...................................................... 172
Interpreting Organizational-Level correlates of Camp Physical
Activity ............................................................................................................. 173
  Camper-Staff Ratio ...................................................................................... 173
  Camp Activity Programming ........................................................................ 174
Application of the Social Ecological Framework ............................................... 176
Limitations .............................................................................................................. 178
  Theoretical Framework Limitations .......................................................... 178
  Conducting Research in Camps .............................................................. 180
  Physical Activity Measurement Issues .................................................. 181
  Missing Data .......................................................................................... 183
  Data Collection Assistants ................................................................... 184
Management Implications ........................................................................ 185
Future Research .......................................................................................... 189
Chapter Five Summary ............................................................................ 194
REFERENCES ................................................................................................. 195

APPENDICES ........................................................................................................ 224
  Appendix A. North Carolina State University IRB Approval ....................... 225
  Appendix B. Overview of Physical Activity in Camps Research Study .......... 226
  Appendix C. Informed Consent Letter to Parents ...................................... 228
  Appendix D. Informed Consent Form for Counselors ................................ 231
  Appendix E. Physical Activity in Camps Study Protocol ............................. 233
  Appendix F. Counselor Quick Reference Sheet ....................................... 239
  Appendix G. Camp Physical Activity Questionnaire ................................. 240
  Appendix H. End of Camp Physical Activity Questionnaire ...................... 243
  Appendix I. Camp Audit Instrument ....................................................... 245
  Appendix J. Camp Daily Activity Participation Form ................................. 253
LIST OF TABLES

Table 2.1. Correlates of Children’s Physical Activity .............................................. 27
Table 3.1. Day Camp Administration and Participation Information .................. 69
Table 3.2. Camp Descriptions – Day Camps ............................................................ 69
Table 3.3. Resident Camp Administration and Participation Information ........... 70
Table 3.4. Camp Descriptions – Residential Camps .............................................. 71
Table 3.5. Example MET Values for Converting Camp Programming to METs .. 91
Table 3.6. Day Camp Physical Environment Characteristics ............................. 98
Table 3.7. Resident Camp Physical Environment Characteristics ...................... 98
Table 3.8. End of Camp Questionnaire Items with High Skewness and Kurtosis in Pilot Testing .......................................................... 100
Table 3.9. Research Questions, Variables of Study, and Associated Bi-variate Statistical Tests: Grouped by Factor ...................................................... 113
Table 4.1. Gender, Age, Race, and Body Mass Index of Day Camp Participants .......................................................... 121
Table 4.2. Gender, Age, Race, and Body Mass Index of Resident Camp Participants .......................................................... 123
Table 4.3. Mean Pre-Camp Physical Activity of Day Campers ............................. 124
Table 4.4. Mean Pre-Camp Physical Activity of Resident Campers ..................... 124
Table 4.5. Mean Stepcount (Physical Activity) at Each Day and Resident Camp .......................................................... 125
Table 4.6. Independent T-test Stepcount Comparisons by Individual Characteristics (Age, Gender, Race, BMI) .......................................................... 128
Table 4.7. Pearson Correlation of Camper Stepcount and Pre-Camp Physical Activity ................................................................. 129
Table 4.8. Ordinary Least Squares Regression of Individual-Level Variables and Day and Resident Camper Physical Activity ......................... 130
Table 4.9. Pearson Correlations of Camper Stepcount and Camp Social Variables .................................................................................. 132
Table 4.10. Ordinary Least Squares Regression of Social-Level Variables and Day and Resident Camper Physical Activity ...................... 134
Table 4.11. Pearson Correlations of Camper Stepcount and Camp Physical Environmental Variables .......................................................... 136
Table 4.12. Ordinary Least Squares Regression of Physical Environmental-Level Variables and Day and Resident Camper Physical Activity ........ 138
Table 4.13. Average Energy Expenditure in Metabolic Equivalency Ratios per Day at Day and Resident Camps ............................................ 141
Table 4.14. Most Common Resident and Day Camp Activities by Programming Periods .................................................................................. 142
Table 4.15. Pearson Correlation of Camper Stepcount and Camp Organizational Variables ........................................................................... 143
Table 4.16. Ordinary Least Squares Regression of Organizational-Level Variables and Day and Resident Camper Physical Activity .............. 144
Table 4.17. Full Day Camp Ordinary Least Squares Regression Model ................................................................. 146
Table 4.18. Change in Explained Variance of Day Camper Stepcount by Factor-Level .................................................................................... 147
Table 4.19. Full Resident Camp Ordinary Least Squares Regression Model ........ 149
Table 4.20. Change in Explained Variance of Resident Camper Stepcount by Factor-Level .............................................................................. 150
LIST OF FIGURES

Figure 1.1. Conceptual Framework of PA in Camps ...........................................5
Figure 2.1. Photo Example of Nesting Analogy of Bronfenbrenner’s Model ......20
Figure 2.2. Bronfenbrenner’s Ecological Theory ................................................21
Figure 2.3. Layers of a Social Ecological Model ...............................................23
Figure 3.1. Adult BMI Classifications .................................................................86
Figure 3.2. Child and Adolescent BMI Classifications .......................................86
Figure 3.3. Example of Classifying a Child’s BMI by Percentile .......................87
Figure 3.4. Formula for Modifying Rock-Climbing and High Ropes
Programming Time ............................................................................................94
Figure 3.5. Formula for Estimating Pedometer Counts for Activities without
Constant Participation ......................................................................................107
INDIVIDUAL, SOCIAL, PHYSICAL ENVIRONMENTAL, AND ORGANIZATIONAL CORRELATES OF CHILDREN’S SUMMER CAMP-BASED PHYSICAL ACTIVITY

CHAPTER I: INTRODUCTION

An epidemic of physical inactivity has contributed to an increasingly unhealthy and disease-susceptible population in the United States. Children are of specific concern as the current generation is one of the most inactive and unhealthy in history (Ogden et al., 2006). A national study conducted by the Centers for Disease Control and Prevention (CDC) reported that 62% of children aged 9- to 13-years-old did not participate in any physical activity (PA) during nonschool hours and 23% engaged in no daily PA (Duke, Huhman, & Heitzler, 2003). Similarly, Troiano et al. (2008) reported that only 42% of children aged 6- to 11-years-old participated in at least 60 minutes of PA per day.

To promote physical development and prepare children for a healthy future, the United States Department of Health and Human Services (USDHHS) recommends 60 or more minutes of moderate-vigorous PA daily (USDHHS, 2008). For children, meeting recommended PA guidelines can result in leaner bodies, increased muscular strength, endurance and flexibility, healthier cardiovascular and blood lipid profiles, reduced blood pressure, development of higher peak bone masses, and greater musculoskeletal health (Bar-Or, 1995; Biddle, Gorely, & Stensel, 2004; Boreham & Riddoch, 2001; Powell et al., 2009; Schofield, Schofield, Hinckson, & Mummery, 2009; Strong et al., 2005).
Of equal importance are the consequences associated with physical inactivity. The greatest concern for children is the relationship between physical inactivity and obesity. Obesity over the lifespan coupled with a lack of PA can result in negative health conditions including increased risk for cardiovascular disease and Type II diabetes (Hill, Wyatt, Reed, & Peters, 2003). The prevalence of obesity in children aged 6-11-years-old has escalated since 1965 and the largest increases occurred following the mid-1980’s (CDC, n.d.; Troiano, Flegal, Kuczmarski, Campbell, & Johnson, 1995). Data from the 2005-2006 National Health and Nutrition Examination Survey (NHANES) indicated that although levels of childhood obesity may have reached a plateau, 33% of 6- to 11-year-old youth were overweight or at risk for being overweight (Ogden, Carroll, & Flegal, 2008). A primary concern for the high prevalence of youth obesity is that a large portion of obese children will become obese adults. Jain (2004) estimated that 40% – 70% of obese children will continue to be obese through adulthood.

Some studies have found that children may be more susceptible to obesity during the summer months (e.g., Carrel, Clark, Peterson, Eickhoff, & Allen, 2007; von Hippel, Powell, Douglas, & Rowland, 2007). Carrel et al. found that obese children had lower levels of fitness and increased body fat during the summer while they were not at school. Similar results that children’s Body Mass Index (BMI) grew at a quicker rate during the summer months were reported by von Hippel et al. The researchers concluded that summer break
from schools may result in less structured days for children leading to less PA and a less healthy diet.

Jago and Baranowski (2004) suggested that structured summer opportunities such as youth summer camps could provide an opportunity for children to be physically active. Summer camps provide a designed experience where campers (mostly children) visit for a set time period (e.g., one week) to experience opportunities programmed and led by trained staff in a group setting (American Camping Association, 1998; Ball & Ball, 2000). Most camps feature an array of experiential settings including outdoor open space, indoor sports courts, playing fields, trails, and lakes.

Camp opportunities have contributed to positive youth outcomes including social and leadership skills and have the potential to make a profound impact as an estimated 10 – 12 million children participate in organized camps each year (American Camp Association, 2005, 2006b; Marsh, 1999; Ramsing, 2007). To better understand the scope of this importance for PA, camp environments must be studied to determine if they can significantly contribute to children’s PA participation. In addition, other camp factors must be examined to determine if adjustments in areas such as social role-modeling, the physical environment, or programming design can be made to have a larger impact on campers’ PA outcomes. Therefore, the purpose of this study was to determine children’s levels of PA in summer camps and explore correlates of their camp PA participation.
Purpose of the Study

The social ecological framework was used to analyze the relationship between four conceptual factors and camper PA participation. The four factors consisted of: (a) individual factors including the camper’s demographic profile and pre-camp PA participation; (b) social factors including both counselor and peer group interactions; (c) physical environmental factors including camp facilities, camp acreage, and weather; and (d) organizational factors including planned programming schedules, and camper-staff ratios. These factors were used to address five research questions for the study.

1. What is the baseline level of PA in day and resident camps?
2. Are individual attributes (i.e., age, gender, race, BMI, typical PA participation) related to children’s PA in camp settings?
3. How are social characteristics, specifically activity levels of peers and counselors, associated with individual PA participation in camps?
4. Are physical environmental characteristics of camps associated with campers’ PA (e.g., size/acreage of facilities, availability of facilities, distance walked to facilities)?
5. How are organizational plans, including programming and camper-staff ratio, related to camp PA?

The proposed framework in Figure 1.1 illustrates the potential nested variables that impact PA participation in camps.
Figure 1.1 – Conceptual Framework of PA in Camps

Theoretical Framework

Public health research conducted in the latter half of the twentieth century points toward a need to move beyond a focus on changing individuals’ health behavior toward accounting for the role that social and physical environments play in reinforcing healthy and active living (Stokols, 1996). To examine the relationship between environments and PA, researchers have begun exploring different settings including neighborhoods, parks,
and schools (e.g., Kaczynski & Henderson, 2007; Owen, Leslie, Salmon, & Fotheringham, 2000; Roemmich, Epstein, Raja, & Yin, 2007; Sallis et al., 2001). To guide their studies, many researchers have used the social-ecological framework. In short, the social ecological framework focuses on the relationship between individuals and their surrounding environment (i.e., social, physical environmental, organizational, political), which can have an impact on behavioral outcomes.

Classic ecological concepts leading to the development of social ecological models for PA include Lewin’s (1936) ecological psychology, Barker’s (1968) behavior settings, and Bronfenbrenner’s (1979) micro-, meso-, exo-, and macrosystems. Sallis, Bauman, and Pratt (1998) simplified a social ecological model for examining PA-related outcomes to four domains: (a) intrapersonal variables including those internal to the human such as self-image, perceived competence, and value systems; (b) social variables such as formal and informal support systems including family, workgroup, and friendship networks; (c) physical environmental variables such as availability of PA-related spaces and equipment, safety, and weather; and (d) policies such as where and when PA can occur and local affordances for PA (e.g., allocation of parks, recreation centers).

The social ecological framework has shifted the focus away from an individual-centered approach (i.e., motivation is the reason for participation) and created awareness that PA participation is a complex phenomenon. Health-related decisions are not solely regulated by individuals and they are influenced by surrounding environments and
settings. As the social ecological perspective has become more prevalent as a framework for public health research and practice, researchers have examined relationships between PA and school (e.g., Fairclough & Stratton, 2005; McKenzie et al., 2006), childcare (e.g., Bower et al., 2008), neighborhood (e.g., Jago, Baranowski, Zakeri, & Harris, 2005; Roemmich, Epstein, Raja, & Yin, 2007; Weir, Etelson, & Brand, 2006), and park (e.g., Bedimo-Rung, Mowen, & Cohen, 2005; Kaczynski & Henderson, 2007) environments.

Significance of the Study

Organized camps are a setting where little research has been conducted to explore PA participation (Jago & Baranowski, 2004; Welk & Schaben, 2004). Although PA in camps has not been substantially researched, camp professionals recognize health and physical inactivity as a pertinent issue. In a 2007 survey of 365 camp professionals, 90% of respondents rated healthy eating and PA for campers as important or very important emerging issues needing attention during the camp planning process (American Camp Association).

Camps can provide healthy activities that are structured and guided for children during the summer. Traditionally, camps have been linked with developmental characteristics including understanding the outdoor environment, participating in group living, experiencing and developing new interests, and practicing health and safety (Ball & Ball, 2000; Carlson, 1975; Henderson, 2001; Lyle, 1947; Paris, 2008; Powell, 2003; Smith, 2006; Spain, Bialeschki, & Henderson, 2005). These positive outcomes are cultivated
through a combination of using outdoor settings, guidance from trained leadership, and planned programming. The programming of camps is significant as camp staff have some control over campers’ participation in activities (Spain et al.). This opportunity allows camp staff to design programs with desired outcomes (e.g., PA) through intentional or deliberate programming (Baldwin, Caldwell, & Witt, 2006). The significance of this study was to determine the opportunity for children to participate in PA at summer camps through the unique characteristics offered by camps including time spent outdoors, trained staff, and programming that can be deliberately designed for positive outcomes.

Scope and Delimitations of the Study

This exploratory study was designed to examine the PA of 8- to 12-year-old youth attending summer camp for about one week (i.e., 5-6 days). Camp counselors participated in the study as well, but their primary role was to assist with data collection. The data collected were predominantly quantitative through the use of pedometers, questionnaires, physical measurements, and camp records. Participants were delimitated to campers registered at the participating camps within the age guidelines (i.e., 8- to 12-years-old) as well as counselors over the age of 18 working with those campers.

The sample of camps for this study was purposive with the intent of exploring different camp formats (i.e., day or resident), physical environments (e.g., size, facilities), and participant demographics. Camps lasting one week in duration located near central North Carolina were selected based on the purposive criterion. Only general programming
camps were included in the sample. This type of camp usually offers a spectrum of opportunities in comparison to specialized camps (e.g., sports). Campers have some freedom to choose from a range of activities including outdoor skills, group sports, and arts and crafts. General programming camps usually plan for multiple youth development opportunities (e.g., spiritual growth, friendship skills, leadership, physical development) and the programs are reflective of the intended outcomes.

Four day and four resident (i.e., sleepover) camps participated in the study. These two formats were separated in data analyses primarily because of their time structures. At resident camps, participants slept at the camp site and woke up each morning to begin participating in camp activities. Day campers were dropped off by parents or guardians in the morning, picked up in the late afternoon/early evening, and returned to camp the next morning. The activities and environments can also differ between some day and resident camps, but the two formats share a common bond through the leadership of planned activities by trained staff to foster personal development of participants.

Definition of Terms

The following glossary is included to define specific camp and PA terms. These terms are used consistently throughout the document:

*Body Mass Index (BMI)*. A formula for estimating body fatness using height and weight \([(\text{kg/m}^2) \times 703]\) to determine if children and adults are obese or at-risk for obesity (CDC, 2008).
Camp Physical Activity (PA). The dependent variable for this study was the amount of PA that campers participated in during their waking camp hours. To measure PA at camp, pedometers were used to count the number of steps each camper took during the camp day. Stepcounts for non-ambulatory activities including swimming and boating were included in the total as well. In reference to camp PA only, the terms stepcount and camp PA are used interchangeably throughout this dissertation as the stepcount was the measure of PA used in the study.

Day camp. A camp session generally lasting through five half-days operated and staffed by an organization. The camper goes home before the end of each evening and returns in the morning. This format is principally designed for children during school vacation periods (American Camping Association, 1998).

Intentional programming. Programming for youth or adults that is designed prior to an event with the intention of resulting in positive outcomes (e.g., increased PA, social skills, outdoor skills) predetermined by programmers (Baldwin et al., 2006).

Metabolic equivalency ratio (MET). A formula for describing intensity of energy expenditure defined as the ratio of work metabolic rate (e.g., walking; MET = 3.0) compared to a standard resting metabolic rate of 1.0 (Ainsworth et al., 1993).

Moderate-intensity physical activity. Bodily movement using large muscle groups accompanied by an increase in heart rate or breathing (e.g., brisk walk, swimming). On an absolute scale, moderate PA is done at 3.0 to 5.9 METs (CDC, 2007).
**Pedometer.** A small box usually worn on the hip with a small internal lever that counts the number of steps of the person wearing the device (Vincent & Pangrazi, 2002a).

**Physical activity (PA).** Bodily movement produced by skeletal muscles resulting in an expenditure of energy (CDC, 2007). Typical forums for children’s PA include free play, school physical education-related activities, organized and non-organized sports, and human-powered transportation (Salmon & Timperio, 2007). Physical activity is not the same as exercise or physical fitness.

**Resident camp.** An overnight camp with sessions typically lasting at least five days. An organization oversees and staffs the camp providing full-time supervision of campers. Campers stay overnight and are on the grounds 24 hours per day (American Camping Association, 1998).

**Stepcount.** The unit of PA measurement recorded by a pedometer. Each footprint taken by an individual wearing a pedometer results in one step (count). For this study, non-ambulatory activity (e.g., swimming) was included in the stepcount using a conversion formula. **Stepcount** was the unit of measurement used to determine **Camp Physical Activity**.

**Vigorous-intensity physical activity.** Intense activity resulting in a large increase in heart rate or breathing (e.g., running, cycling, aerobic dancing). On an absolute scale, vigorous PA is done at a rate of 6.0 or more METs (CDC, 2007).
Chapter One Summary

There is a high prevalence of physical inactivity and obesity among children in the United States. Children need at least 60 minutes of PA per day to maintain a healthy physical profile with decreased risks for obesity, reduced blood pressure, and greater musculoskeletal health. Children may have a greater risk for obesity and fitness deterioration over the summer months, and a lack of organization provided during the school year is one of the primary reasons. Youth-serving organizations, including camps, offering summer programming may be able to play a role in promoting children’s PA over the summer months. The purpose of this study was to determine children’s levels of PA in summer camps and explore potential correlates of their camp PA participation. The social ecological framework was used as the theoretical guide for determining four factors that may influence camper PA including individual characteristics, and social, physical, and organizational environments.
CHAPTER II: LITERATURE REVIEW

The purpose of my study was to determine children’s levels of PA in youth summer camps and explore potential correlates of camper PA participation. To introduce the topic a brief history of PA is presented including the development of paradigms and methods of inquiry as well as calls for PA participation to sustain public health. This introduction to PA research progresses into a review of studies related to social ecological models and the research questions for my study. As determined by the social ecological framework, a range of factors (i.e., individual characteristics and, social, physical environmental, organizational environments) are correlated with children’s PA participation and intensity. Each factor is discussed with an emphasis on the specific variables for the study. Although little empirical PA research has been conducted in camps, the final portion of this literature review describes camp literature and the potential role of camps in facilitating PA.

The History and Development of Physical Activity Research

The history of PA inquiry can be traced into the late 1940’s when researchers began to examine the relationship between health conditions and PA. During this period the potential for PA to reduce the risk of chronic diseases was identified (Dishman, Washburn, & Heath, 2004). The landmark study for this relationship was conducted by Morris, Heady, Raffle, Roberts, and Parks (1953) who found that men in more physically
active jobs, specifically bus conductors in London, had less risk for coronary heart disease than men in sedentary jobs.

Through the early 1970s few researchers examined the relationship between PA and health, but their findings helped the USDHHS establish physical fitness and exercise as one of 15 areas of focus for improving the health of the American population in the 1980’s (USDHHS, 1980). To monitor PA behaviors of the United States’ adult population, the USDHHS began to collect data on a national level from a questionnaire known as the Behavioral Risk Factor Surveillance System (BRFSS).

As data were collected on the PA levels of the American population, results indicated that a majority of leisure time activity was spent in sedentary pursuits. In 1990, more than 27% of adult men and women reported no leisure-time PA (CDC, 2005). With the realization that the population was more sedentary than active, efforts to determine the relationship between PA and health conditions began to develop rapidly. As a response to sedentary lifestyles, the American College of Sports Medicine and CDC published national guidelines for PA and public health. These guidelines recommended that adults in the United States should participate in 30 minutes or more of moderate-intensity PA most days of the week (Pate et al., 1995). Recently these guidelines have been updated to 150 minutes of moderate-intensity PA or 75 minutes of vigorous-intensity PA per week. Additionally, muscle-strengthening activities involving all major muscle groups are recommended at least two times per week (USDHHS, 2008).
The call for greater PA participation in the United States’ population resulted in further exploration of the positive benefits of PA. In *Physical Activity and Health: A Report of the Surgeon General*, the USDHHS detailed positive benefits of PA including prevention of cardiovascular diseases, obesity, musculoskeletal injury, type II diabetes, and mental health issues (USDHHS, 1996). This report was the first of its kind from the Surgeon General and delivered the message that Americans can substantially increase their physical health and quality of life by participating in frequent bouts of PA.

A unique contribution of this report was that it also considered the PA of adolescents and young adults (i.e., aged 12- to-21-years-old). The results showed that nearly half of adolescents and young adults were not vigorously active, and that PA participation declined rapidly throughout adolescence (USDHHS, 1996). Future studies, driven by an interest in younger age groups, identified that children also spend a large amount of their time in sedentary pursuits (Duke, Huhman, & Heitzler, 2003; Luepker, 1999; Matthews et al., 2008). With evidence that children and adolescents are physically inactive, recent research has shifted to identify methods of inactivity prevention for future generations.

As the age groups and variables of study for PA research have changed over time, so have the research methods and models. Sallis, Linton, and Kraft (2005) described the evolution and history of PA and health research in four eras. The first era prior to 1970 was focused on physiological fitness improvements related to PA participation. During this
time, recommendations for PA participation were formed to improve fitness, not general health. A second phase (1970 – 1990) consisted of epidemiological studies that substantiated PA as a significant health priority. These studies began to explore the relationships between physical inactivity and mental and physical health conditions. A third phase (1990 – 2000) focused on building an evidence base about PA motivators to support promotion and interventions. Intrapersonal and psychosocial factors such as self-efficacy and social support were frequently studied during this period.

During this third era theories were applied to PA research to explore the decisions that people make to participate in PA or not. The majority of guiding theories used in early PA research focused on the impact of cognitive, affective, and social influences on an individual’s choice to be physically active or not (King, Stokols, Talen, Brassington, & Killingsworth, 2002). The common theme shared among these theories such as Theory of Planned Behavior (Azjen, 1991) and the Transtheoretical Model (Prochaska & DiClemente, 1984) was a focus on intrapersonal processes (e.g., attitudes, beliefs). In a review of third-era theoretical frameworks for studying active leisure participation, Beaton and Funk (2008) determined that the majority of available models did not provide a holistic account of the phenomenon of PA participation. In analyzing models they found that the Health Belief Model, Transtheoretical Model, Theory of Planned Behavior, Schema Theory, Sport Commitment Model, and Psychological Continuum Model all contributed to some development of knowledge about PA, but were not broad enough to encompass all
variables that influence PA. For this reason, these theories have all stimulated and furthered PA research, but traditionally have been unable to explain more than a small-moderate amount of variance associated with PA (King et al., 2002).

As a result of the limited explanatory capabilities of these psychosocial factors, researchers have moved into a fourth era of PA research (Giles-Corti, 2006; Sallis et al., 2005). This fourth era focuses on determining PA participation through the interrelatedness of an individual’s characteristics and their surrounding environment (Stokols, 1996; Sallis et al., 1998). This perspective is represented by the social ecological framework, which emphasizes the role of a person’s setting in determining their likelihood to participate in PA (Sallis & Owen, 1997).

Theoretical Framework – Ecological Models

Ecological models are derived from the study of human ecology. In the human health context, the ecological perspective focuses on the relationship of people with their physical and sociocultural environments. For this reason, ecological models are frequently referred to as social ecological models to reinforce that the model does not only include the physical environment, but a mixture of interrelations including intrapersonal processes, social relationships, the physical environment, and policy (Sallis et al., 1998).

Early theorizing about the influence of the environment on individuals’ actions was done by Kurt Lewin (1935), who coined the term ecological psychology. His classic equation, $B = f(PE)$, was the beginning of interactionist research concerning the
relationship of a person and the environment. The premise of this equation is that behavior (B) is a function (f) of the interplay between a person (P) and the environment (E). Two of Lewin’s theories, “life space” and “topological psychology” overlapped with one another creating the roots of social ecological theory. These two theories of individuals’ perception of the environment’s impact on behaviors were limited in scope as they only considered perceived interactions. A basic description is that visual and physics-based cues from both the physical environment and people as perceived by an individual would motivate that person to perform actions.

The ecological perspective was further developed by Barker (1968) in studies of children in their everyday environments. Through studies that were typically conducted in school settings, Barker described “behavior settings,” referring to physical and social aspects of environments and the behaviors that occur within them. A behavior setting is comprised of three major classes of variables: physical properties, human components, and programs. Barker maintained that the combination of these three classes in a setting directly affected a child’s psychological states and behaviors. His belief was that conditions of a behavior setting were a greater predictor of child behavior than individual characteristics.

Bronfenbrenner (1979) also discussed the role of the environment in developing or acquiring “molar activities” with his version of an ecological model. Molar activities are developed within individuals because of a response to a stimulus in their surrounding
environment. Bronfenbrenner used the example that a three-year-old child is more likely to learn to talk if others around her are speaking as well. Therefore, he inferred that a child would be more likely to learn to talk in a setting that obligates or encourages actors in the environment to talk. Bronfenbrenner expanded the behavior setting concept and identified four major levels of ecological interaction between the individual and the environment: the micro-, meso-, exo-, and macrosystems. Each of these levels are nested and interrelated with one another. A set of Russian dolls (i.e., Matryoshka; see Figure 2.1) has been used as a metaphor for this model, implying that each of the levels radiate from the center outward with effects upon each other. The dolls are each pieces of their own, but each piece is related to the others as they can be assembled inside of one another. For Bronfenbrenner’s model (see Figure 2.2), the smallest doll is the individual. In the closed or nested form of the dolls, it is the innermost piece surrounded by the others that are the multiple levels of the environment including the micro-, meso-, exo-, and macrosystems. This leveling approach of environmental factors is a common facet of multiple influence ecological models used in PA research.
The Bronfenbrenner (1979) model begins with the microsystem, which is the intimate and immediate social and physical environmental setting of an individual. Bronfenbrenner specifically defined the microsystem as “a pattern of activities, roles, and interpersonal relations experienced by the developing person in a given setting with particular physical and material characteristics” (p. 22). The microsystem refers to interpersonal relationships with actors such as family members, peers, teachers, and co-workers in actor-specific environments. As a young person ages the size of their microsystem expands, and actors within this system communicate forming the mesosystem. The mesosystem refers to actors from more than one microsystem interacting across two or more settings (e.g., if parents are highly involved in the selection and planning process for their children to attend camp during the summer, they interact with the camp providers). The exosystem refers to a broader social system that includes
political and business transactions that can impact an individual. The first three systems (i.e., micro-, meso-, and exo-) culminate in the larger overarching macrosystem. This system consists of characteristics of cultures, subcultures, and other social structures such as belief systems, resources, and lifestyles (Bronfenbrenner).

![Bronfenbrenner's Ecological Theory](image)

*Figure 2.2. Bronfenbrenner’s Ecological Theory (from McLaren & Hawe, 2005, p. 10)*

Bronfenbrenner’s (1979) levels demonstrated that behaviors may be determined by a complex and interconnected series of variables. For social ecological models to contribute theoretically, researchers must determine the most imperative micro-level
relationships within each of the levels to construct reasonable predictors for outcome variables (i.e., for my study - PA). Therefore, health professionals have aimed to use social ecology as a framework to create definitive and relative nested layers for health-related topics.

Moos (1979) created one of the first health-specific social ecological models, but separated environmental influences from personal influences by distinguishing that each was a separate system. However, he believed that the two systems met together forming the basis for health decisions. The personal system described the variables that cause varied decisions within environments including stress, roles, expectations, and impairment factors. More aligned with the social ecological model were environmental factors such as: (a) physical settings including features of the natural and built environments such as architecture and design, geography, and weather; (b) organizational factors including philosophy, funding, size, and functions; (c) the human aggregate consisting of sociodemographic or sociocultural factors such as social, economic, educational, ethnic, and cultural backgrounds; and (d) the social climate of perceived support and interaction.

McLeroy, Bibeau, Steckler, and Glanz (1988) provided similar but more specific social ecological categories related to health outcomes including:

1. Intrapersonal factors – characteristics of the individual such as knowledge, attitudes, behavior, self-concept, skills, etc; this includes the developmental history of the individual.
2. Interpersonal processes and primary groups – formal and informal social networks and social support systems, including the family, work group, and friendship networks.

3. Institutional factors – social institutions with organizational characteristics, and formal (and informal) rules and regulations for operation.

4. Community factors – relationships among organizations, institutions, and informal networks within their defined boundaries.

5. Public policy – local, state, and national laws and policies. (p. 355)

These factors do not exist exclusively, but are nested within each other like the Russian dolls example (see Figure 2.3).

---

Figure 2.3. Layers of a Social Ecological Model (Giles-Corti, 2006)

General and health-related ecological frameworks provided a starting point for a PA model, but Sallis and Owen (1997) suggested that behavioral settings associated with
PA such as parks, health centers, neighborhoods, and schools require specific ecological models that pertain to those environments. Giles-Corti, Timperio, Bull, and Pikora (2005) echoed these sentiments as the basis of the ecological model is that individuals behave differently depending upon the environment. This criticism suggests that ecological models can be a great contributor to understanding PA participation, but the model must be adapted and fine tuned for the specific environment (e.g., parks, camps) being studied. One general model is not enough to specify differences between environments. Specificity of ecological models is currently a work in progress by the research community.

Sallis et al. (1998) created a frame for examining PA-related outcomes in these environments through four domains: (a) intrapersonal factors including those internal to the human such as self-image, perceived competence, and value systems; (b) social factors such as formal and informal support systems including the family, workgroup, and friendship networks; (c) physical environmental factors such as quality of PA-related spaces and equipment, safety, and weather; and (d) policies such as where and when PA can take place and local affordances for PA (e.g., parks, recreation centers). The relative importance of each of the variables and attributes of each factor may differ by environment, but this model has provided a frame of reference for using ecological models for PA exploration.
Social Ecological Correlates of Children’s Physical Activity

My study of PA in camps used previous research from the PA and camp literature to construct a social ecological framework for analyzing PA in the summer camp environment (refer back to Figure 1.1). While little to no research has been conducted on PA in camps, independent variables have been examined to determine their roles in influencing PA participation. Physical activity research began with studying adults and a majority of the published research has focused on that population. Funding organizations and researchers now have begun to focus their attention on child and adolescent PA participation (e.g., Active Living Research, 2009). Children were previously perceived as inherently active, but studies provided evidence that this assumption is not necessarily true (e.g., Duke, Huhman, & Heitzler, 2003; Matthews et al., 2008; Troiano et al., 2008). Findings of childhood inactivity have influenced researchers to explore the correlates of PA in children, which differ from adolescents and adults (Sallis, Prochaska, & Taylor, 2000).

Because of the developmental state of PA research in general, the content of this review will discuss all age groups (i.e., children, adolescents, adults). Children will be the focus, but some discussion concerning adults and adolescents will be included for depth. Findings that may translate across the three groups will be discussed, but the impacts of specific variables (e.g., peer influence, environmental influences) are not consistent among the different age groups (Sallis et al., 2000). I explicitly state if a study that did not include children is discussed in the literature review.
To assess the existing evidence related to child PA, Sallis et al. (2000) conducted a systematic review of all studies of correlates of PA of children (4- to 12-years-old) and adolescents (13- to 18-years-old) from 1970 to 1998. The authors located 54 studies, with 76% published in the 1990s. The most consistent positive correlates of child PA included gender (i.e., male), parental overweight status, PA preferences, intention to be active, perceived barriers (i.e., inverse), previous PA participation, healthy diet choices, access to PA facilities and programs, and time outdoors (see Table 2.1).

Little consistency existed between the variables related to PA for children in comparison to adolescents. Variables consistently associated with adolescent PA included male gender, white ethnicity, inverse age, perceived activity competence, intention to participate in PA, inverse depression, parent support, support from others, PA of siblings, help from parents, and opportunities for exercise. Adolescents had a larger number of variables related to their PA participation especially for social and cultural factors. These findings helped illuminate that age groups should be separated for PA analyses because of the differing correlates during their developmental stages.
Table 2.1

Correlates of Children’s Physical Activity

<table>
<thead>
<tr>
<th>Variable</th>
<th>Association</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic and biological factors</strong></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>??</td>
</tr>
<tr>
<td>Ethnicity (EuroAm)</td>
<td>??</td>
</tr>
<tr>
<td>Sex (Male)</td>
<td>++</td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td>00</td>
</tr>
<tr>
<td>Single parent status</td>
<td>0</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>??</td>
</tr>
<tr>
<td>Parent overweight/obesity</td>
<td>+</td>
</tr>
<tr>
<td><strong>Psychological, cognitive, and emotional factors</strong></td>
<td></td>
</tr>
<tr>
<td>Self-esteem</td>
<td>00</td>
</tr>
<tr>
<td>Perceived competence</td>
<td>??</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>??</td>
</tr>
<tr>
<td>Body image</td>
<td>00</td>
</tr>
<tr>
<td>Attitudes, outcome expectation</td>
<td>??</td>
</tr>
<tr>
<td>Sweat attitudes</td>
<td>00</td>
</tr>
<tr>
<td>After school activity attitudes</td>
<td>00</td>
</tr>
<tr>
<td>Dislikes PE</td>
<td>00</td>
</tr>
<tr>
<td>PA intention</td>
<td>+</td>
</tr>
<tr>
<td>PA preference</td>
<td>+</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>00</td>
</tr>
<tr>
<td>General barriers</td>
<td>-</td>
</tr>
<tr>
<td><strong>Behavioral attitudes and skills</strong></td>
<td></td>
</tr>
<tr>
<td>Cigarette use</td>
<td>0</td>
</tr>
<tr>
<td>Alcohol use</td>
<td>0</td>
</tr>
<tr>
<td>Healthy diet</td>
<td>+</td>
</tr>
<tr>
<td>Caloric intake</td>
<td>0</td>
</tr>
<tr>
<td>Previous PA</td>
<td>++</td>
</tr>
<tr>
<td>Sedentary time</td>
<td>??</td>
</tr>
</tbody>
</table>
Table 2.1 (continued).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Association</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social and cultural factors</strong></td>
<td></td>
</tr>
<tr>
<td>Parent PA</td>
<td>??</td>
</tr>
<tr>
<td>Parent PA participation with youth</td>
<td>??</td>
</tr>
<tr>
<td>Parent benefits of PA</td>
<td>0</td>
</tr>
<tr>
<td>Parent barriers to PA</td>
<td>0</td>
</tr>
<tr>
<td>Parental encouragement</td>
<td>00</td>
</tr>
<tr>
<td>Parent transports child</td>
<td>00</td>
</tr>
<tr>
<td>Parent pays PA fees</td>
<td>0</td>
</tr>
<tr>
<td>Subjective norms</td>
<td>0</td>
</tr>
<tr>
<td>Peer influence</td>
<td>0</td>
</tr>
<tr>
<td><strong>Physical environment factors</strong></td>
<td></td>
</tr>
<tr>
<td>Access to facilities/programs</td>
<td>+</td>
</tr>
<tr>
<td>Parent provides transportation to PA</td>
<td>0</td>
</tr>
<tr>
<td>Season (Summer/Spring)</td>
<td>?</td>
</tr>
<tr>
<td>Milieu (rural)</td>
<td>?</td>
</tr>
<tr>
<td>Neighborhood safety</td>
<td>00</td>
</tr>
<tr>
<td>Time outdoors</td>
<td>+</td>
</tr>
</tbody>
</table>

*Note.* ?: means indeterminate, 0 means no correlation, + means positive correlation, - means negative correlation. The doubling of a categorization (e.g., 00) indicates more evidence for the relationship. (Adapted from Sallis et al., 2000)

Although this systematic review had limitations including the number of studies conducted for each variable and the methodologies used, it was a starting point for determining future independent variables that need research in relationship to PA. The authors stated that the variables with indeterminate results were the most important for future studies because consistent findings need less support. The Sallis et al. (2000) study was used for determining variables that may be related to camp PA participation and
served as a basis for locating other PA-related literature. Existing PA literature, in combination with the social ecological framework and a conceptual understanding of the camp environment, provided guidance for the variables that were included in my study.

**Individual Characteristics and Physical Activity Participation**

Within social ecological models, individual characteristics are the first level. These characteristics can include both demographic (e.g., age, gender) and biological characteristics (e.g., body mass) as well as psychological states (e.g., self-esteem, body image, perceived competence). When using the social ecological framework one must conceptually determine the variables that are pertinent to study. With the exploratory nature of my study, individual variables were selected based upon existing literature. These variables included previous PA participation, age, gender, race, and Body Mass Index (BMI).

**Physical Activity Participation Patterns**

One of the most consistently significant correlates of PA participation is continued or consistent participation in physical activities. In a review of child and adolescent PA, Sallis et al. (2000) reported that previous PA participation was significantly related to subsequent PA participation for both children and adolescents. These findings suggest that PA participation at a young age can build a foundation for continued activity throughout the lifespan. Cross-sectional and longitudinal studies have found moderate correlations between PA in childhood and PA in subsequent life stages (e.g., Kristensen et al., 2008).
Pate, Baranowski, Dowda, and Trost (1996) found that PA begins to “track” as early as 3- to 4-years-old. In their longitudinal study of children’s PA, the researchers found that frequency of PA participation was moderately to highly correlated with frequency of PA participation three years later. Nyberg, Ekelund, and Marcus (2009) found similar moderate to high correlations for continued PA participation over a 1.5 year period for 7.5- to 9-year-old children. High PA levels were more stable than low PA levels, which meant younger children with low levels of PA were more likely to either increase or decrease their levels of participation while those with high levels were more likely to maintain them.

Previous PA participation continues into adolescence and adulthood as a significant correlate of later PA participation. In a study on the relationship between PA participation and transitioning from elementary to middle school, Garcia, Pender, Antonakos, and Ronis (1998) found that although PA beliefs (e.g., social support, perception of benefits, self-efficacy) changed during the transition, actual participation remained static. The authors concluded that although beliefs about PA may change during life transitions, previous PA participation is the greatest correlate of post-transitional activity levels.

Correlations between childhood PA and adult PA attenuate, but the two are still moderately related. In a 21-year study including multiple age cohorts, Telama et al. (2005) found that high levels of PA predicted high levels of future PA during all life stages. Friedman et al. (2008) reported similar findings during a 60-year longitudinal study. The
authors reported that “active, energetic children tended to become active, energetic adults, and in turn tended to remain active” (p. 1100).

*Age and Physical Activity Participation*

Although high levels of PA participation are related to PA continuing into later life, age across the lifespan has had a consistent negative correlation with PA participation (e.g., Sallis, 1993; Trost, Owen, Bauman, Sallis & Brown, 2002; Welk, 1999). Through each life stage (i.e., childhood to adolescence to adulthood), people participate in less PA (Sallis et al., 2000; Trost, Owen et al., 2002). Associations between PA and age in yearly age intervals during childhood are inconsistent, but large scale changes in PA participation occur at the onset of adolescence (Heitzler, Martin, Duke, & Huhman, 2006; Sallis et al., 2000). Both moderate and vigorous PA as well as strengthening patterns decline consistently each year in both males and females from ages 12- to 21-years-old (Caspersen, Pereira, & Curran, 2000). Some evidence suggests that this decline may begin as early as 6- to 9-years old (Sallis, 1993; Trost, Pate et al., 2002).

Central to childhood and adolescence is the developmental changes that occur during these times. Physical development slows during middle to late childhood (ages 6- to 11 years-old), but still plays a prevalent role in the overall development of a child. School age children grow about one to three inches and gain from five to ten pounds each year (Papalia, Olds, & Feldman, 2001). During this stage their motor skills develop
including learning to shift weight for power, developing accuracy in throwing, perceiving and following rhythm, and increasing running and jumping skills.

In the following years known as adolescence, young people experience a growth spurt. They experience sexual development and learn to use the motor skills acquired during mid- to late-childhood. Adolescents also begin to form their identity through complex psychological self-perceptions, the influences of society and peer groups, and education (Papalia et al., 2001). The physical, mental, and social changes that occur during both childhood and adolescence have been the focal point for a majority of the variables that are studied to determine the relationship between PA and young people (Sallis et al., 2000).

The rapid rate of change for these physical, mental, and social conditions is a primary reason for studying the relationship between age and PA during childhood. Although complex, determining the ages where these changes begin to occur is of utmost importance. The relationship between age and PA has been indeterminate during childhood and these discrepancies in findings require further research to determine how aging is related to PA. Age is specifically important at camps because programs and relationships frequently vary based upon age and experience.

*Gender and Physical Activity Participation*

Another consistent finding of disparities in PA across all age groups has been between males and females (e.g., Jago, Anderson, Baranowski, & Watson, 2005; Sallis,
2000; Sallis et al., 2000; Telford, Salmon, Timperio, & Crawford, 2005; Trost, Owen et al., 2002). Although PA decreases with age for both genders, girls and women are significantly less active than boys during all stages of life (Pate, 2003). A systematic review of nine studies reported that child and adolescent males are 15% – 25% more active than females (Sallis, 1993). Further research has confirmed these findings by tracking pedometer-counted steps of children at school. Males take 20% – 25% more steps than females during each school day (Tudor-Locke, Lee, Morgan, Beighle, & Pangrazi, 2006; Vincent & Pangrazi, 2002b). Differences between males and females may occur through intensity of participation, activity preferences, reasons for participating in PA, and self-perceptions.

One of the greatest differences between male and female PA participation is the level of intensity. Using accelerometer technology, researchers can measure energy expended (i.e., calories) during PA and categorize participation as sedentary, moderate, or vigorous. Intensity-related findings show that differences between males and females may begin as early as 5- to 6-years-old and that the largest disparities are in vigorous PA participation (Telford et al., 2005). Trost, Pate et al. (2002) reported that males participated in 45% more daily vigorous PA minutes than females. The gap in moderate PA participation was smaller with males participating in 11% more moderate PA than females.

One explanation for the intensity differences is the activities that males and females choose. In an analysis of the common activities of 10- to 12-year-olds, Telford et al. (2005) found that girls preferred lifestyle activities such as bike riding, walking,
swimming, jogging, dancing, rollerblading and tennis whereas boys favored active team sports such as Australian rules football, soccer, and basketball. Some researchers have suggested that the difference in these preferred activities, especially a higher level of organized sport participation for males, is largely responsible for the variance in intensity of participation (Vilhjalmsson & Kristjansdottir, 2003).

Males and females display dissimilar preferences in physical activities, but there are also differences in all of their free time activities. Jago, Anderson et al. (2005) studied the daily activities and PA of males and females over the course of a week. They found that males were significantly more active than females, but spent more time watching television and playing video games. The girls spent more time in personal care. However, the boys cancelled out their electronic entertainment use by participating in more sports.

Physical activity differences between males and females may also be explained by different barriers and reasons for females’ PA participation. In focus groups with 15- to 16-year old girls, peer influence, lack of social support, lack of time, parental constraints, school demands, and self-efficacy emerged as constraints to activity participation (Dwyer et al., 2006). However, when Allison, Dwyer, Goldenberg, Yoshida, and Boutilier (2005) conducted focus groups with 15- and 16-year-old boys they perceived a number of the same barriers including parents valuing education over activity, technology, peer and family PA, lack of time, and accessibility to facilities. To compare the constraints of the two groups, Morgan et al. (2003) studied a sample of 12-year-old Mexican-American and
European-American adolescents. Female participants reported fewer opportunities for team sports and outside play as well as lower enjoyment of PA and lower physical self-perception than boys. Low self-perception including a perceived lack of body attractiveness, physical strength, and physical condition has also been mentioned in other research as a barrier to young females’ PA (Altintas & Asci, 2008).

Research has also suggested that reasons for participating in PA may differ between males and females. Previous research suggests that adolescent females (ages 13- to 16-years-old) choose to participate in PA for well-being and challenge instead of physical health benefits or competition (Brooks & Magnusson, 2007). In contrast, Allison et al. (2005) reported that adolescent boys participate in PA because it is enjoyable, challenging, develops new skills, allows them to socialize, and provides physical and psychological health benefits. The boys also expressed that physical fitness and health were important to them to impress girls and show off.

A consensus has not been reached about the reasons for PA disparities between males and females. Different barriers may exist for girls such as the activities selected, access to PA opportunities, or self-perception issues. Additionally, some females face further issues as they may not only be marginalized by their gender, but by their race and BMI as well.
**Race, Ethnicity, and Physical Activity Participation**

Another demographic variable of importance is race/ethnicity. A difficulty with studying this variable has been obtaining samples with a breadth of races/ethnicities with equivalent cell sizes. For the most part, researchers have only been able to capture data on the three largest groups in the United States: European-Americans, African-Americans, and Mexican-Americans. The existing research shows that although associations between race/ethnicity and PA are inconsistent in children, membership in the Caucasian race is a stable correlate of PA in both adolescents and adults (e.g., van der Horst, Paw, Twisk, & Van Mechelen, 2007; Richmond, Hayward, Gahagan, Field, & Heisler, 2006; Sallis et al, 2000; Sirard, Pfeiffer, Dowda & Pate, 2008; Trost, Owen et al., 2002).

The Surgeon General’s report was one of the first sources to suggest that minorities are an at-risk group for physical inactivity (USDHHS, 1996). Using data from the Third National Health and Nutrition Examination Survey to test this suggestion on adults ages 20 and older, Crespo, Smit, Andersen, Carter-Pokras, and Ainsworth (2000) reported that African-Americans (35%) and Mexican-Americans (40%) spent a greater amount of their leisure time in sedentary activities than Caucasians (18%).

These findings led to further explorations in child and adolescent populations. Kimm et al. (2002) provided more evidence that although fewer differences are found during childhood, racial differences become more prevalent during adolescence. In a longitudinal study of black and white girls from ages 9- to 19-years-old, the researchers
found that although levels of PA declined as the girls aged, black girls’ PA declined at a rate that was 36% greater than white girls. At 17 years old, participation in no regular leisure time PA was reported by 56% of black girls and 31% of white girls.

Levels of participation for each race/ethnicity differ, but a common theme is that minorities (i.e., non-Caucasians) have less access to spaces for PA participation. Powell, Slater, and Chaloupka (2004) determined that African-Americans were significantly less likely to have parks, green spaces, public pools, or beaches near their residence. In addition, Morgan et al. (2003) found that in comparison the European-Americans, Mexican-Americans had less access to convenient facilities (e.g., parks, recreation centers) within a 5-minute radius.

The quality of spaces that minorities can access is also in question. Although they did not have the data to determine differences between schools, Richmond et al. (2006) found that African-Americans and Hispanic-Americans attending schools that were highly populated with minorities were less likely to be physically active. This finding suggested that the schools may have fewer or lower quality facilities for the students to use for PA. Floyd, Spengler, Maddock, Gobster, and Suau (2008) suggested that if facilities are accessible and intentionally designed with activity areas that are culturally salient and appropriate, minorities may participate in PA more frequently.

Other potential reasons for disparities between races/ethnicities are psychosocial variables and the influence of culture. When compared to European-Americans, 12-year-
old Mexican-American adolescents reported lower physical self-perception, less enjoyment of PA, and more barriers to participation (Morgan et al., 2003). In addition, Gordon-Larsen et al. (2004) found that 8-year-old African-American girls were constrained by their social relationships and a lack of access to nearby facilities. In interviews with the girls and their caregivers, both parties expressed that the caregiver had low motivation for facilitating PA for the child.

A further aspect of ethnicity is culture. United States’ immigrants selectively adapt to the American culture and may follow different cultural practices. Unger et al. (2004) studied the impact of acculturation on PA in Asian-American and Hispanic adolescents. Higher levels of acculturation were significantly associated with less PA participation and increased frequency of fast food consumption. Culture can also be developed and maintained within the country of residence. Body image and development can have implications for PA participation frequency in certain cultures. For African-American women (i.e., > 18 years old), the ideal body size is significantly larger than for European-Americans and African-American men are more likely to prefer this larger body type (Powell & Kahn, 1995). Fitzgibbon, Blackman, and Avellone (2000) found that the mean BMI when European-American women express body dissatisfaction is significantly lower than the mean for African-American women.
Body Mass Index and Physical Activity Participation

Body Mass Index (BMI) is a standard measure used to estimate body stature that produces a number used to determine obesity (Dietz & Belizzi, 1999). The body mass number (i.e., index) is calculated by dividing a child’s weight by height in inches squared, then multiplying by 703. The product can then be used to classify the child into categories of underweight, healthy weight, at risk of overweight, or overweight. For a more in-depth review of BMI calculations and classifications, please see Chapter III of this dissertation.

As children in the United States are becoming increasingly obese, many studies have examined BMI as a variable that is dependent upon PA participation (e.g., Blanchard et al., 2005; Troiano et al., 1995). Research findings on this relationship between children’s PA (independent variable) and BMI (dependent variable) have been indeterminate to date (e.g., Guerra et al., 2006; Rennie et al., 2005; Sallis et al., 2000; Thompson et al., 2009). An explanation for this indeterminacy is that body mass is determined by a spectrum of variables, not just PA. Most overweight problems are linked with a caloric imbalance (i.e., too many calories consumed versus calories expended), which is a complicated issue to address due to multiple contributors including nutrition and PA (Henderson & Bialeschki, 2005). Genetic variables (e.g., growth hormones, leptin, gherlein) also contribute to a person’s weight and further complicate the relationship between PA and BMI (American Academy of Pediatrics, 2003).
Another way to examine the relationship between BMI and PA is to determine how being overweight can inhibit PA participation. For my study, the BMI variable was used in this way. As with the dependent variable BMI scenario, findings for BMI as an independent variable related to children’s PA have also been indeterminate (e.g., Campagna et al., 2002; Jago, Anderson et al., 2005; Sallis, 2000; Thompson et al., 2009). Although the findings have been inconclusive, many researchers have discussed the possibility that a high BMI could inhibit PA participation.

Thompson et al. (2009) found that children in 3rd grade with high BMI’s (i.e., at risk of overweight, overweight) did not participate in as much high intensity PA as normal weight children. In their study there were no differences between normal weight and overweight boys and girls for minutes of light (>1 ≤ 3 METs), moderate (>3 ≤ 6 METs), and hard (>6 ≤ 9 METs) PA participation, but the normal weight children participated in significantly more very hard (>9 METs) PA participation. The researchers suggested that this discrepancy may have been related to less effort in activities or a selection of less intense activities.

Children with higher BMI’s may also be inhibited by a host of psychosocial challenges. Sallis, Alcaraz, McKenzie, and Hovell (1999) found that although overweight 4th and 5th grade boys had PA preferences that were similar to their healthy weight counterparts, they did not participate in those activities. The authors speculated that many children may be unwilling to engage in active play with obese individuals. Zeller,
Reiter-Purtill, and Ramey (2008) confirmed this speculation because 8- to 16-year-old normal weight individuals found their obese peers to be less physically attractive and athletic. They also perceived that the obese children were more sickly, tired, and missed school more frequently. This negative perception led to lower rates of peer acceptance and lessened the likelihood of playing together. These findings further reinforced statements by Sallis et al. (1999) that obese children are highly constrained by social issues (e.g., acceptance for participation). Their image of themselves, selection of activities, and potential social networks may all be related to social constructions that can inhibit their participation.

The Social Environment and Physical Activity Participation

The second sphere in social ecological models is the social environment of individuals. The social system in a child’s life consists of intrapersonal relationships with parents, other family members, peers, teachers, and counselors. Perceptions of PA, role modeling, and social support from each of these actors have been studied in relationship with PA of both adults and children (e.g., Decloe, Kaczynski, & Havitz, 2009; Heitzler et al., 2006; Trost, Pate, Ward, Saunders, & Riner, 1999; Trost, Owen et al., 2002). Sallis et al. (2000; see Table 2.1) found that most social-level variables were not related to children’s PA. However, the research on the social aspects of PA participation at that time was less plentiful and developed.
More recent research has found that social variables may play a critical role in influencing children’s PA participation. The most consistently significant relationship has been found with the role that social actors (i.e., parents, teachers, peers, counselors) play in supporting the PA of children. This variable is specifically germane to summer campers as they are inserted into an environment where they may be meeting new peers and supervisory figures (e.g., counselors). No research has been conducted on social support and PA in camps, but some research exists for these relationships in other environments and in different contexts (e.g., non-PA related social relationships) within camps.

*Parents, Guardians and Physical Activity Participation*

Parents serve a primary role in facilitating their children’s PA. The younger the child, the more influential parents are (Hohepa, Scragg, Schofield, Kolt, & Schaaf, 2007; Prochaska, Rodgers, & Sallis, 2002; Sallis, 1999). Parents are the primary means of transport for children to PA settings and inspirational figures for encouraging continued participation. Early research on the topic indicated that parents who transport their children to active settings (Sallis et al., 1992), participate in activities with their children (Stucky-Ropp & DiLorenzo, 1993), and organize activities (Anderssen & Wold, 1992) are the most effective supporters.

For children, PA participation frequently starts with the beliefs of parents. Parental beliefs have been an inconsistent correlate of child PA, but they provide the initialization for parental support (Sallis et al., 2000). McGrath Davis, James, Curtis, Felts, and Daley
(2008) found that parents of overweight children: (a) believe that overweight children are lazy, (b) are concerned about the weight of their children, (c) believe that some children will be overweight regardless of what they do, and (d) try to help their children lose weight through nutrition and PA. However, Zehle, Ming Wen, Orr, and Rissel (2007) found that these beliefs and concerns about obesity and PA may not actually occur in many parents until children develop indicators of becoming obese. From in-depth interviews of mothers of children aged 0 to 2-years-old, the authors found that parents were not fostering preventive behaviors by facilitating PA participation and a healthy diet in the children’s early years.

Positive beliefs about PA can lead parents to become provide stronger logistical support for their children’s PA participation. Providing transportation and planning for PA times and methods are positive ways that parents can support their children to be physically active (Davison, Cutting, & Birch, 2003; Robbins, Stommel, & Hamel, 2008). Davison et al. found that both mothers and fathers were involved in this process, but in different roles. Mothers were more involved in the assistive support (e.g., paying fees), while fathers did more trip planning for PA participation. These logistics are of specific importance to camp participants as parents typically serve as a representative for selecting camps, paying the fees, and transporting the child to the camp site.

Parents physically participating in PA with children has been one of the least consistent social correlates of children’s PA (Beets, Vogel, Forlaw, Pitetti, & Cardinal, 2006;
Duncan, Duncan, & Strycker, 2005; Sallis et al., 2000; Zabinski, Saelens, Stein, Hayden-Wade, & Wilfrey, 2003). Duncan et al. found a significant relationship between parents observing their children participate and increased PA, but the actual participation of parents was not a significant predictor. This finding is likely because peers are a greater source of influencing and explaining side-by-side PA participation (Frenn et al., 2005; Jago et al., 2009; Prochaska et al., 2002).

**Peer Group Influence on Physical Activity Participation**

Recent research exploring all of the social players in children’s and adolescents’ lives resulted in finding that peers are a greater correlate of individual PA than other social groups (Beets et al., 2006; Frenn et al., 2005; Prochaska et al., 2002). The majority of peer research has been conducted with adolescents. However, some researchers have indicated that peer relationships are also related to children’s PA participation (Beets et al., 2006; Jago et al., 2009). Peer encouragement, friendship reciprocity, and parallel play are all moderately consistent social correlates of child and young adolescent PA.

In a study of children and adolescents across segmented school days, Hohepa et al. (2007) found that peer support through perceived encouragement was a significant correlate of both lunchtime and after school PA participation. This finding was true for both younger students aged 12- to 14-years-old and older students aged 15- to 18-years-old. Peers play a unique role in the schoolyard setting because parents are not present and the ratio of students to teachers is typically high.
For peers to have an impact, the relationship between persons must be accepted and perceived by both parties. Schofield, Mummery, Schofield, and Hopkins (2007) found that friendship reciprocity is an important indicator of PA for teen girls. The researchers used pedometers to track the PA of girls during the school week and then had the girls indicate who they perceived to be their friends at school. Girls who had friends with high levels of PA were more likely to be physically active. However, if the perceived friendship was not reciprocal the PA levels of the two girls were unrelated. This finding suggests that reciprocal friends are more likely to participate in a larger number of activities together resulting in increased PA. However, Voorhees et al. (2005) warned that reciprocal friendships may also have negative implications for PA. In their study they found that close friendships were important for girls, but that these friendship groups may influence the habit of being inactive if the dyads were both infrequent PA participants.

*Summer Camp Social Relationships and Physical Activity Participation*

No research has been conducted directly on the relationship between social support and PA in camps, but studies have examined social relations and outcomes in camps. Researchers from the American Camp Association found that participation in summer camp increases social skills and provides a forum for children to make new friends (American Camp Association, 2005). Camp relationships differ from those with parents and school peers because campers typically only spend a one week session in the camp environment with staff members and peers that are different than those in their everyday
lives. This short but intense period adds a unique dimension to the study of social relationships in camp settings.

During the camp week counselors serve as the primary caregivers for campers. In resident camps the campers and counselors eat, sleep, and participate in activities together. Because of this close relationship, the counselor must serve as a role model or guiding figure for the campers (Schafer, 2007; Spain et al., 2005). In a study conducted by the American Camp Association (2006a) that analyzed camp services including supportive relationships, safety, youth involvement, and skill building, the supportive relationships provided by counselors were recognized by campers as the highest performing category. On a scale of optimal, mixed, or insufficient, a national sampling of 8- to 14-year-old campers indicated that counselors provided optimal levels of guidance (79%), emotional support (89%), practical support (81%), adult knowledge (71%), and peer knowledge (65%). Spain et al. hypothesized that if counselors were trained to view and model PA as an important daily task, campers would follow.

Peer support can also be important for a positive camp experience. Hanna and Berndt (1995) found that having poor quality friendships at home did not lead to the same results in camps. At camp children and adolescents may actually find friends that provide better intimacy, prosocial behavior, and esteem support. To examine the role of different friendship groups Jago et al. (2009) created three categories: school friends, neighborhood friends, and other friends. The possession of several friendship groups was desirable for
the 10- to 11-year-old participants in their study as these groups provided fresh and interesting perspectives. For all types of groups, participants indicated in focus groups that friends provided support to initiate PA via co-participation, active modeling, and providing verbal support. The findings demonstrate that regardless of the setting, peer groups can be positive role players in facilitating PA participation. Therefore, developing relationships in camps (i.e., other friends), may be related to PA participation.

The American Camp Association (2005) found mixed results for 8- to 14-year-old summer campers’ social interactions. The researchers found that both parents and children reported improved friendship skills such as talking and playing with new and different peers after attending camp. Follow-up tests showed that these increased skills diminished within six months, but that the child’s friendship skills were still higher than their pre-camp levels. In contrast, some campers reported decreased peer relationship skills during the camp week. These campers may have had social challenges meeting new peers, getting along with others, or believing that they were liked by peers because of the short time they spent with their fellow campers.

The Physical Environment and Physical Activity Participation

The individual and their social relationships both share a common context – the physical environment that surrounds them. The “environment” that a person constructs can contain many factors including social, cultural, and political influences. The physical
environment, however, refers to tangible built and natural spaces and structures. Davison and Lawson (2006) defined a child’s physical environment as:

...objective and perceived characteristics of the physical context in which children spend their time (e.g., home, neighborhood, school) including aspects of urban design (e.g., presence and structure of sidewalks), traffic density and speed, distance to and design of venues for physical activity (e.g., playgrounds, parks and school yards), crime, safety and weather conditions. (p. 1)

Environmental psychologists have long held that the physical environment can influence behaviors (e.g., Barker, 1968; Lewin, 1935), but researchers have just recently begun to explore the relationship between physical spaces and PA participation.

In the systematic review of youth PA correlates studied from 1970 – 1998, Sallis et al. (2000) identified that physical environmental variables were studied less frequently than individual and social variables (refer back to Table 2.1). Since that review, researchers have conducted more research on the relationship between physical environments and PA. Many health and PA researchers have made a paradigmatic shift to the social ecological model and view the physical environment as a key component to influencing PA.

The environment-focused movement has also been adopted by funders and policy makers. The grant making organization Active Living Research, an initiative of the Robert Wood Johnson Foundation, now supplies the majority of their grant funds for physical
environment and policy-based research (Sallis et al., 2009). The fundamental belief of this organization and many PA researchers is that physical environment changes may have a greater capacity to impact PA behaviors of large groups of people in comparison to individual-focused change approaches (Giles-Corti, 2006; McCormack et al., 2004; Owen, Humpel, Leslie, Bauman, & Sallis, 2004; Sallis et al., 1998).

No research has been conducted on the relationship between camp physical environments and PA. However, researchers have studied the relationship between PA and neighborhood, park, and school environments. Each of these environments possesses camp-like characteristics that may inform how the camp physical environment can influence or deter PA.

**Physical Activity in Neighborhoods**

Neighborhoods have been the most commonly studied physical environments as both children and adults spend the majority of their time in that setting (Carver, Timperio, & Crawford, 2008). Many of the constraints to PA in neighborhoods including access to facilities (e.g., Davison & Lawson, 2006; Giles-Corti & Donovan, 2002; Huston, Evenson, Bors, & Gizlice, 2003; McCormack et al., 2004; Powell, Chaloupka, Slater, Johnston, & O’Malley, 2007) and transportation paths (e.g., Ainsworth, Wilcox, Thompson, Richter, & Henderson, 2003; Hume et al., 2009; Jago, Baranowski, & Baranowski, 2006; Owen et al., 2004) are not concerns in camp environments. Another constraint to neighborhood PA, safety from roads and strangers (e.g., Carver et al., 2008; Davison & Lawson, 2006; Farley
et al., 2007; Gomez, Johnson, Selva, & Sallis, 2004; Moore, Glick, Romanowski, & Quinley, 1996; Veitch, Bagley, Ball, & Salmon, 2006) may be related to camps but in a different capacity. Children and parents may have reduced roadside issues while the child is at camp, but some camps are not completely safe from pedestrian and motorized traffic. Precautions are taken at camp to assure that no unauthorized individuals are on the camp property, but issues can still arise. Nevertheless, campers are usually not allowed to move freely without being accompanied by another camper or staff member.

One variable that may translate from neighborhoods to camps is aesthetics (i.e., attractiveness). Studies of neighborhood aesthetics have only considered adolescents and adults, but the findings may apply to children as well. Researchers have found significant relationships between adult PA (i.e., mostly walking) and pleasing visual environments (e.g., Humpel, Owen, & Leslie, 2002; Owen et al., 2004; Saelens, Sallis, Black, & Chen, 2003). However, the findings for the impact of aesthetics on adults PA has been mixed, with some studies reporting a non-significant relationship between the two (Atkinson, Sallis, Saelens, Cain, & Black, 2005; Jago, Baranowski et al., 2005).

Only one study with a non-adult sample was located. Mota, Almeida, Santos, and Ribeiro (2005) found that 14- to 15-year-old adolescents were more likely to be physically active if they had “...many interesting things to look at in the neighborhood” (p. 835). Therefore environments such as neighborhoods, parks, and camps with visually pleasing characteristics may attract children to use those areas for PA. While aesthetics is the only
neighborhood variable that may be associated with camps, a more similar environment is local parks.

*Physical Activity in Parks*

Parks share common parallels with camp environments because: (a) they are comparable in size and facilities, and (b) a substantial portion of day camps are held in community parks. To summarize the current state of PA-related parks and recreation literature, Kaczynski and Henderson (2007) conducted a systematic review. The authors located 50 studies in English journals from 1998 – 2005 with about 80% reporting some type of positive association between parks and recreation and PA. The majority of the studies sampled adults, but a small number included children.

Two major research foci on the association of parks and PA were identified: proximity and facilities (Kaczynski & Henderson, 2007). Proximity is the closeness of a park to a person’s home and is seemingly unrelated to camps other than the delivery of many public recreation day camps in parks. Day camps that are closer to a user’s home may be more likely to attract local participants, but this variable was not under consideration in my study. Beyond proximity, some park settings and facilities may influence greater levels of PA participation (Kaczynski & Henderson; Kaczynski, Potwarka, & Saelens, 2008). For children these settings include access to the out-of-doors and playgrounds.

*Park Proximity and Physical Activity Participation.* Many but not all persons have parks within walking distance of their homes. In a 1992 national survey of adults, Godbey,
Graefe, and James (1992) found that about 70% of adults (and their children) live within walking distance of a park or playground. Cohen et al. (2006) found that 57% of child and adolescent girls in six major cities had a park available within a 1-mile radius. For persons with parks near their homes, researchers have established close proximity as a significant correlate of PA participation for all age groups (e.g., Babey, Hastert, Yu, & Brown, 2008; Cohen et al., 2006, 2007; Grow et al., 2008; Paxton, Sharpe, Granner, & Hutto, 2005; Roemmich et al., 2006). If day camps are held in these nearby parks, they could be a contributor to the PA that occurs during park use.

The Availability of Park Facilities and Physical Activity Participation. Park proximity is one variable that contributes to PA participation, but the availability and quality of the amenities and facilities in parks is more closely related to camps. Kaczynski and Henderson (2007) found that specific amenities (e.g., water fountains, restrooms) and facilities (e.g., trails, open spaces) at parks may lead to an increased likelihood of park-user PA. Henderson et al. (2001) conducted focus groups with community leaders and determined that a range of settings, facilities, and programs for both children and adults are necessary for parks to facilitate PA. Coen and Ross (2006) reinforced that the park setting can influence PA stating that, “...access to a wider range of activities increases the potential likelihood of a person participating in some form of physical activity, as a greater variety of facilities may appeal to a broader range of tastes” (p. 369).
Many parents and children select parks based upon the facilities that are available. In a qualitative study of 82 parents in London, Ontario, participants determined that their main reasons for choosing parks were water attractions, shade, swings, and cleanliness (Tucker, Gilliland, & Irwin, 2007). The parents were more likely to drive their children further distances to parks that had these features versus using close parks with less desirable characteristics. Only 49% of participants reported that they most frequently visited the park closest to their home. Veitch et al. (2006) reported similar results from parents in Melbourne, Australia. Parents in their study were more likely to drive their children longer distances for facilities that were appealing to all ages. The participants expressed that many playgrounds were designed for toddlers and their older children found the facilities boring.

Playgrounds may be a key facility for facilitating PA in public parks. Studies have consistently found that playground use is positively associated with children’s PA (e.g., Potwarka, Kaczynski, & Flack, 2008; Shores & West, 2008; Timperio et al., 2008). In addition, designing these playgrounds with certain quality standards can increase the amount of PA that takes place. Floyd et al. (2008) reported that playgrounds were related with PA, but with moderate intensity levels. To increase PA levels on playgrounds, certain features can be added. In an intervention that modified a public playground, Stratton and Leonard (2002) reported that painting playground equipment with fluorescent markers resulted in a 35% increase in energy expenditure. These fluorescent markers included
graphics of animals and other interesting images that would draw the children to the equipment pieces. Ridgers, Stratton, Fairclough, and Twisk (2007) verified that the effects of the multicolored markings were constant over a six-month period (i.e., there was no deterioration of effect following the initial installation).

Not all camps feature playgrounds with fixed play structures and sand, but they do have many playground-like characteristics. Some authors have argued that playgrounds need to be conceptualized more broadly by thinking more about the “play” than the associated “ground” (e.g., Bengtsson, 1970; Brett, Moore, & Provenzo, 1993; Iacofano, 1992). The common message is that the use of out-of-doors features elicits creative and physical play for children. Camps provide these features with numerous facility choices including lakes, ropes courses, climbing walls, vast amounts of open natural space, and sometimes traditional sand and structure playgrounds. Although all camps do not share these features, most focus on some type of out-of-doors programming (Ball & Ball, 2000; Johnson, 1960; Lyle, 1947; Smith, 2006).

Just being outside in spaces such as parks and camps may potentially be related to PA participation. Louv (2007) captured national attention for detailing the lack of time that children spend outdoors in his book, *Last Child in the Woods: Saving Our Children from Nature-deficit Disorder*. He implied that children would be more physically active by chance if they spent more time outdoors. Limited research findings suggest that Louv’s commentary may be valid.
Sallis et al. (1993) found that spending time outdoors was significantly correlated with PA for Mexican- and Anglo-American children. The authors stated that “The more time children spend outdoors, the more opportunity they have to be active, and the less time they are in an indoor environment where activity is severely constrained, both physically and socially” (p. 395). Cleland et al. (2008) reported similar results. The researchers found that for each additional hour spent outside, 10- to 12-year-old girls accumulated an extra 27 minutes of moderate-vigorous PA, while boys participated in an additional 20 minutes. Further evidence to support these findings is necessary, but these results suggest that if children spend more time in outdoor environments including parks and camps they may be more likely to be physically active.

**Physical Activity in Schools**

Schools are a setting that provide limited time outdoors, but have many features that are similar to camps. The school environment is a primary location for children’s PA as most children spend an average of seven hours per weekday at school, which constitutes a large portion of their waking hours. Schools are similar to parks and camps as their size, quality, and availability of PA facilities and equipment can influence PA participation.

Cradock, Melly, Allen, Morris, and Gortmaker (2007) found that the size of school campuses, buildings, and play areas is related to student PA. Schools with larger campuses, buildings, and play areas were associated with a 20% – 30% increase in PA. Because of multicollinearity between the three variables (i.e., campus, building, and play
area size) the authors could not separate and analyze the effects of each. They hypothesized that walking further distances between locations (e.g., class to class, class to cafeteria) was one of the primary reasons for increased PA. This idea translates to camps as campers in larger-acreage camps must walk longer distances between destinations (e.g., dining hall to cabin, activity area to activity area) as well.

Other studies have found relationships between PA in schools and the availability and quality of facilities (Lanningham-Foster et al., 2008). Sallis et al. (2001) examined the physical environmental characteristics of schools in association with PA before, during, and after school. From a sample of 24 public middle schools, the researchers found that high levels of facility improvements defined as “permanent improvements, including number of basketball hoops, tennis courts, baseball diamonds, and football or soccer goals” (p. 618), resulted in higher levels of PA for both boys and girls.

Bower et al. (2008) found that children in preschools with more supportive PA environments, including a greater availability of fixed and portable play equipment, had higher mean levels of PA participation. Dowda et al. (2009) reported similar findings for 3- to 5-year-old children in preschools. Children in school environments with PA-inducing qualities spent fewer minutes in sedentary activities and more time in moderate-vigorous PA. These qualities included larger playgrounds and more portable versus fixed equipment. The researchers speculated that portable equipment (e.g., balls, tricycles, Frisbees™) was more likely to influence PA because fixed structures (e.g., playgrounds,
basketball hoops) may promote waiting and congregating, and offer a less creative means of participation.

The debate of fixed versus portable structures is more closely related to how PA programs are facilitated and run. For example, schools may tend to promote more team sports, which would lend to a greater prevalence of fixed structures. For all youth-serving organizations including camps, the oversight and planning of facilities and associated programming are part of the organizational-level social ecological factor that may also influence PA participation.

The Organizational Environment and Physical Activity Participation

The outermost factor of the social ecological framework for my study (see Figure 1.1) is the organizational environment. The organizational environment includes the rules, policies, planning, and programming implemented by institutions (e.g., camp organizations and directors) that may influence or inhibit PA participation. By planning methods for supporting and facilitating PA prior to the start of camp sessions, camp-providing organizations (e.g., American Camp Association, Young Men’s Christian Association, Girl Scouts of America) and administration may be able to influence the amount of PA participation that takes place during the week. Two organizational-level variables that can be controlled and designed by camp administration are the number of staff and the programming content.
Camper-Staff Ratio and Physical Activity Participation

Camp staff members are trained to support children throughout their camp experience and foster developmental outcomes including an appreciation for the outdoors, leadership skills, and positive values (Meier & Mitchell, 1993). For proper supervision of campers’ safety and developmental growth, the American Camp Association suggests that one staff member is present for every eight children ages 9- to 14-years-old (American Camp Association, 2009). No research has been conducted to determine the number or expertise of staff members necessary to facilitate PA, but similar research has been conducted on the roles of parents and teachers.

Physical activity-related research for supervision from both parents and teachers has reported mixed results. For example, Duncan et al. (2005) found that children participated in more PA when their parents observed them. Other researchers have found that both supervision and a range of actions from parents and teachers can influence children’s PA (e.g., Coleman, Geller, Rosenkranz, & Dzewaltowski, 2008; McKenzie et al., 1995, 2006; Rushovich et al., 2006; Sallis et al, 2001).

Some researchers, however, have found that supervisory involvement may have a limited or negative impact on children’s PA. McKenzie et al. (2006) found that teacher’s promotion of PA helped middle school-aged girls increase their overall PA frequency and intensity, but only a small number of teachers were compelled to provide PA support. Verbal encouragement can increase PA for children, but an inverse relationship may occur
if the supervisor becomes too involved. Coleman et al. (2008) found that teachers of fourth-grade students positively reinforced school-time PA participation for children, but their decisions to implement structures and rules during games inhibited PA intensity. When children were allowed to play freely with no rules they had higher levels of moderate-vigorous intensity. One solution to teacher or counselor control over activities is to create programming schedules that include periods for different types of PA opportunities.

*Intentional Programming and Physical Activity Participation*

The process of intentional programming includes purposefully designing activities that will result in planned outcomes or results (Baldwin et al., 2006). Organizers and administrators must theoretically and systematically select and design programs prior to their delivery to maximize the potential for the achievement of specific goals (Caldwell, 2000). For example, if a programmer wanted to increase PA participation, he or she would design a program that limits sedentary choices, offers a broad sampling of PA choices, and may mandate participation in specific activities.

Camp administrators have a history of designing intentional programs for outcomes such as spirituality and connectedness to nature, but PA is an emerging topic that they are beginning to consider (American Camp Association, 2008). Although camps are commonly believed to be places where children are active, designing programs to facilitate and positively reinforce PA participation may increase the likelihood that children
achieve PA-based outcomes while attending camp. One environment with a similar organizational structure (i.e., determines rules and programs) that has experimented with intentional programming is schools. Although school and camp physical environments are different, studies on program modifications in schools may provide guidance for the changes that could occur in camps.

Intentional programming in schools is frequently delivered through interventions. Changes are made to a program and then measured against pre-experimental standards to determine if an effect occurred. In a systematic review of PA in elementary schools, Fairclough and Stratton (2006) found that intentional modifications to time allotted for PA or adjustments to activities resulted in PA increases for students. During the school day, children spent 34% of their time in moderate-vigorous activity during periods designed for PA. Children participated in 28 – 41% more PA when programs were intentionally structured with activities that would elicit greater PA levels. Invasion games, which are team-based games where the objective is to score by putting a ball in a net or taking control of an object from an opponent (e.g., basketball, soccer, hockey), resulted in the highest levels of energy expenditure (Fairclough & Stratton; Simons-Morton, Taylor, Snider, & Huang, 1993).

To determine and select games and activities with the greatest amounts of energy expenditure, researchers and practitioners can consult the Compendium of Physical Activities (Ainsworth et al., 1993, 2000). Researchers developed this catalog of common
physical activities to exhibit which types of activities result in the greatest amount of physical exertion. Team invasion games rank lower in the hierarchy than some individual pursuits, but programmers should consider two aspects: (a) the activities in the Compendium imply constant participation, and many high expenditure activities such as rock climbing cannot be sustained for long periods of time, and (b) activities that allow all participants to move at once will result in more overall group PA. Using the Compendium can allow programmers to intentionally design programs that should elicit specific PA levels. However, continuously selecting high energy expenditure activities may not be the best practice.

Results from previous research suggest that a combination of invasion-type games and periods for free play may result in the highest levels of PA participation for children (e.g., Coleman et al., 2008; Telford et al., 2005; Wickel & Eisenmann, 2007). The two areas can serve as yin and yang as both contribute to active participation. A range of game choices can allow children to learn rules and select activities they may enjoy. Free periods can serve as time to practice skills for games, release energy and stress, and make social interactions (Story, Kaphingst, & French, 2006). By intentionally designing programs using a combination of these activities, camp programmers may be able to increase PA participation in camps.
Outcome-Based Camp Research

Although little to no research has been conducted on the social ecological relationship between PA and camps, related camp topics have been explored. Most camp research has focused on evaluations of camper satisfaction and on-site psychological and safety issues (e.g., Henderson & Bialeschki, 1993; Kerns, Brumariu, & Abraham, 2008; Thurber & Walton, 2007; Yard et al., 2007), but with the support of the American Camp Association researchers have begun to study outcomes of camp participation such as identity, social skill, and positive value improvements. No empirical research has been published on the relationship between PA and general programming camps, but some researchers have examined camps that use PA and other health behavior interventions to help obese children (e.g., “fat camps”).

Camp Outcomes Research

Some of the first large-scale camp outcome research was commissioned by the American Camp Association in two national studies entitled, “Youth Development Outcomes of the Camp Experience” and “Improving Youth Experiences in Summer Camp Programs” (2005, 2006b). Data on ten outcome constructs within four domains including (a) positive identity (positive identity, independence); (b) social skills (leadership, making friends, social anxiety, peer relationships); (c) positive values and spiritual growth (positive values/decision making, spirituality; and (d) thinking and physical skills (adventure/exploration, environmental awareness) were analyzed from the American
Camp Association (2005) outcomes study. Researchers found significant pre- to post-camp gains in six of the outcome constructs including adventure/exploration skills, making friends, positive identity, independence, leadership, and spirituality (Henderson et al., 2006/2007). Follow-up data provided six months later indicated that some outcomes may have long-lasting effects although others regress to pre-camp levels (Thurber, Scanlin, Scheuler, & Henderson, 2007). The findings from this study indicated that summer camps are a place where children can develop positive behaviors that they may continue even after leaving camp.

To facilitate these positive behaviors, camp administrators can intentionally design the camp social, physical, and organizational environment. The American Camp Association (2006b) program improvement study involved 23 camps with intentionally redesigned structures, policies, and activities to improve the potential for youth involvement, skill building, supportive relationships, and safety. Researchers reported that 83% of the camps showed improvements in the youth involvement or skill building categories. This evidence suggested that intentional planning in camps can likely result in the intended outcomes.

Marsh (1999) found similar results indicating that intentional planning can produce camp outcomes. In a metaanalysis of camp research published through the late 1990’s, Marsh found that camps with intentionally designed programs for self constructs (e.g., self-esteem) had a greater likelihood of positive self construct outcomes. Although the
relationship between intentional planning and PA has not been examined in most camps, some researchers have examined this relationship in special needs camps.

*Physical Activity and Health Behavior Camps Research*

Studies have conducted to examine PA outcomes in camps specifically built, designed, and staffed to improve health behaviors of obese children (e.g., Baranowski et al., 2003; Gately, Cooke, Butterly, Mackreth, & Carroll; 2000; Gately et al., 2005). These special camps, often known by the slang term “fat camps,” are different from the general programming camps sampled in my study. They can, however, provide some evidence that camps with a certain threshold of intentional social relationships, environments, and programs can increase levels of PA participation and reduce prevalence of obesity.

Gately et al. (2005) found that obese children who attended residential summer camps providing education for physical fitness skills as well as dietary restrictions significantly decreased their BMI and fat mass. The decreases were dependent upon a prolonged stay consisting of about 29 days with six 1-hour program periods for PA each day. Baranowski et al. (2003) found that a similar 4-week summer day camp resulted in high levels of PA for both obese and healthy weight 8-year-old girls. The girls participated in about 71 minutes of moderate-vigorous PA for each camp day, exceeding the current standards recommended by the CDC.

The positive outcomes of these camps may continue even after the participants leave the camp setting. Gately et al. (2000) found that 12-year-old children who attended
an 8-week summer camp focused on PA programming and dietary restrictions significantly decreased their BMI during camp and retained a lower BMI in a 10-month follow-up test. Physical activity levels were not re-examined following the camp, but the researchers implied that continued PA was one of the contributors to the sustainability of a lower BMI. These studies indicate that opportunities for camp PA can be designed intentionally and the outcomes may have an impact on health that lasts beyond the camp experience.

Chapter Two Summary

Little to no research has explored the relationship between the camp environment and PA. However, positive relationships between PA and neighborhoods, parks, and schools illustrate the potential for the camp environment to facilitate PA. The social ecological framework, which emphasizes the relationship between persons and multiple influences in the environments surrounding them, was used to categorize four factors potentially related to the PA of summer campers. These conceptual factors included: (a) individual attributes (e.g., demographics, typical levels of PA); (b) social relationships (e.g., relationships with peers and counselors); (c) the physical environment (e.g., camp area, number of facilities for PA); and (d) organizational variables (i.e., planning and programming from administration including activities and camper-staff ratio). The existing body of PA research indicates that a range of variables within these four factors may influence camp PA participation.
CHAPTER III: METHODS

This chapter details the research design, data collection methods, and analyses used in this study. This study was cross-sectional with data collected exclusively during one week (i.e., 5-6 days) at each participating camp. Primarily quantitative data were collected using pedometers, questionnaires, and self-reports. Through the use of these methods this exploratory study examined: (a) a baseline for camp PA participation, (b) the role of personal attributes (i.e., demographics, previous PA) in PA at camp, (c) the relationship of peer and counselor PA with camper PA, (d) the camp physical environment and its relationship to PA, and (e) camp organizational controls including programming and camper-staff ratio and their relationship to PA.

Design

A cross-sectional data collection design was implemented during one week of camp participation for each site. One week of data collection for each site was selected because: (a) one week is the most common format for summer camp sessions, (b) this study planned only to collect a snapshot of camp PA versus behavioral PA changes that could occur over a full summer of camp participation, and (c) at least three to five days of activity monitoring are necessary to obtain a reliable measurement of PA (Trost, Pate, Freedson, Sallis, & Taylor, 2000; Vincent & Pangrazi, 2002a). The sample was purposefully

---

1 This study was approved by the North Carolina State University Institutional Review Board on May 25, 2007 (See Appendix A).
selected to obtain a diverse group of camps and campers, but was a convenience sample including only camps in central and western North Carolina.

Sample

The sample for this study included individuals at organized youth summer camps. Guided by the social ecological framework, data were collected on individuals’ characteristics and the social, physical, and organizational environments of each of the participating camps (see Figure 1.1). Each camp was purposefully selected to include different camp settings (e.g., programming) and individuals (e.g., personal attributes).

Sample of Camps

To examine the relationship between camp settings and PA, participation was recruited purposefully from eight camps in central and western North Carolina. Camps within central North Carolina were given precedence for travel and administration concerns. Additionally, only camps that had children in attendance for one camp week (i.e., 5-6 days) were included in the study. One week is the duration of most traditional (i.e., not sport or single-outcome specific) summer camps (American Camping Association, 1998).

Each camp was selected to capture different programming and facility designs. Camps were located and recruited by suggestions from camp professionals through the American Camp Association as well as personal phone calls. A brief summary of the methodology and requirements for study participation (e.g., counselor data collection
assistance) was sent to each camp (see Appendix B) and then discussed with the director. Dates and times for data collection (e.g., questionnaires, programming schedules) and methods of recruiting participants were determined during these conversations as well.

Eight camps participated in the study including four day (see Table 3.1, 3.2) and four resident (see Table 3.3, 3.4) camps.

**Sample of Participants**

Participation in this research study was voluntary for campers aged 8- to 12-years-old and counselors 18 years and older at the camps in the sample. Parental signature and a statement of assent from the camper were required for participation (see Appendix C). Counselors were able to sign forms of consent for themselves (see Appendix D). To protect the confidentiality of participants, a unique code was assigned for each participant consisting of their initials plus their birthdate (e.g., BDH05131981). This code was then placed on all forms for each participant for data synchronization.
Table 3.1

*Day Camp Administration and Participation Information*

<table>
<thead>
<tr>
<th>Camp Name</th>
<th>Organization</th>
<th>Total Campers (week of study)</th>
<th>Total Full-Time Staff (week of study)</th>
<th>Location</th>
<th>Ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEF</td>
<td>Non-profit</td>
<td>302</td>
<td>65</td>
<td>Central NC</td>
<td>Entering Grades 1 – 10</td>
</tr>
<tr>
<td>CBP</td>
<td>Public recreation</td>
<td>164</td>
<td>20</td>
<td>Central NC</td>
<td>Entering Grades 1 – 6</td>
</tr>
<tr>
<td>DEJ</td>
<td>Public recreation</td>
<td>78</td>
<td>14</td>
<td>Central NC</td>
<td>5 – 12 years</td>
</tr>
<tr>
<td>RLL</td>
<td>Public recreation</td>
<td>40</td>
<td>4</td>
<td>Central NC</td>
<td>6 – 12 years</td>
</tr>
</tbody>
</table>

Table 3.2

*Descriptions of Participating Day Camps*

<table>
<thead>
<tr>
<th>Camp</th>
<th>Brief Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEF</td>
<td>Campers participated in primarily active pursuits using both outdoor (e.g., soccer fields, a large playground, shaded lunch areas) and indoor facilities (e.g., swimming pool, basketball courts).</td>
<td></td>
</tr>
<tr>
<td>CBP</td>
<td>A center-based day camp where campers spent most of their time in active opportunities (e.g., dodgeball, basketball) with a small amount devoted to arts, crafts, and field trips.</td>
<td>This camp was in a large community park, but campers spent most of their time indoors.</td>
</tr>
</tbody>
</table>
Table 3.2 (continued).

<table>
<thead>
<tr>
<th>Camp</th>
<th>Brief Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEJ</td>
<td>Based in a recreation center, campers participated in active recreation (e.g., basketball, dance) combined with arts, crafts, movies, and field trips. The end of the summer camp season culminated in an exhibition of skills learned at camp.</td>
<td>This camp served mostly African-Americans and during the week of the study campers prepared for a public performance of skills and dance.</td>
</tr>
<tr>
<td>RLL</td>
<td>This camp was based predominantly in an indoor recreation center with core activities including gym sports (e.g., dodgeball, tag), arts and crafts, and field trips.</td>
<td>This camp kept the participant size to a minimum (n~40) in comparison to the other camps.</td>
</tr>
</tbody>
</table>

Table 3.3

*Resident Camp Administration and Participation Information*

<table>
<thead>
<tr>
<th>Camp Name</th>
<th>Organization</th>
<th>Total Campers (week of study)</th>
<th>Total Full-Time Staff (week of study)</th>
<th>Location</th>
<th>Ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCH</td>
<td>Non-profit</td>
<td>180</td>
<td>62</td>
<td>Western NC</td>
<td>7 – 17 years</td>
</tr>
<tr>
<td>BJP</td>
<td>Non-profit</td>
<td>145</td>
<td>31</td>
<td>Central NC</td>
<td>8 – 14 years</td>
</tr>
<tr>
<td>PCR</td>
<td>Non-profit, faith-based</td>
<td>219</td>
<td>45</td>
<td>Central NC</td>
<td>Completed Grades 3 – 5</td>
</tr>
<tr>
<td>WCK</td>
<td>Non-profit</td>
<td>220</td>
<td>55</td>
<td>Central NC</td>
<td>6 – 15 years</td>
</tr>
</tbody>
</table>
Table 3.4

*Descriptions of Participating Resident Camps*

<table>
<thead>
<tr>
<th>Camp</th>
<th>Brief Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BJP</td>
<td>Placed in coed activity groups according to age, campers participated in horseback riding, canoeing, archery, climbing, swimming, arts and crafts, cookouts, campfires, nature exploration, teambuilding, and high ropes.</td>
<td>Sample participants at this camp all came from one North Carolina county through a youth organization.</td>
</tr>
<tr>
<td>PCR</td>
<td>A faith-based camp focused on counseling and programming guided by Christian principles. Physical activities including swimming and capture the flag were mixed with outdoor living skills (e.g., creek walking, rock climbing).</td>
<td>Extreme heat regulated the possible activities and the programming was adjusted with the majority of time spent at the swimming pool.</td>
</tr>
<tr>
<td>WCK</td>
<td>This camp advertises a focus on skill development and a character growth through outdoor activities including swimming, kayaking, wall climbing, and traditional field games (e.g., capture the flag, tag).</td>
<td></td>
</tr>
<tr>
<td>BCH</td>
<td>The focus of this camp was character building skills including interpersonal communications, sportsmanship, and environmental stewardship through an offering of land- (e.g., high ropes, soccer) and water-based (e.g., swimming, kayaking, creek discovery) activities.</td>
<td>This was the largest physical environment of all camps (i.e., 1438 acres) and participants often walked long distances in between activities.</td>
</tr>
</tbody>
</table>
Multiple methods were used to recruit participants. The majority of participants consented by mail or at registration on the first day of camp. At camps RLL, AEF, CBP, BJP, and DEJ, letters were sent to parents for signatures prior to the start of the camp week (e.g., see Appendix C). The letters were then returned on the first day of camp or mailed in a return envelope. At camps PCR, WCK, and BCH, camp directors preferred that all participants were recruited on-site. This recruitment was done on the first day of camp when parents dropped off their children. During the general registration or drop-off period parents were referred to a sign-up table for information concerning the research study. Both the child and the parent were debriefed about the study and asked to sign the consent form if the child would like to participate. Camps AEF and CBP also required some on-site recruitment to increase the number of participants from low mailing return rates. Additional participants at camps CBP and RLL were procured at “open-house” days where parents and children were invited to visit the camp and sign up before the beginning of the camp season.

Counselors involved in direct supervision of campers also participated in the study. A group of 4 – 5 counselors at each camp was recruited based on the number of campers under their supervision who were participating in the study. Counselors with a greater number of participating campers were more likely to be selected to volunteer to participate in the study. Only counselors 18 years of age and older were recruited to participate because of the difficulty of securing informed consent (see Appendix D) from
parents for those who were younger. Selected counselors participated in the study, providing the same data as campers. However, counselor data were not analyzed individually or as groups of counselors, but were only analyzed in relationship to camper data.

Although some counselors were participants in the study, the primary role of counselors was to assist with data collection. All counselors with participating campers in their group assisted in some form. Counselors helped attach and collect pedometers, administer surveys, and record campers’ daily participation schedules. Participation in the study was not required of the counselors, but they were strongly encouraged to assist with data collection.

Data Collection Procedures

Data were collected with assistance from a research assistant (RA) and camp counselors. The RA was trained through on-site experience with the Principal Investigator (PI). She spent one week shadowing the PI and was provided with a copy of the proposal for the study and an in-depth protocol (see Appendix E). A monetary stipend was paid to the RA for her assistance.

The majority of the data for this study was collected by the counselors at participating camps. Counselors were responsible for checking that campers were wearing their pedometers, recording stepcounts, recording the schedule of the activities that campers participated in, and collecting pedometers at the end of the camp day. In a 20
minute training session before the start of the camp week, counselors helping with the
data collection were trained in the collection methods by the PI. The purpose of the
training was to teach proper data collection procedures and foster an understanding and
commitment to the study. No monetary stipends were paid to assisting counselors.

Training sessions began with a brief overview of the purpose of the study. The
most critical information covered was proper placement of the pedometer (i.e., on the
waistband at the hip, in-line with the right knee), how to read and reset pedometer
stepcounts, how to fill out the camp programming schedule at the end of each evening,
and tips for fostering camper participation fulfillment. An in-depth protocol (see Appendix
E), as well as a quick reference guide (see Appendix F) was given to each counselor and
camp director to address additional questions.

Counselors at Camp PCR were not trained prior to the commencement of the camp
session. A miscommunication between the camp director and PI resulted in campers
arriving at the camp before the counselors could be trained. Informal meetings with each
counselor data assistant took place in the evening in their cabins before the specified
lights out time. This lack of proper counselor training was potentially related to data
collection issues (e.g., inadequate program schedule depth, missing stepcounts) at Camp
PCR.

On nights when the PI or RA was present on the camp site, they inspected data
collected by the counselors and were available for consultation. The data inspection
included reviews of pedometer count records and daily schedules. If data were missing, requests were made to fill in any of the blanks. These checks were implemented to increase the overall quality and reliability of the data collected.

Instrumentation

The instrumentation for this study was selected to be accurate and minimally invasive in addressing each of the research questions. Both the researcher and camp directors felt a necessity for minimal time impacts upon the participants during their camp experience. Data were collected for each of the research questions by the following methods:

1. A baseline for camp PA participation (pedometry)
2. Personal attributes in relationship to PA at camp [Camp Physical Activity Questionnaire (see Appendix G); BMI]
3. Relationship of peer and counselor PA with individuals’ PA [pedometry; End of Camp Questionnaire (see Appendix H)]
4. The camp physical environment and its relationship to PA [audit instrument (see Appendix I); camp records; web resources]
5. Organizational design and its relationship with PA [camper verbal reports (see Appendix J); camp records].
Pedometers

Pedometers were used as the method of objective data collection for PA in this study. A pedometer is a small box usually worn at the hip on the clothing waistband that counts the number of steps a person takes. Most pedometers have a small, weighted internal “arm” mechanism suspended from a spring that moves up and down as a person walks. Each time a step is taken, the arm moves down, touches a contact, and a step is counted. Excellent reliability ($r = .97$; Vincent & Sidman, 2003), inexpensiveness (~$18), and ease of use were the primary reasons for using pedometers.

Stepcount as a Unit of Measurement

As a need for objective PA measurement has increased, pedometers have become a useful and popular measurement device (Sirard & Pate, 2001). For extended periods of data collection, the stepcount recorded by pedometers has been recommended as a standard unit of measurement of PA in free living individuals (Tudor-Locke & Myers, 2001b). Pedometers have been used to monitor PA participation (e.g., Flohr, Todd & Tudor-Locke, 2006; Tudor-Locke, Lee, Morgan, Beighle, & Pangrazi, 2006) and set guidelines for daily PA participation (e.g., Tudor-Locke, Pangrazi et al., 2004; Vincent & Pangrazi, 2002b).

For adults, 10,000 steps has gained acceptance as the threshold for reducing the risk of obesity and chronic disease caused by a lack of PA (New Lifestyles, n.d.; Tudor-Locke & Bassett, 2004). However, the daily PA guidelines for children are higher than for
adults. Children should participate in 60 minutes of moderate-vigorous PA each day (USDHHS, 2008). Therefore it has been suggested that 10,000 steps per day are not enough for children to meet the government-recommended guidelines.

Although children likely need more than 10,000 steps per day to meet the 60 minutes of moderate-vigorous PA per day guidelines, no general consensus exists about the number of steps necessary. Vincent and Pangrazi (2002b) collected four days of pedometer data from a large sample ($N = 711$) of 6- to 12-year-old children and used mean values from the sample to suggest that 11,000 steps per day for girls and 13,000 steps per day for boys should be the standard. Two years later, Tudor-Locke, Pangrazi et al. (2004) used the same mean-based approach, but concluded from a larger ($N = 1,954$), international sample of 6- to 12-year-olds that the standards should be 12,000 steps per day for girls and 15,000 steps per day for boys.

These two sets of guidelines are two of the more commonly cited sources, but many have questioned the rationale behind their mean-based approach (Laurson et al., 2008). With updates in technology, researchers have been able to use accelerometers to measure actual minutes of moderate-vigorous PA versus the generic stepcount recorded by pedometers. In a study where 11- to 15-year-old boys wore both pedometers and accelerometers, Jago, Waston et al. (2006) found that as few as 8,000 steps per day were enough to meet the 60-minute guidelines. Rowlands and Eston (2005) conducted a similar study with 8- to 10-year-old boys and girls and found that 12,000 steps per day for girls
and 13,000 steps per day for boys resulted in greater than 60 minutes of PA recorded by an accelerometer. Although no consensus has been reached, about 12,000 – 13,000 steps counted on a reliable pedometer may be necessary to accrue 60 minutes of moderate-vigorous PA.

**Pedometer Validity and Reliability**

Construct validity for pedometers was established through positive relationships with other indicators of fitness including: a six-minute walk test \( r = .69 \), timed treadmill test \( r = .41 \), and estimated maximum oxygen uptake \( r = .22 \); Tudor-Locke, Williams, Reis, & Pluto, 2002a). Convergent validity has also been established through positive correlations with accelerometers \( r = .86 \), time in observed activities \( r = .82 \), varying measures of energy expenditure \( r = .68 \), and self-reported PA \( r = .33 \); Tudor-Locke, Williams, Reis, & Pluto, 2002b).

To ensure the reliability of PA measured for my study (i.e., stepcount), literature was reviewed to select the highest-quality pedometer. Based upon this literature, the New Lifestyles SW-200™ was selected. This pedometer is known by many different names (Yamax Digiwalker SW-200™ and DW200™, Yamax My Lifestepper 2000™; Vincent & Pangrazi, 2002b) depending upon the distribution region and market. This pedometer records steps only with a large, digital display for the stepcount, and a delayed reset button to deter accidental deletions of data. The case snaps shut to hide pedometer data, limiting frequent checks and unintentional resets. A safety strap, or “gator clip,” was
purchased with the pedometers to keep them from falling off campers. The pedometer was clipped to the waistband of the participant and this additional clip was placed either on the shirt or further down the waistband to prevent loss.

A majority of studies using pedometers select the SW-200 for its well-documented accuracy and reliability (Rowe, Mahar, Raedeke, & Lore, 2004). Multiple studies (e.g., Bassett et al., 1996; Crouter, Schneider, Karabalut, & Bassett, 2003; Schneider, Crouter, Lukajic, & Bassett, 2003) have found the SW-200 to be among the most accurate (i.e., correctly counting steps) and reliable (i.e., interinstrument agreement) pedometers available. Vincent and Sidman (2003) conducted a test where a machine shook the SW-200 to determine the accuracy of the device. This test yielded less than 3% error in actual shakes versus shakes recorded ($r = .97$). This test was then repeated after seven weeks of pedometer use. No significant differences were found in the subsequent shake test, indicating that continued use of the device did not deteriorate its measurement accuracy.

Some concerns do exist for pedometers and other electronic devices used to measure PA. A particular concern with pedometers is that users may alter their PA patterns in response to wearing the pedometer. However, findings suggest that both sealed (i.e., pedometers where the display is sealed shut, generally with a zip tie, so participants cannot view it; Vincent & Pangrazi, 2002a) and unsealed (Rowe et al., 2004) pedometers have no reactivity threat. In my study the pedometers were unsealed. Sealing pedometers was considered, but since the display needed to be viewed each evening for
data collection, a large sample was involved, and many different counselors assisted in the data collection it was deemed unfeasible.

Pedometers were not the only objective data collection devices considered for this study. Other electronic devices can be used to collect PA data and have specific benefits and risks. The other device considered for this study was an accelerometer. Accelerometers are box-like devices usually worn on the hip like pedometers, but they collect a more advanced form of PA data by measuring the intensity of body movements (i.e., energy expenditure; Sirard & Pate, 2001). Although accelerometers were considered for this study, they were not selected because of their expense (>\$100/unit), obligatory additional analysis software, time commitment, and necessary technical expertise (Tudor-Locke & Myers, 2001a; Rowlands & Eston, 2005).

Pedometers have limitations such as the inability to record non-ambulatory activities (e.g., bicycling, swimming, rowing) and a lack of differentiating between vigorous and moderate bouts of participation. However, they were selected for this exploratory study because of their relative strengths. Some limitations such as the inability to record non-ambulatory activities can be controlled as well.

Campers and selected counselors wore the pedometer during their waking hours at camp to collect a total stepcount for each day to indicate their level of PA. Pedometer readings were collected at the end of each day. For resident camps these readings were done before the specified “lights out” time. At day camps the readings were done before
children were picked up to leave camp each day. Pedometer data were recorded in cabins in resident camps or at a common meeting place in day camps. After the data were recorded, the pedometers were collected in a box for safe-keeping until the next morning.

Camp Physical Activity Questionnaire for Older Children

Pedometers were used to measure PA during camp only. General PA levels of participants before camp were also of interest. To collect this data, campers completed a modified version of the Physical Activity Questionnaire for Older Children (PAQ-C; Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997). This questionnaire asked questions pertaining to favorite activities, frequency of participation in common physical activities, and perceived level of PA participation.

The PAQ-C was developed as a self-report instrument to measure PA over a 7-day period for children ages 8- to-14-years-old. The intent was to measure moderate-vigorous PA participation. Validity and test-retest reliability of the instrument have been established in repeated trials (Crocker et al., 1997; Kowalski, Crocker, & Faulkner, 1997). Two studies examined the validity of the instrument (Crocker et al.). In the first study, investigating convergent, divergent, and construct validity, the PAQ-C was positively correlated with measures such as a comparative activity rating (Sallis, Patterson, Buono, & Nader, 1988; \( r = .63 \)), teacher’s rating of PA (\( r = .45 \)), and perceptions of athletic competence (\( r = .48 \)). In a second study, conducted to investigate convergent and construct validity, the PAQ-C was positively correlated with a Seven-Day Recall Interview.
(PAR; Sallis et al., 1985; $r = .53$), the Leisure Time Exercise Questionnaire (Godin & Shephard, 1985; $r = .41$), and a Caltrac motion sensor ($r = .39$). Test-retest reliability was determined to be acceptable as well ($r = .75$ for males; $r = .82$ for females).

Although accepted as valid measurement tools, PA self-report instruments are not as reliable as pedometers or accelerometers and have been criticized for subjectivity, recall errors, misinterpretations, and social desirability (Sirard & Pate, 2001). The essence of a self-report instrument relies “completely on a respondent’s ability to provide good information about his or her own behaviors” (Matthews, 2002, p. 108). Although participants may give their best estimates, PA participation is frequently overestimated on self-report instruments. Children especially have difficulty estimating their frequency of PA participation (Sirard & Pate). To account for these potential issues, the self-report instrument for this study was selected for its simplicity and lack of in-depth estimation questions (e.g., How many hours per week do you participate in PA?).

The PAQ-C was modified for my study to be more camp-specific and titled the Camp Physical Activity Questionnaire (CPAQ-C; see Appendix G). Minor changes included adding and removing items as well as small wording adjustments. The original instrument contained items that were school-specific and inquired about PA participation during separate time periods such as during school, after-school, and weekends. Since camps do not have these specific time divisions, these questions were removed (see Appendix G). The instrument was also simplified with removals of activities that were not available in
the geographic region of study (i.e., ringette and cross-country skiing), and tennis was substituted for badminton. Additions included three categorical questions asking: (a) where a majority of participant pre-camp PA took place, (b) where the participant was located for the week prior to camp (e.g., different camp, same camp, home, vacationing), and (c) the specific activity in which the participant spent the majority of their time before camp.

The modified instrument did not differ from the original instrument notwithstanding item subtractions unrelated to camps and additions of categorical questions. Therefore, the validity and reliability for the instrument remained the same. A Cronbach’s alpha for internal consistency was not reported for the original instrument because it is not a unidimensional measure of PA. This instrument, original and modified alike, collects descriptive information making internal consistency not applicable. The initial instrument did report test-retest reliability, but it could not be determined for the modified instrument because the sample did not remain the same from week to week for retesting.

Camper and Counselor Demographic Information

In addition to pre-camp PA data, demographic information was collected for all participating campers and counselors on the CPAQ-C. Participants provided their age, grade entering, gender, and race at the beginning of the questionnaire. In circumstances where participants were not able to complete the CPAQ-C, their age data were imputed.
This calculation was made by using their participant identification code (e.g., BDH05131981) and the week of the camp session.

**Body Mass Index (BMI) Measurement**

With the assumption that children would not know their specific height and weight, a physical measurement approach was used. During lunch or an afternoon break, the PI and RA measured the height and weight of each participant, including counselors, using a physician’s beam scale. Participants were measured one at a time in an isolated area to minimize the potential for any adverse reactions to their height or weight. This portion of data collection was voluntary for all participants and 10 total participants elected not to be measured.

Raw height and weight numbers were then converted into a Body Mass Index (BMI) equivalent. Body Mass Index is a formula calculated by dividing the weight of a person (in pounds) by their squared height (in inches), and multiplying by 703. The product, or BMI, can be used to classify children into specific categories of body fat by age and gender including underweight, healthy weight, at risk of overweight, and overweight. The CDC recognizes and recommends this number as a valid measure of an individual’s body fat (CDC, 2008). Additionally, the worldwide International Obesity Task Force (IOTF) endorses BMI as the most appropriate measure of obesity in children and adolescents around the world (Dietz & Bellizzi, 1999). Researchers have found high correlations between BMI and more objective measures of body fat including dual-energy X-ray
absorptiometry \((r = .50 - .83;\) Daniels, Khoury, & Morrison, 1997; Goran, Driscoll, Johnson, Nagy, & Hunter, 1996) and underwater weighing \((r = .44 - .77;\) Deurenburg, Weststrate, & Seidell, 1991; Roche, Siervogel, Chumlea, & Webb, 1981).

For children, BMI is not consistent for all individuals. Age and gender are significant covariates that must be accounted for in body fat prediction using BMI (e.g., Pietrobelli et al., 1998). Therefore, childrens’ BMI is categorized differently than adults’. All adults older than 20 years of age can be classified into four categories using Figure 3.1. Children’s BMI, however, is assessed using percentiles. The weight status category that children are assigned to uses the BMI number, but the classification is made by relative percentile (see Figure 3.2). Separate criterion and percentile charts are constructed for males and females by age (CDC, 2000). Figure 3.3 presents an example of a 10 year old boy child being classified into different BMI percentile groups.

For this study, BMI was calculated by dividing the camper’s weight by their squared height and multiplying the product by 703. To account for the percentiles, age and gender data were used to classify the participants into a categorical variable consisting of four categories (underweight, normal weight, at risk of overweight, and overweight). Information from Figure 3.2 was used to determine the cutoff points for the categories and classify the participants into the groups. Participants greater than 20 years of age (counselors) were designated into the four categories from Figure 3.1.
<table>
<thead>
<tr>
<th>BMI</th>
<th>Weight Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 18.5</td>
<td>Underweight</td>
</tr>
<tr>
<td>18.5 – 24.9</td>
<td>Normal</td>
</tr>
<tr>
<td>25.0 – 29.9</td>
<td>Overweight</td>
</tr>
<tr>
<td>30.0 and Above</td>
<td>Obese</td>
</tr>
</tbody>
</table>

*Figure 3.1. Adult BMI Classifications (CDC, 2008)*

<table>
<thead>
<tr>
<th>Percentile Range</th>
<th>Weight Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than the 5th percentile</td>
<td>Underweight</td>
</tr>
<tr>
<td>5th percentile to less than the 85th percentile</td>
<td>Healthy weight</td>
</tr>
<tr>
<td>85th to less than the 95th percentile</td>
<td>At risk of overweight</td>
</tr>
<tr>
<td>Equal or greater than the 95th percentile</td>
<td>Overweight</td>
</tr>
</tbody>
</table>

*Figure 3.2. Child and Adolescent BMI Classifications (CDC, 2009)*
Figure 3.3. Example of Classifying a Child’s BMI by Percentile (National Center for Health Statistics, 2000)
End of Camp Questionnaire

The End of Camp Questionnaire (EOC-Q; see Appendix H) consisted of 10 Likert-type questions (1 – Agree a lot; to 5 – Disagree a lot) to assess participants’ attitudes about PA, perceptions of PA participation relative to other youth, and their feelings about wearing a pedometer. Questions for the EOC-Q were created based upon other instruments that assess perceptions of PA including the Children’s Physical Self-Perception Profile (C-PSPPP; Whitehead, 1995) and Girls’ Health Enrichment Multisite Studies Outcome Expectancy instrument (GEMS-OE; Klesges et al., 2004). Each of these instruments focus on perceived PA participation (e.g., I am more physically active than others of my age/gender) and outcomes (e.g., PA is fun).

The internal consistency for the EOC-Q was checked using the reliability analysis module of Statistical Package for the Social Sciences 15.0™ software (computer software, SPSS, Chicago, IL). Reliability for the scale (r = .448) was below acceptable for internal consistency criterion even for exploratory studies (r = .60; Garson, 2008b). The removal of one item, “I spend most of my time indoors,” improved the reliability of the scale substantially (r = .560), but it still did not meet required criterion.

A factor analysis was then conducted to check the scale for unidimensionality. Using an eigenvalue greater than one criterion, three factors (i.e., wearing a pedometer, PA at home, PA at camp) were identified (Norusis, 2006). The reliabilities for these three factors were low as well (r = .535 – .626) indicating that the issue with the scale was not
multiple dimensions, but weak internal relationships most likely related to the development of the questions.

Because of low reliability, the researcher decided to eliminate a portion of the data collected from the EOC-Q in statistical analyses. Other data were collected on the EOC-Q, such as favorite camp activities and camp friends, so the discussion of the instrument and a copy of the questions were included in the manuscript. However, all of the EOC-Q Likert-scale questions were removed from analyses.

The remaining EOC-Q items asked campers to identify favorite activities and friends at camp. On the EOC-Q form, campers were asked to identify their single favorite camp and non-camp activities. Additionally, with researcher and counselor moderation, campers indicated the codes of up to five of their closest friends who participated in the study. These codes were the identification codes used for each individual camper consisting of their initials and birth date (e.g., BDH05131981).

Program Data Collection

In addition to stepcount and questionnaire data, the detailed program activities (e.g., hiking, sports, crafts, rest hour) for each participant were recorded (See Appendix J). To determine how programming (i.e., the activities at camp) can influence PA, programming data were collected from two sources: (a) self-reports, and (b) camp schedules. Some periods and programs were standardized for all participants, but others differed by group or were electives chosen by individual campers.
Each evening when campers returned to their final destination, they were asked to report their activities during the day. These data were collected at the end of each day because children’s extended recall of activity (i.e., asking these questions at the end of camp) has not been reliable (Rowe et al., 2004). This report was prompted, recorded, and checked by the counselor for accuracy. Additionally, camper programming data were checked against daily activity schedules provided by the camp directors. The data reported by the camper took precedence over the general schedules because of more specificity, but the general schedule could be used to check for the reliability of common times (e.g., arrival, lunch, activity blocks).

To quantify the word-based data that campers reported for their activities, energy expenditure ratios were assigned to each separate activity for the camp day. Each activity, based on the duration of participation, was assigned a value associated with the estimated energy expended during that time. The Compendium of Physical Activities, a widely used method for estimating energy expenditure was used (see Ainsworth et al., 1993, 2000).

The Compendium of Physical Activities is a compilation of energy expenditure values for common activities (e.g., swimming, housecleaning, walking, sports) from previously published and unpublished data (Ainsworth et al., 1993). Each activity is assigned an intensity number represented as the ratio of work metabolic rate to a resting metabolic rate (MET). A resting MET is 1.0, whereas the METs for activities vary by the
amount of exertion involved (see Table 3.5). The numbers are for one minute of participation in that activity.

Table 3.5

<table>
<thead>
<tr>
<th>Activity</th>
<th>Compendium Activity</th>
<th>MET value/minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archery</td>
<td>Archery (non-hunting)</td>
<td>3.5</td>
</tr>
<tr>
<td>Swimming</td>
<td>Swimming, leisurely, not lap</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>Swimming, general</td>
<td></td>
</tr>
<tr>
<td>Canoeing</td>
<td>Canoeing, rowing, 4.0-5.9 mph, moderate effort</td>
<td>7.0</td>
</tr>
<tr>
<td>Breakfast, Lunch, Dinner</td>
<td>Eating (sitting)</td>
<td>1.5</td>
</tr>
<tr>
<td>Cabin cleanup</td>
<td>Cleaning, house or cabin, general</td>
<td>3.0</td>
</tr>
<tr>
<td>Cabin time</td>
<td>Sitting - talking or talking on phone</td>
<td>1.5</td>
</tr>
<tr>
<td>Dodge ball</td>
<td>Children’s games (dodge ball)</td>
<td>5.0</td>
</tr>
<tr>
<td>Rock climbing</td>
<td>Rock climbing, ascending rock</td>
<td>11.0</td>
</tr>
<tr>
<td>Horseback riding</td>
<td>Horseback riding, walking</td>
<td>2.5</td>
</tr>
<tr>
<td>Fishing</td>
<td>Fishing, general</td>
<td>3.0</td>
</tr>
<tr>
<td>Devotions</td>
<td>Sitting quietly (listening)</td>
<td>1.0</td>
</tr>
<tr>
<td>Arts and crafts</td>
<td>Sitting - arts and crafts, light effort</td>
<td>1.5</td>
</tr>
</tbody>
</table>

A rise in metabolic rate is associated with heavy breathing, or an increase in oxygen intake. In theory, these standard energy expenditure units (METs) can be used to determine the kilocalorie energy cost of an activity by multiplying the MET value by body weight (in kilograms) and then multiplying by the minutes participated out of 60 [e.g. A
60-kilogram individual bicycling for 40 minutes expends: \((4 \text{ METs} \times 60 \text{ kg body weight}) \times (40 \text{ min/60 min}) = 160 \text{ kilocalories}\).

However, Ainsworth et al. (1993) warned that if a researcher intends to use BMI as a separate variable in a model analyzing PA, BMI should not be used to calculate kilocalorie values because of multicollinearity issues. If a model included kilocalorie values as one variable and BMI as another, the two would be highly correlated because BMI is part of the kilocalorie calculation equation. This situation would cause the energy expenditure variable to be improperly estimated in a statistical model. Since my study used both variables in a model, I followed the approach of Giles-Corti and Donovan (2002) to only use the METs or energy expenditure ratios alone without a weight adjustment to estimate intensity of participation in activities.

Each activity was assigned a MET value directly from the Ainsworth et al. (2000) PA Compendium, or in rare cases the MET value that was mostly closely associated with an activity not listed in the Compendium (refer back to Table 3.5). These MET values were then assigned and added for each minute of participation in that specific activity. For example, dodgeball is assigned a MET value of 5.0 in the Compendium. If a camp participant played dodgeball for one hour they received a MET classification of 5.0 multiplied by 60 minutes for that hour. Some activities lasted less than one hour, so campers were credited with the total minutes of participation (e.g., 30 minutes of
dodgeball @ 5 METs/min = 150 METs for the half-hour). Energy expenditure numbers were summed for all minutes of each camper’s daily programming for a total value.

**Missing or Unspecified Programming Data**

In some cases, counselors did not provide enough detail to determine campers’ specific activities. For example, a counselor may have written in “activity period one” or “counselor’s choice” instead of rock climbing or dodgeball. To address this issue, an average MET value was used. A broader classification of MET values by Pate et al. (1995) distinguished categories of light (< 3 METs), moderate (3 – 6 METs), and vigorous (> 6 METs) PA participation. Therefore, the number 3.01 was selected for ambiguous or missing programming descriptions that implied moderate but not vigorous activity. The value 3.01 was also a representative mean of many of the METs in the dataset (e.g., sitting and talking = 1.5; tag, dodgeball = 5.0).

Additionally, some activities were adjusted for the amount of participation time. A caveat of using MET values is that they imply constant participation (Ainsworth, 2000). For example, if a person runs for a period of time but then starts walking, the MET value would change when the activity changed. For the data in this study, two activities including climbing rock walls and participating in high ropes courses did not permit all campers to participate for the entire time period. Due to the nature of the activity, periods of waiting are common because few individuals can use the facilities simultaneously.

Expert outdoor-recreation North Carolina State University faculty and students was
consulted to approximate the amount of time that an individual in a group setting would spend participating on a rock wall or high ropes course (A. Attarian, B. James, & P. James; personal communication; April 25, 2008). For a group of 10 – 12 campers, the experts estimated that participation occurs during one-third of the time. The remainder of the time is spent standing, waiting, or receiving verbal directions. To account for this downtime, a formula (see Figure 3.4) was created to calculate a MET value that incorporated the time engaged in the activity as well as the remainder of time spent waiting or standing (MET value = 2.0).

\[
\frac{1}{3} (\text{minutes rock climbing or on highropes course}) \ (\text{MET value for activity})) + \frac{1}{3} (\text{minutes allotted for activity}) \ (2.0)\]

For example, participating on a high ropes course (MET value = 8.0) for two hours would be calculated:

\[
\left(\frac{1}{3} \times 120 \text{ minutes} \times 8.0\right) + \left(\frac{1}{3} \times 120 \text{ minutes} \times 2.0\right) = 480 \text{ METs}
\]

Figure 3.4. Formula for Modifying Rock-Climbing and High Ropes Programming Time for MET Data Use

Camp Environment Audit Instrument

To determine the impact of the physical environment on PA, camp layout, design, facilities, and program areas were assessed (see Appendix I). Data were collected on: (a)
the size of the area (acreage/sq ft.), (b) aesthetics (Giles-Corti et al., 2005), (c) facilities available (including condition, capacity, percent indoor/outdoor), (d) distance between facilities, and (e) shade (McKenzie, Marshall, Sallis, & Conway, 2000). Three environment assessment tools including the Quality of Recreation Facilities Assessment (QRFA; Cavnar et al., 2004), Environmental Assessment of Public Recreation Spaces (EAPRS; Saelens et al., 2006), and Physical Activity Resource Assessment (PARA; Lee, Booth, Reese-Smith, Regan, & Howard, 2005) were used to create a camp audit tool (see Appendix I).

The reliability of audit tools is reported using inter-rater reliability. Pairs of reviewers assess facilities based on the included variables (e.g., shading, ground condition) and their paired responses are analyzed with intraclass correlation coefficients or Cohen’s Kappa scores (Fleiss & Cohen, 1973). Comprehensive reliabilities were reported for the QRFA \( r = .80 \) and PARA \( r = .77 \). With over 800 items, a comprehensive reliability for the EAPRS was not established, but 70% of the items had a reliability of .6 or greater.

All environmental audits were conducted by the PI and no reliability checks were done with a second independent source. A second reviewer was not included because no trained persons were available to assist with the data collection. Due to the lack of a reliability check and the difficulty of establishing reliability for an instrument that was modified and created for a unique environment (i.e., camps), only variables that were collected by checklist or from external sources (e.g., camp records, internet) were used in the final analyses for this project. Variables used in the results of this study included the
average distance to activity areas, camp acreage, recreation center size, the number of activity areas used, and weather (see Table 3.6, 3.7).

The data that were used in the final analyses were recorded on the audit sheet and collected from several sources. Average distance between activity areas was only collected for resident camps because the majority of day camp programming occurred indoors with little or no walking between activities. These data were collected by measuring the distance from a common meeting place (i.e., the dining hall) to each of the facilities used at the camp (e.g., fields for play, lake, swimming pool, campfire circle). The distance was measured in feet and inches using a contractor’s measuring wheel.

Activity areas were defined as the camp spaces designated for specific types of physically active programming (e.g., basketball courts, swimming pool, climbing wall). The number of activity areas used for PA was determined by daily camp schedules provided by the directors of each camp and correspondence with the directors. This information was checked against the programming data provided by the campers and counselors. Some camps may have had a greater number of PA areas than the data suggests, but if the areas were not used during the camp week they were not included.

Weather data were collected from a website. Weather Underground (2008) collects weather data for every hour of the day for every zip code in the country and indexes weather history. Temperature and precipitation data were collected for each day of the week during camp hours (9:00 A.M. – 5:00 P.M. at day camps, 7:00A.M. – 10:00P.M.)
at resident camps). The hourly figures for temperature were averaged for each camp day and then an average temperature was constructed for the week as a single variable. Precipitation in inches was added for the entire camp week into a single variable as well.

Pilot Test

A pilot test of the data collection methods was conducted at one of the participating day camps two weeks prior to the start of the study. The same camp participated in the study later in the summer, but the pilot data were not retained. Each of the components of the study was tested including pedometers, questionnaires, program-data collection, and an environmental audit.

Pilot test data were analyzed prior to starting the full research study. These data were not included in the final sample. Forty-three campers participated in the pilot study. The group was comprised of predominantly 9-year-olds (77%) with a nearly equal proportion of males (44%) and females (56%). The race of the participants was relatively dispersed with 69% non-minorities (i.e., Caucasians) and 31% minorities. Both the state of North Carolina (U.S. Census Bureau, 2000) and United States’ summer camps (American Camp Association, 2008) have similar proportions.
Table 3.6

*Day Camp Physical Environment Characteristics*

<table>
<thead>
<tr>
<th>Camp Name</th>
<th>Acreage</th>
<th>Center ft.²</th>
<th>Avg. Temp</th>
<th>Total Precipitation</th>
<th>Avg. Walk Distance</th>
<th>PA Areas Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBP</td>
<td>310</td>
<td>29000</td>
<td>85.08°F</td>
<td>0.71 inches</td>
<td>N/A</td>
<td>7</td>
</tr>
<tr>
<td>AEF</td>
<td>27</td>
<td>83000</td>
<td>85.38°F</td>
<td>2.13 inches</td>
<td>N/A</td>
<td>11</td>
</tr>
<tr>
<td>RLL</td>
<td>57</td>
<td>42000</td>
<td>84.51°F</td>
<td>0.93 inches</td>
<td>N/A</td>
<td>4</td>
</tr>
<tr>
<td>DEJ</td>
<td>46</td>
<td>30944</td>
<td>88.35°F</td>
<td>0 inches</td>
<td>N/A</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 3.7

*Resident Camp Physical Environment Characteristics*

<table>
<thead>
<tr>
<th>Camp Name</th>
<th>Acreage</th>
<th>Center ft.²</th>
<th>Avg. Temp</th>
<th>Total Precipitation</th>
<th>Avg. Walk Distance</th>
<th>PA Areas Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCH</td>
<td>1438</td>
<td>N/A</td>
<td>79.79°F</td>
<td>0 inches</td>
<td>1239.98 ft.</td>
<td>15</td>
</tr>
<tr>
<td>WCK</td>
<td>150</td>
<td>N/A</td>
<td>80.29°F</td>
<td>0.36 inches</td>
<td>749.89 ft.</td>
<td>9</td>
</tr>
<tr>
<td>BJP</td>
<td>220</td>
<td>N/A</td>
<td>73.70°F</td>
<td>0.32 inches</td>
<td>893.36 ft.</td>
<td>10</td>
</tr>
<tr>
<td>PCR</td>
<td>393</td>
<td>N/A</td>
<td>93.77°F</td>
<td>1.80 inches</td>
<td>820.34 ft.</td>
<td>9</td>
</tr>
</tbody>
</table>
Pedometer data were collected for five days of camp. An initial planning conflict was the pedometer distribution process. Campers arrived at different times making it difficult for the pedometers to be distributed upon camper arrival. To overcome this difficulty, a set time and place for pedometer distribution and collection was established. This process also allowed for a standard pedometer wearing time for each participant.

Distribution was not the only issue with pedometers. Some of the participants wore pedometers incorrectly or did not wear them at all. Although campers were briefed on how to wear the pedometers, more instruction from the PI and counselors was necessary. The response to this issue was to garner more support from counselors by establishing a pre-camp training session to increase commitment and explain the methodology for the study.

Another issue was missing pedometer data. Over the five days of the pilot study a daily average of 26% of the pedometer data were missing. Missing pedometer data occurred through camper absence, lost pedometers, reset pedometers, and campers forgetting to replace pedometers after water-based activities. The solution for reducing data loss was for counselors to pay more attention to pedometer usage. To assist the counselors a quick reference sheet was created (see Appendix F) and the PI and RA also became more involved in monitoring and assisting counselors.

In addition to wearing pedometers, participants completed two questionnaires, the CPAQ-C (see Appendix G) and EOC-Q (see Appendix H). Few issues were associated
with the CPAQ-C. Since the CPAQ-C was not a unidimensional measure of PA, reliability was not tested. The instrument was pilot tested to determine if children could read and understand the questions on the instrument. Based upon responses to the race category, a choice for Asian or Pacific Islander was added. One PA choice, badminton, was changed to tennis because no participants indicated any participation in badminton for the week before camp. Tennis was frequently listed as a write-in option so it was substituted as a more common racquet sport for children. Two choices, ringette and cross-country skiing were eliminated as all pilot study participants indicated no participation in those activities.

The largest issue with the EOC-Q was low reliability. Internal reliability for the scale was below the acceptable cutoff criterion \( r = .403; \) Garson, 2008b). The poor internal reliability was likely because of items with high levels of skewness and kurtosis (see Table 3.8). Skew and kurtosis indicate if an item does not have a normal curve, but a skewed distribution. For a normal distribution, skew should be within -2 to 2, and kurtosis should be within -3 to 3 (Garson, 2008e).

Table 3.8

*End of Camp Questionnaire Items with High Skewness and Kurtosis in Pilot Testing*

<table>
<thead>
<tr>
<th>Item</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am a physically active person</td>
<td>2.27</td>
<td>7.20</td>
</tr>
<tr>
<td>Physical activity is fun</td>
<td>2.17</td>
<td>6.82</td>
</tr>
<tr>
<td>Physical activity at camp was fun</td>
<td>2.37</td>
<td>5.81</td>
</tr>
</tbody>
</table>
To attempt to control for high skew and low reliability, two changes were made. The scale was reduced from a six-point Likert scale to five-points with the assumption that children may be able to better interpret the meanings of fewer categories. Additionally, one question, “I did not like wearing the pedometer” was reworded to reflect the positive tone of the other questions to “I liked wearing the pedometer.” Although these changes were made, the possibility that the scale would not be reliable still existed based upon its poor performance in the pilot study.

Initial programming data collection included writing down the schedule of participation for each camper on a log sheet for each day (see Appendix J). Completing this task each afternoon took longer than expected. Some counselors had difficulty remembering the activities for the day and were not interested in spending a substantial amount of time recording the data. To accommodate these issues, the process had to be streamlined. Master schedules were collected from camp directors and given to counselors to use for reference. Additionally, campers were frequently segmented into common groups that participated in the same activities. If campers were in a common group, one data sheet could be filled out and stapled with others that were duplicates without writing the data on each. If an individual participated in an activity that differed from the group, the differences could be noted on the individual’s sheet.
Data Entry

Data collected for this study were entered into SPSS 15.0™ software. A hard copy and electronic SPSS™ coding sheet were created to safeguard against data entry errors. Raw data were transferred from the data sheets (i.e., questionnaires, programming data, audit sheet) directly into SPSS™ for processing. This program was then used to separate day and resident camps, clean the data for errors, adjust and calculate values, replace missing data, create categorizations for independent variables, and conduct statistical analyses.

Data Separation

One of the first changes to the dataset was to separate the day and resident camp data. Day and resident camps were separated for two primary reasons: time spent at camp and the environment. First, resident camps had programming that lasted from sunrise until later in the evening (typically 7:00 A.M to 10:00 P.M.). Day camps were much shorter. At day camps parents dropped their children off in the morning and picked them up at the end of a traditional work day (typically 9:00 A.M. to 5:00 P.M.). Therefore, resident campers wore pedometers for a longer period of time. The longer days at resident camps also had programming implications as the participants spent long hours in the hot summer weather and did not return to their homes at the end of the camp day. Physical activity can still be a large part of resident camps, but more periods for rest, rejuvenation, and other sedentary activities are necessary.
Second, the physical environments for these two types of camps varied greatly. Resident camps had programming areas that were spread across many acres of land while the majority of day camps in this study were based indoors. This difference had implications for the types of programming that camps could provide as well as the PA that was accrued by walking from place to place at resident camps. Based upon the two major differences, all further data adjustments and analyses were relative to the type of camp (i.e., day or resident), not the entire dataset.

Data Preparation

The raw data for this study needed to be examined and cleaned before making any analyses. The first step was to check the data for entry errors. Two duplicate cases were identified and removed. The next step was refining the data. Camp days that did not have a full programming schedule (i.e., half days typically at the entry and exit of resident camps) were removed from the dataset. This process left five full days of pedometer values for all camps other than BCH and BJP, which had four full days. Some camper data were also removed. A small number of participants in the study were younger than 8-years-old (\(n = 3\)) and older than 12-years-old (\(n = 9\)). These campers’ data cases were removed from the dataset.

Stepcount outliers were then removed from the dataset. Boxplot graphing was used to analyze the daily pedometer stepcount day for each camper. Data points for each separate group (i.e., day or resident) that were beyond +/- 3 standard deviations from the
group mean were removed from the dataset (Norusis, 2006). Six total values were removed. Previous research in schools has suggested that practical criteria for identifying daily pedometer stepcount outliers should include any counts fewer than 1,000 and greater than 30,000 (Rowe et al., 2004). The boxplot approach in my study found somewhat similar results, but the cutoff for the maximum was higher. The six outliers removed were below 1,256 and above 40,250 steps.

Subsequent data adjustments included adding steps to pedometer counts for non-ambulatory activities, replacing missing pedometer data, collapsing attribute categories for variables with small cell sizes, and standardizing variables with conceptual similarity and high multicollinearity.

**Adding Non-Ambulatory Stepcount Data**

A further issue with the pedometer data was that the raw stepcounts did not reflect all camp activities. A moderate portion of the camp activities were water-based including swimming and boating. During these non-ambulatory water activities the pedometer was not in use. To add this data to the total PA count, estimates based upon previous research were used. Miller, Brown, and Tudor-Locke (2006) recommended two methods for adding non-ambulatory activity into total stepcounts, the Simple Conversion Method (SIM) and the Intermediate Conversion Method (INT). The SIM method is based on guidelines that all non-ambulatory activities are equivalent to walking. To convert walking-like activities not recorded by pedometers, metabolic equivalents (METs) were
used. By using multiple trials of steps of children and adults, walking at 3.0 METs has been determined to have a step equivalent of approximately 100 steps per minute (Tudor-Locke, Sisson, Collova, Lee, & Swan, 2005). Therefore, under the SIM method, 100 steps per minute should be added to a stepcount total for each minute of participation in a non-ambulatory activity.

The INT method is similar to the SIM method, but suggests that typical non-ambulatory activity (e.g., cycling, swimming, boating) is undertaken at two times the MET level of walking (i.e., 6 METs). Therefore, stepcounts should be replaced with double the steps of the SIM method for 200 steps per minute. The INT method is suggested only for highly active participation (e.g., vigorous swimming, cycling, rowing).

Since the activity of campers could vary between the INT and SIM methods, an additional data collection step was added. A self-reported estimate of participant activity level was asked about non-ambulatory activities at the end of each camp day. When campers reported the programs they participated in at the end of the day a question was asked regarding the level of energy exerted when participating in activities where the pedometer could not be worn. A three-point, rapid-estimate scale was used to categorize the activity as light, moderate, or vigorous. For example, children were asked if they participated in the following ways: did they swim or boat: (1) very little, (2) some of the time, or (3) most to all of the time. These rapid-estimates were then used to convert stepcount data with a mixture of the SIM and INT methods. Children reporting that they
swam or boated very little had 100 steps/minute of programming time added to their data, those reporting some of the time had 150 steps/minute added, and those reporting most to all of the time had 200 steps/minute added.

One limitation of the mixture of SIM and INT methods undertaken was that these MET and stepcount conversions imply continuous (i.e., constant) participation in the activities. Most programming schedules reflected traveling time without the pedometer, dress and preparation, and resting during participation. Therefore, it could not be assumed that camp-based non-ambulatory activities were continuous. To control for this issue, programming schedules for non-ambulatory activities were divided into thirds (i.e., 60 minutes of programming = 20 minutes of actual continuous activity). This new time allotment was then used for the stepcount calculations. The time adjustment figure was determined from on-site observations by the PI and a camp director from one of the sites (F. Perry, personal communication, June 9, 2009). Figure 3.5 presents an example of how a non-ambulatory activity would be calculated and then added into the stepcount total.
Time allotted for activity $\times$ [Intensity #]

3

60 minutes of swimming on the program schedule (20 minutes of continuous activity) $\times$ 2

on the rapid estimate scale (150 steps/minute) $= 3,000$ steps added to the participant’s

stepcount for the day.

---

Figure 3.5. Formula for Estimating Pedometer Counts for Activities without Constant
Participation

Missing Data

Following the removal of outliers and addition of non-ambulatory PA, missing data

for stepcounts (i.e., PA), were addressed. The majority of missing pedometer values in this

study resulted from participants losing, improperly wearing, or accidentally not wearing

pedometers. If a counselor was aware that a camper did not wear the pedometer for the

full day or the pedometer was reset, a value was not recorded for that day. Additionally,

some day campers were not in attendance for all camp days so their pedometer data were

not collected on those days.

The dependent variable, PA of campers or stepcount, was created by totaling a

camper’s daily stepcounts for the camp week and dividing by the number of days the

pedometer was worn (e.g., 40,000 total steps/5 days $= 8,000$ steps per day). An issue with
this calculation was that some campers were missing stepcount data for one or more of the days of the camp week. After cleaning the data, the Missing Value Analysis module of SPSS™ indicated that 21% of the stepcounts were missing for the total sample.

Missing values are common in PA research and often have a negative impact on data quality (Kang, Zhu, Tudor-Locke, & Ainsworth, 2005). Because a stable measure of PA participation requires multiple days of data collection, missing data can occur (Trost et al., 2000; Vincent & Pangrazi, 2002a). To account for missing data, statistical imputation or estimation can be used to predict the missing data based upon available data.

For my study, missing pedometer data were replaced using the expectation-maximization (EM) algorithm. Tudor-Locke, Bassett et al. (2004) used this method to replace missing data in a one-year longitudinal study that used pedometers to monitor PA participation. As previously discussed, the data points were not estimated based upon the whole dataset, but separately for day and resident camps.

Expectation-maximization used the existing variables in a dataset to assist with the calculation of missing values. For example, the missing stepcounts in this dataset were estimated using the available data for each case (e.g., age, race, gender) in relationship to other cases in the dataset with similar attributes. The EM algorithm consists of two steps: expectation and maximization. The E step is a regression equation of variables in the dataset to estimate expected replacement values. The M step is a re-estimation of distribution using both the missing and imputed data to maximize the likelihood of the
means and covariance matrices. These two steps are repeated iteratively until the most likely (i.e., maximum likelihood) number is approached and used as the replacement (Allison, 2002).

To assess the risks of imputing data, a correlation analysis was used to compare the dependent variable for steps/day without imputation and steps/day with imputation. The two variables did not differ significantly and had a high correlation ($r = .990$). Each of the analyses of the independent variables was also run with both the original and imputed data and there were no changes in statistical significance or substantive conclusions. Based upon these findings it was concluded that the imputed data would not interfere with relationships between variables.

Other missing values for independent variables in the dataset were not replaced. However, some independent variables had high percentages of missing data including: friend group pedometer average (35%); counselor stepcount average (21%); and CPAQ-C self-report of PA (20%). These data were most likely not missing due to unwillingness to report, but administrative reasons. Missing data from the questionnaires (EOC-Q, CPAQ-C) were caused by campers who did not have the opportunity to fill out the questionnaires due to missing days of camp or not being present at the time of survey administration. Counselor and friend group pedometer values were missing if: (a) they were not in a cabin with a counselor wearing a pedometer, or (b) participants did not have friends who were wearing pedometers. These missing values resulted in reduced sample sizes for certain
analyses, but because of the other changes being made to the dataset they were left unchanged.

**Aggregation of Categorical Demographic Variables**

Following the handling of changes to the dependent variable, stepcount, a number of the independent variables had to be modified as well. Three of the independent variables including age, race/ethnicity, and BMI started with broad attribute categories, but had to be aggregated because of small cell sizes.

Participants in the study ranged from 8- to 12-years-old. Age was initially recorded for each birth year of the participants, and although the ages were adequately dispersed, the spreading of the participants across four categories resulted in small cell sizes. To adjust for the small groups, age was divided into a dichotomy: 8/9/10-years-old and 11/12-years-old. This classification was based upon the reasoning that at 11-years-old a child is typically entering middle school. Grade changes may result in a developmental shift that differs from children 8- to 10-years-old who are still attending elementary schools. Additionally, Papalia et al. (2001) suggested that adolescence may begin as early as 11-years-old, indicating that the two groups could differ in terms of mental and physical development.

The race/ethnicity category initially included choices for African-American, Hispanic, Caucasian, Native American, Asian, Biracial, and Other. A low representation for Hispanic, Asian, and Biracial participants resulted in the decision to collapse the
categories. Using protocol from Sallis et al. (2000) participants were distributed into non-minority and minority groups. For the predominance of PA research, Caucasians (i.e., non-minorities) are used as the reference group for minorities (refer back to Chapter II).

The final independent variable that was collapsed into smaller attribute groups was BMI. Initially, participants were categorized into one of four BMI groups, underweight, healthy weight, at risk of overweight, and overweight based upon their height and weight percentiles. A majority of participants fell into the normal weight category, with minimal underweight representation. To stabilize the groupings, the variable was dichotomized with categories for participants not at risk for overweight (i.e., underweight, healthy weight) and at risk or currently overweight. Being underweight may also be a health risk, but it has different PA implications when compared to being overweight.

Standardization of Variables with High Multicollinearity

In addition to the collapsing of categories, some of the independent variables (e.g., the square footage of indoor recreation facilities and the number of activity areas available) were similar in definition and highly correlated with one another. This relationship caused an issue because if these variables would be entered into a multiple regression model their contribution to the model could not be uniquely estimated because they are measuring the same construct. To circumvent this issue the variables were standardized and combined into a single variable.
Standardization is the process of converting numbers to relative values (i.e., z-scores) so they can be compared or combined. The statistical software SPSS 15.0™ was used to convert the variables in question into standardized z-scores. The z-scores for each related pair of variables were then added together and divided by two to make a single variable. Convergent reliability of the paired variables was tested using reliability analysis in SPSS 15.0™. Only one pair of variables needed to be combined. Day camp recreation facility ft.² and the number of available activity areas \( (r = .92) \) were merged to make a day camp facilities variable. Following these adjustments, the data were prepared for statistical analysis.

**Statistical Analyses**

Data for this study were analyzed to explore relationships between the dependent variable (stepcount, or PA) and the multiple independent variables. Descriptive statistics were used to define the sample and establish a baseline for the number of steps campers took while at camp. Further analyses examined bi-variate relationships between variables. Each of the independent variables based upon the conceptual social ecological model factors were analyzed individually (see Table 3.9). The statistical tests for these analyses included independent t-tests and correlations.
Table 3.9

Research Questions, Variables of Study, and Associated Bi-variate Statistical Tests: Grouped by Factor

1. What is the baseline level of PA in day and resident camps?

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stepcount</td>
<td>Average steps per camp day; Continuous variable</td>
</tr>
</tbody>
</table>

2. Are personal attributes (e.g., age, race, BMI, typical PA participation) related to children’s PA in camp settings? – Individual factor

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Age of camper (separated into 8-10, 11-12 years); T-test</td>
</tr>
<tr>
<td></td>
<td>Dichotomous variable</td>
</tr>
<tr>
<td>Gender</td>
<td>Male or female; Dichotomous variable</td>
</tr>
<tr>
<td>BMI</td>
<td>Body Mass Index separated into two categories:</td>
</tr>
<tr>
<td></td>
<td>(a) Underweight and normal</td>
</tr>
<tr>
<td></td>
<td>(b) At risk of overweight and overweight; Dichotomous variable</td>
</tr>
<tr>
<td>Race</td>
<td>Race separated into minority, non-minority; T-test</td>
</tr>
<tr>
<td></td>
<td>Dichotomous variable</td>
</tr>
<tr>
<td>Avg. Participation In PA</td>
<td>Average of responses on Likert scale to each individual PA activity (pre-camp) on CPAQ-C; Continuous variable</td>
</tr>
</tbody>
</table>

3. How are social characteristics, specifically activity levels of peers and counselors, associated with individual PA participation in camps? – Social factor

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counselor stepcount</td>
<td>Counselor of camper average steps per camp day; Correlation</td>
</tr>
<tr>
<td></td>
<td>Continuous variable</td>
</tr>
</tbody>
</table>
Table 3.9 (continued).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Statistical Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friend stepcount</td>
<td>Average stepcount of friends wearing pedometers as indicated on EOC-Q (Friend average stepcount/number of friends); Continuous variable</td>
<td>Correlation</td>
</tr>
</tbody>
</table>

4. **Are physical environment characteristics of camps associated with campers’ PA (e.g., camp acreage, availability of facilities, distance to facilities, weather)? – Physical environmental factor**

- **Weather**
  - Average temperature during the camp week; Continuous variable
  - Correlation

- **Walk distance (res. camp only)**
  - Average distance walked to each facility within the camp from a common location (e.g., dining hall to pool, dining hall to archery range); Continuous variable
  - Correlation

- **Areas used**
  - Number of camp zones or areas used for PA (res. camp). Standardized number of camp zones or areas used combined with square footage of facilities (day camp); Continuous variable
  - Correlation

- **Acreage**
  - Camp acreage; Continuous variable
  - Correlation

5. **How is camp programming related to campers’ PA? - Organizational factor**

- **Index Avg.**
  - MET expenditure per day averaged by the number of days at camp; Continuous variable
  - Correlation

- **Camper-staff ratio**
  - Number of campers divided by the number of full-time staff members assisting in camper supervision; Continuous variable
  - Correlation

To expand upon the relationship of the conceptual social ecological factors and the dependent variable (i.e., PA), multiple regression analyses were conducted. A separate
multiple regression model was created for each of the four factors (i.e., individual, social, physical environmental, organizational) to assess the relative strength of each variable within the factor. A final multiple regression model included all of the variables from each of the factors in a single model.

**Independent T-tests**

Independent t-tests were used for bi-variate analyses between dichotomous independent variables and the dependent variable. This procedure is used to compare two means from a measure of different populations (e.g., PA of boys or girls) and determine whether the means are equal or statistically different from one another. In statistical theory, t-tests are used for small samples \( n < 30 \) and standardized z-tests are used for larger samples (Ott & Longnecker, 2001). However, in the SPSS™ software the t-test is the standard option available for this comparison.

Statistical assumptions for t-tests include normal distributions and similar variances (i.e., homoscedasticity; Garson, 2008d). For my study, Shapiro-Wilk tests of normality were all insignificant for each of the independent variables in relationship to the dependent variable, indicating normally distributed data. Levene’s test of equality was used to determine similar variances and only one variable was significant for unequal variances. To adjust for this violation of assumptions, resident-camp gender data were reported using the standard SPSS 15.0™ option for unequal variances (refer to Table 4.6).
Pearson Correlation Coefficients

Not all independent variables of study were dichotomous. Many variables in the study were continuous. Correlation was used as the bi-variate analysis procedure for examining the relationship between continuous independent variables and the dependent variable. Pearson correlation coefficients are standardized slope equations determining the linear relationship of two variables (Agresti & Finlay, 1997). The values for these equations range from 1 to -1 with larger numbers indicating stronger relationships. Positive numbers indicate positive relationships between variables while negative numbers indicate inverse relationships. All independent variables met assumptions of correlation analyses including interval data, linear relationships, homoscedasticity, and the removal of outliers (Garson, 2008a).

Multiple Regression

Following the bi-variate statistical tests, multiple regression testing was used to determine the explanatory capabilities of each independent variable within each factor and for the entire set of variables in the study. Multiple regression analyses were conducted for each of the separate factors (i.e., individual, social, physical environmental, organizational) and a comprehensive model including all of the independent variables was also constructed for day and resident camps. Multiple regression models are used to predict a value for a criterion (i.e., dependent) variable on the basis of other predictor (i.e., independent) variables (Brace, Kemp, & Snelgar, 2003).
The strength of these models is that they control for each of the independent variables entered into the model (Agresti & Finlay, 1997). Additionally, the combination of the independent variables can be used to explain the amount of variance in the dependent variable (i.e., $R^2$). The data collected for this study met all of the assumptions of multiple regression analyses including linearity of relationships, homoscedasticity, interval or near-interval data, and no outliers (Garson, 2009).

**Exploratory Analysis and Setting an Alpha Level**

For all bi- and multi-variate statistics an alpha level must be selected as the cutoff point for the statistically significant confidence of the results reported. For example, a .05 alpha level results in 95% confidence that the results reported are not erroneous. An alpha level of .05 was adopted for all statistical examinations in my study. The .05 alpha level is the most commonly used in the social sciences (Agresti & Finlay, 1997; Garson, 2008c). However, in exploratory studies such as mine a higher alpha level (e.g., .10) is commonly acceptable because there is no precedent to guide the study.

The rationale for selecting the .05 alpha level was based upon the volume of statistical tests that were conducted in this study. Some statisticians suggest that the alpha level should be lowered for each independent variable analyzed in relationship to a dependent variable. This procedure, known as a Bonferroni adjustment, results in the initial alpha level being divided by the number of inferences on the dependent variable (e.g., .05/10 = .005; Abdi, 2007). This adjustment is made to account for the potential that
an erroneous finding can occur by chance because of the multiple inferences. For example, the individual factor in this study has six separate independent variables analyzed in relationship to the same dependent (i.e., stepcount). If a Bonferroni adjustment were used, the alpha level would be divided by six to account for error that could occur by chance. As middle ground between the exploratory nature of this study and the multiple comparisons made, the .05 alpha level was selected for all statistical analyses.

Chapter Three Summary

Data on individual, social, physical environmental, and organizational correlates of PA were collected on summer campers aged 8- to 12-years-old. The data were primarily quantitative and were collected using pedometers, questionnaires, an audit instrument, camp records, and camper and counselor reports. To evaluate the procedures for this study a pilot test took place two weeks before data collection. The pilot study guided the design and structure for the data collection in the full study. Although the data were collected with the best available methods, changes (e.g., missing data imputation) had to be made to the raw data to prepare for the analyses in the results section of this manuscript. Statistical tests including t-tests, correlations and multiple regressions were used to analyze the data collected in the study.
CHAPTER IV: RESULTS

This chapter describes and presents analyses of the data collected for this exploratory study. The purpose was to determine children’s levels of PA in summer camps and explore correlates of camper PA participation. Descriptive statistics were used to define the sample and determine PA participation frequency at camps. Bi-variate analyses were used to analyze the relationship between each of the independent variables and camper stepcount. Multiple regression models were constructed for each conceptual factor to determine the relative weights of the variables within each factor. The percent of variance in the dependent variable explained by each factor was also determined. Finally, a full multiple regression model was used to determine the relative impact of each of the factors and variables in the study. All analyses were separated by the type of camp: day or resident.

The data analyses were used to address the five research questions for this study:

1. What is the baseline level of PA in both day and resident camps?

2. Are individual attributes (i.e., age, race, BMI, typical PA participation) related to children’s PA in camp settings?

3. How are social characteristics, specifically activity levels of peers and counselors, associated with individual PA participation in camps?

4. Are physical environment characteristics of camps associated with campers’ PA (e.g., size/acreage of facilities, availability of facilities, distance walked to facilities)?
5. How are organizational plans, including programming and camper-staff ratio, related to camp PA?

Descriptive Statistics

Descriptive statistics were used to report individual attributes of participants in the study, survey responses about their pre-camp PA, and the average steps taken at each camp. In total, 277 campers and 47 counselors participated from eight camps. The counselors served primarily as data assistants and their data were only used to determine the relationship between counselor stepcounts and camper stepcounts. Participants were evenly distributed among the eight camps. There were between 30 to 47 campers at the separate day camps and 27 to 36 campers at resident camps. Additional data on the sample of camps were presented in Tables 3.1 – 3.4.

*Descriptive Statistics for Day Camp Participants*

Demographic information including age, gender, race, and BMI were collected for each of the participants at day camps (see Table 4.1). The participants in the study were 8- to 12-years-old and the mean age was 10-years-old ($SD = 1.20$). Gender was evenly split with one-half male and one-half female participants. Race was equally dispersed for minorities (48%) and non-minorities (52%), but each minority race or ethnicity was not equally represented. The majority of campers had a normal BMI (68%), but some were at risk of overweight (18%) or overweight (14%).
Table 4.1

*Gender, Age, Race, and Body Mass Index of Day Camp Participants*

<table>
<thead>
<tr>
<th>Demographic</th>
<th>n</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Role</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camper</td>
<td>154</td>
<td>86.0</td>
</tr>
<tr>
<td>Counselor</td>
<td>25</td>
<td>14.0</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>77</td>
<td>50.0</td>
</tr>
<tr>
<td>Female</td>
<td>77</td>
<td>50.0</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 years</td>
<td>18</td>
<td>11.7</td>
</tr>
<tr>
<td>9 years</td>
<td>46</td>
<td>29.9</td>
</tr>
<tr>
<td>10 years</td>
<td>36</td>
<td>23.4</td>
</tr>
<tr>
<td>11 years</td>
<td>33</td>
<td>21.4</td>
</tr>
<tr>
<td>12 years</td>
<td>16</td>
<td>10.4</td>
</tr>
<tr>
<td>Missing</td>
<td>5</td>
<td>3.2</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African-American</td>
<td>50</td>
<td>32.5</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2</td>
<td>1.3</td>
</tr>
<tr>
<td>Caucasian</td>
<td>66</td>
<td>42.9</td>
</tr>
<tr>
<td>Native American</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Asian</td>
<td>6</td>
<td>3.9</td>
</tr>
<tr>
<td>Biracial</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Missing</td>
<td>27</td>
<td>17.5</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Normal weight</td>
<td>85</td>
<td>54.1</td>
</tr>
<tr>
<td>At risk of overweight</td>
<td>23</td>
<td>14.6</td>
</tr>
<tr>
<td>Overweight</td>
<td>17</td>
<td>10.8</td>
</tr>
<tr>
<td>Missing</td>
<td>31</td>
<td>19.7</td>
</tr>
</tbody>
</table>
Descriptive Statistics for Resident Camp Participants

The same demographic data (i.e., age, gender, race, BMI) were also collected at resident camps (see Table 4.2). The average age of resident campers was 11-years-old ($SD = 1.23$). Gender was almost evenly distributed with 46% males and 54% females. There were a larger percentage of non-minorities (74%) than minorities (26%). The majority of resident campers had normal BMI’s (64%), but there were at risk of overweight (19%) and overweight (16%) campers. Less than 1% of the resident campers had a below normal BMI.

Survey Data Descriptive Statistics

Both day and resident campers completed two questionnaires, the Camp Physical Activity Questionnaire (CPAQ-C) and End of Camp Questionnaire (EOC-Q). Peer group data were the only data used from the EOC-Q instrument. The CPAQ-C was used to determine pre-camp levels of PA for participants. Campers indicated their pre-camp PA participation for the week before camp on a list of common physical activities scaled from $1 = \text{no participation}$ to $5 = \text{seven or more bouts of participation}$. Their frequency of participation in the physical activities is reported in Tables 4.3 and 4.4. The mean of self-reported participation in these activities (including an option for “other” activities) was used to determine pre-camp PA participation.
Table 4.2

**Gender, Age, Race, and BMI of Resident Camp Participants**

<table>
<thead>
<tr>
<th>Demographic</th>
<th></th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Role</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camper</td>
<td>123</td>
<td>84.8</td>
</tr>
<tr>
<td>Counselor</td>
<td>22</td>
<td>15.2</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 years</td>
<td>5</td>
<td>4.1</td>
</tr>
<tr>
<td>9 years</td>
<td>25</td>
<td>20.3</td>
</tr>
<tr>
<td>10 years</td>
<td>26</td>
<td>21.1</td>
</tr>
<tr>
<td>11 years</td>
<td>29</td>
<td>23.6</td>
</tr>
<tr>
<td>12 years</td>
<td>37</td>
<td>30.1</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>57</td>
<td>46.3</td>
</tr>
<tr>
<td>Female</td>
<td>66</td>
<td>53.7</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African-American</td>
<td>5</td>
<td>4.1</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Caucasian</td>
<td>84</td>
<td>68.3</td>
</tr>
<tr>
<td>Native American</td>
<td>20</td>
<td>16.3</td>
</tr>
<tr>
<td>Asian</td>
<td>2</td>
<td>1.6</td>
</tr>
<tr>
<td>Biracial</td>
<td>2</td>
<td>1.6</td>
</tr>
<tr>
<td>Missing</td>
<td>7</td>
<td>5.7</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Normal weight</td>
<td>77</td>
<td>62.6</td>
</tr>
<tr>
<td>At risk of overweight</td>
<td>23</td>
<td>18.7</td>
</tr>
<tr>
<td>Overweight</td>
<td>19</td>
<td>15.4</td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>2.4</td>
</tr>
</tbody>
</table>
Table 4.3

Mean Pre-Camp Physical Activity of Day Campers

<table>
<thead>
<tr>
<th>Activity</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swimming</td>
<td>124</td>
<td>3.75</td>
<td>1.29</td>
</tr>
<tr>
<td>Jogging or running</td>
<td>124</td>
<td>3.66</td>
<td>1.33</td>
</tr>
<tr>
<td>Walking for exercise</td>
<td>124</td>
<td>3.04</td>
<td>1.37</td>
</tr>
<tr>
<td>Basketball</td>
<td>121</td>
<td>2.98</td>
<td>1.62</td>
</tr>
<tr>
<td>Tag</td>
<td>122</td>
<td>2.61</td>
<td>1.28</td>
</tr>
<tr>
<td>Bicycling</td>
<td>122</td>
<td>2.44</td>
<td>1.51</td>
</tr>
<tr>
<td>Soccer</td>
<td>125</td>
<td>2.44</td>
<td>1.46</td>
</tr>
<tr>
<td>Dance</td>
<td>123</td>
<td>2.43</td>
<td>1.54</td>
</tr>
<tr>
<td>Skipping</td>
<td>122</td>
<td>2.29</td>
<td>1.42</td>
</tr>
<tr>
<td>Baseball, softball</td>
<td>122</td>
<td>2.09</td>
<td>1.32</td>
</tr>
<tr>
<td>Football</td>
<td>125</td>
<td>1.95</td>
<td>1.29</td>
</tr>
<tr>
<td>Floor, street hockey</td>
<td>124</td>
<td>1.69</td>
<td>1.13</td>
</tr>
<tr>
<td>Tennis</td>
<td>123</td>
<td>1.67</td>
<td>1.07</td>
</tr>
<tr>
<td>Skateboarding</td>
<td>125</td>
<td>1.64</td>
<td>1.26</td>
</tr>
<tr>
<td>Volleyball</td>
<td>123</td>
<td>1.61</td>
<td>1.08</td>
</tr>
<tr>
<td>In-line skating</td>
<td>121</td>
<td>1.59</td>
<td>1.11</td>
</tr>
<tr>
<td>Aerobics</td>
<td>122</td>
<td>1.53</td>
<td>1.06</td>
</tr>
<tr>
<td>Boating/canoeing</td>
<td>119</td>
<td>1.33</td>
<td>0.81</td>
</tr>
<tr>
<td>Ice skating</td>
<td>124</td>
<td>1.27</td>
<td>0.84</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
<td>2.24</td>
<td>0.64</td>
</tr>
</tbody>
</table>

Table 4.4

Mean Pre-Camp Physical Activity of Resident Campers

<table>
<thead>
<tr>
<th>Activity</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swimming</td>
<td>116</td>
<td>3.21</td>
<td>1.51</td>
</tr>
<tr>
<td>Jogging or running</td>
<td>116</td>
<td>2.82</td>
<td>1.35</td>
</tr>
<tr>
<td>Walking for exercise</td>
<td>116</td>
<td>2.68</td>
<td>1.46</td>
</tr>
<tr>
<td>Bicycling</td>
<td>115</td>
<td>2.36</td>
<td>1.38</td>
</tr>
<tr>
<td>Basketball</td>
<td>115</td>
<td>1.98</td>
<td>1.36</td>
</tr>
<tr>
<td>Tag</td>
<td>116</td>
<td>1.98</td>
<td>1.06</td>
</tr>
<tr>
<td>Skipping</td>
<td>114</td>
<td>1.96</td>
<td>1.21</td>
</tr>
<tr>
<td>Soccer</td>
<td>115</td>
<td>1.91</td>
<td>1.32</td>
</tr>
<tr>
<td>Dance</td>
<td>116</td>
<td>1.84</td>
<td>1.24</td>
</tr>
<tr>
<td>Football</td>
<td>116</td>
<td>1.75</td>
<td>1.30</td>
</tr>
<tr>
<td>Baseball, softball</td>
<td>114</td>
<td>1.68</td>
<td>1.31</td>
</tr>
<tr>
<td>Volleyball</td>
<td>116</td>
<td>1.55</td>
<td>1.16</td>
</tr>
<tr>
<td>Skateboarding</td>
<td>116</td>
<td>1.51</td>
<td>1.10</td>
</tr>
<tr>
<td>Tennis</td>
<td>115</td>
<td>1.44</td>
<td>0.98</td>
</tr>
<tr>
<td>In-line skating</td>
<td>110</td>
<td>1.34</td>
<td>0.79</td>
</tr>
<tr>
<td>Boating/canoeing</td>
<td>110</td>
<td>1.32</td>
<td>0.80</td>
</tr>
<tr>
<td>Floor, street hockey</td>
<td>116</td>
<td>1.26</td>
<td>0.88</td>
</tr>
<tr>
<td>Ice skating</td>
<td>115</td>
<td>1.16</td>
<td>0.60</td>
</tr>
<tr>
<td>Aerobics</td>
<td>116</td>
<td>1.15</td>
<td>0.59</td>
</tr>
<tr>
<td>Total</td>
<td>116</td>
<td>1.86</td>
<td>0.56</td>
</tr>
</tbody>
</table>
Stepcounts by Camp Site

The first research question for this study aimed to assess baseline PA in camps. The measure of PA for campers was stepcount as recorded by pedometers with additional steps included for activities where the pedometer could not be worn. Day campers averaged 11,916 steps per camp day at camp, while resident campers averaged 19,699 steps per day. The mean amount of camper PA varied among the camps participating in this research study (Table 4.5). Day campers took 9,284 – 13,222 steps depending upon the camp, while resident campers took 16,481 – 23,726 steps.

Table 4.5

Mean Stepcount (Physical Activity) at Each Day and Resident Camp

<table>
<thead>
<tr>
<th>Site</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AEF</td>
<td>45</td>
<td>13222.40</td>
<td>3112.77</td>
<td>8047.57</td>
<td>20041.60</td>
<td>1</td>
</tr>
<tr>
<td>CBP</td>
<td>38</td>
<td>12683.70</td>
<td>2444.83</td>
<td>6805.96</td>
<td>16219.20</td>
<td>2</td>
</tr>
<tr>
<td>RLL</td>
<td>30</td>
<td>12232.04</td>
<td>2532.40</td>
<td>8146.91</td>
<td>17128.25</td>
<td>3</td>
</tr>
<tr>
<td>DEJ</td>
<td>37</td>
<td>9283.86</td>
<td>2405.50</td>
<td>4494.68</td>
<td>15380.63</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>150</td>
<td>11916.35</td>
<td>3065.62</td>
<td>4494.68</td>
<td>20041.60</td>
<td>N/A</td>
</tr>
<tr>
<td>Resident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCH</td>
<td>35</td>
<td>23726.11</td>
<td>4433.13</td>
<td>13330.00</td>
<td>31151.50</td>
<td>1</td>
</tr>
<tr>
<td>WCK</td>
<td>33</td>
<td>19294.48</td>
<td>4014.24</td>
<td>11790.40</td>
<td>28977.40</td>
<td>2</td>
</tr>
<tr>
<td>PCR</td>
<td>21</td>
<td>17453.94</td>
<td>3605.86</td>
<td>10930.90</td>
<td>24117.72</td>
<td>3</td>
</tr>
<tr>
<td>BJP</td>
<td>25</td>
<td>16481.80</td>
<td>3460.59</td>
<td>9304.49</td>
<td>23316.50</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>114</td>
<td>19699.21</td>
<td>4859.92</td>
<td>9304.49</td>
<td>31151.50</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Statistical Tests for the Four Conceptual Factors of the Social Ecological Framework

In addition to establishing a baseline for the number of steps taken in camps, four research questions addressed the relationship of PA with four conceptual factors (i.e., individual, social, physical environmental, organizational) based on the social ecological framework used in this study. The dependent variable, camper PA, was used in bi-variate (i.e., t-test, correlation) analyses with each of the independent variables. Multiple regression models were then created for the variables within each factor and then for all of the variables of study for each type of camp (i.e., day or resident). For a further description of each of the variables, refer back to Table 3.9.

*Individual-Level Variables and Camp Physical Activity*

The second research question for this study focused on the relationship between individual-level characteristics and camp PA. Individual-level variables included age, gender, race, Body Mass Index (BMI), and pre-camp PA participation. Four of the variables were dichotomous (i.e., age, gender, race, BMI) and one was continuous (i.e., pre-camp PA participation). Dichotomous variables were analyzed using independent t-tests (see Table 4.6), while the continuous variable was analyzed using a Pearson correlation coefficient.

Age was the only non-significant individual-level dichotomous variable. No significant differences in stepcounts were found between 8-to-10-year-old campers and 11-to-12-year-old campers at day or resident camps. There were, however, significant differences in camp PA participation based upon gender, race, and BMI.
Male campers were more physically active than female campers at both day and resident camps. Males took 2,671 more steps per day than females at day camps and 2,611 more steps per day at resident camps. Significant differences were also found between race and PA participation at both types of camps. Specific race/ethnicity data were collected for this study, but due to low representation from each group the data were collapsed into minority and non-minority (i.e., Caucasians) categories. Non-minorities took 2,604 more steps per day than minorities at day camps and 3,757 more steps per day at resident camps.

Campers were also more or less physically active depending upon their BMI. Campers who were below the 85th percentile for BMI (i.e., normal or below average weight) took 1,858 more steps per day than campers above the 85th percentile for BMI (i.e., at risk of overweight or overweight) at day camps and 2,226 more steps per day at resident camps.
Table 4.6

*Independent T-test Stepcount Comparisons by Individual Characteristics (Age, Gender, Race, BMI)*

<table>
<thead>
<tr>
<th>Age</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 11 yrs.</td>
<td>99</td>
<td>11766.18</td>
<td>3199.73</td>
<td>-0.77</td>
<td>.45</td>
</tr>
<tr>
<td>&gt; 10 yrs.</td>
<td>48</td>
<td>12182.64</td>
<td>2863.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 11 yrs.</td>
<td>51</td>
<td>20289.02</td>
<td>5049.79</td>
<td>1.12</td>
<td>.26</td>
</tr>
<tr>
<td>&gt; 10 yrs.</td>
<td>62</td>
<td>19256.01</td>
<td>4716.93</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Gender |       |           |          |       |     |
| Day   |     |           |          |       |     |
| Male  | 76   | 13233.75  | 3081.00  | 5.91**| .01 |
| Female | 74   | 10563.34  | 2401.49  |       |     |
| Resident |     |           |          |       |     |
| Male  | 52   | 21119.09  | 5410.73  | 2.88**| .01 |
| Female | 62   | 18508.34  | 4014.50  |       |     |

| Body Mass Index |       |           |          |       |     |
| Day             |     |           |          |       |     |
| Under/normal weight 84 | 12397.76 | 3045.81  | 3.16**  | .01 |
| At risk/overweight | 39   | 10539.99  | 3004.29  |       |     |
| Resident         |     |           |          |       |     |
| Under/normal weight 72 | 20581.50 | 4858.09  | 2.34*   | .02 |
| At risk/overweight | 39   | 18355.51  | 4633.73  |       |     |

| Race  |       |           |          |       |     |
| Day   |     |           |          |       |     |
| Non-minority | 65   | 13153.93  | 2890.96  | 5.03**| .01 |
| Minority | 61   | 10549.97  | 2915.08  |       |     |
| Resident |     |           |          |       |     |
| Non-minority | 81   | 20689.57  | 4682.32  | 3.65**| .01 |
| Minority | 28   | 16932.70  | 4751.48  |       |     |

*Note.* *p* < .05. **p* < .01.
Another variable collected for the individual-level factor was pre-camp PA participation. While the other individual-level variables were dichotomous, pre-camp PA was continuous. An index of the frequency of participation in pre-camp physical activities (refer back to Table 4.3, 4.4) was correlated with camp stepcount to determine if pre-camp PA was related to PA during the camp week (see Table 4.7). Low and non-significant Pearson correlation coefficients indicated that pre-camp PA was not related with PA during the camp week. This relationship must be interpreted with caution as the measures of PA were different for pre-camp (i.e., self-report) and during camp (i.e., pedometer).

Table 4.7

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Avg. of CPAQ-C activities</td>
<td>124</td>
<td>2.24</td>
<td>0.64</td>
<td>.07</td>
<td>.47</td>
</tr>
<tr>
<td>Resident Avg. of CPAQ-C activities</td>
<td>109</td>
<td>1.86</td>
<td>0.56</td>
<td>.10</td>
<td>.30</td>
</tr>
</tbody>
</table>

Following bi-variate analyses, each of the factors were examined using a multiple regression model. For these models all of the variables within the factor were examined as a group. The multiple regression models for the four factors were run using the “enter” method. In the enter method, all of the independent variables are entered into the model at once. Other multiple regression modeling methods including stepwise were considered, but the stepwise process eliminates variables from the model and does not display their
contribution to the overall equation. The enter method was chosen because the minimum requirements were met, including at least five cases for each independent variable, and the exploratory nature of the study made it important to display the relative weight of each of the variables (Garson, 2009). For the individual factor, variables included age, gender, race, BMI, and pre-camp PA (see Table 4.8).

Table 4.8

Ordinary Least Squares Regression of Individual-Level Variables and Day and Resident Camper Physical Activity

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
</tr>
<tr>
<td>Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>19893.34</td>
<td>1771.50</td>
</tr>
<tr>
<td>Age</td>
<td>215.31</td>
<td>602.24</td>
</tr>
<tr>
<td>Gender</td>
<td>-2276.71</td>
<td>531.76</td>
</tr>
<tr>
<td>BMI</td>
<td>-1501.91</td>
<td>536.53</td>
</tr>
<tr>
<td>Race</td>
<td>-2659.98</td>
<td>543.25</td>
</tr>
<tr>
<td>Pre-camp act. mean</td>
<td>487.90</td>
<td>405.61</td>
</tr>
<tr>
<td>Resident</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>28447.26</td>
<td>2936.01</td>
</tr>
<tr>
<td>Age</td>
<td>-444.57</td>
<td>909.75</td>
</tr>
<tr>
<td>Gender</td>
<td>-2576.94</td>
<td>915.39</td>
</tr>
<tr>
<td>BMI</td>
<td>-855.99</td>
<td>990.42</td>
</tr>
<tr>
<td>Race</td>
<td>-3252.13</td>
<td>1061.11</td>
</tr>
<tr>
<td>Pre-camp act. mean</td>
<td>678.36</td>
<td>775.18</td>
</tr>
</tbody>
</table>

Note. **p < .01. Day camp (N = 104). Resident camp (N = 107).

The individual-level factor explained 40.7% ($R^2 = .407$) of the variance in stepcount at day camps. The findings from the multiple regression model mirrored the findings from
the bi-variate tests. When controlling for all of the individual-level independent variables, male gender, non-minority status, and normal-low BMI were significant and positively associated with PA in day camps. The model also indicated the relative importance of each of these variables with the order being non-minority race, male gender, and then normal-low BMI. Non-minority race resulted in 2,660 more steps per day compared to minorities. Male gender resulted in 2,277 more steps per day than females. Campers with BMI’s below the 85th percentile took 1,502 steps more than campers with BMI’s above the 85th percentile.

Resident camps had similar results from the individual-level multiple regression model, but less variance was explained by the independent variables when compared to the day camps (20.1%; $R^2 = .201$). Non-minority race and male gender were significant and positively related to camp PA when controlling for all of the individual level variables. BMI was not significant. Non-minority race had the strongest effect size, followed by female gender. Non-minority race resulted in 3,252 more steps per day versus minorities. Males took 2,577 more steps per day when compared to females.

For day campers, male gender, non-minority race, and normal-low BMI were significantly related to higher PA participation, while pre-camp PA and age were not significantly related to PA participation in either bi-variate or regression tests. For resident campers, the results were similar. Male gender, non-minority race, and normal-low BMI were significant and positively related to PA in bi-variate tests, but only gender and race
were significant in the resident camp regression model for individual characteristics. Pre-campus PA and age were not significant correlates of resident camper PA in either bi-variate or regression tests.

**Social-Level Variables and Camp Physical Activity**

The third research question for this study aimed to explore the role of social relationships in determining camp PA participation. The social groups of campers were separated into peer groups and group leaders (i.e., direct supervision counselors). To measure peer group PA, campers indicated up to five friends who participated in the study. The average of the friends’ stepcounts was used. Counselor PA participation was directly recorded through their use of pedometers during the camp week. Both variables were continuous and Pearson correlation coefficients were used to examine the relationships (see Table 4.9).

Table 4.9

**Pearson Correlations of Camper Stepcount and Camp Social Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counselor stepcount</td>
<td>150</td>
<td>.36**</td>
<td>.01</td>
</tr>
<tr>
<td>Friend avg. stepcount</td>
<td>89</td>
<td>.65**</td>
<td>.01</td>
</tr>
<tr>
<td><strong>Resident</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counselor stepcount</td>
<td>97</td>
<td>-.16</td>
<td>.12</td>
</tr>
<tr>
<td>Friend avg. stepcount</td>
<td>99</td>
<td>.55**</td>
<td>.01</td>
</tr>
</tbody>
</table>

*Note.* **p < .01.**
The relationship between campers’ stepcounts and counselors’ stepcounts differed at day and resident camps. At day camps, campers’ stepcounts were moderately correlated and significantly related to the stepcounts of counselors. At resident camps the relationship was not significant, and slightly negative. Friend or peer group stepcounts, however, were significant at both day and resident camps. The steps taken by peer groups had a stronger correlation with individual camper stepcounts at day camps versus resident camps, but both were significant.

Multiple regression modeling of the relationship between social-level variables and camp PA participation indicated similar findings to the bi-variate statistics (see Table 4.10). One change was that counselor PA was not related to camper PA at day or resident camps. Peer group stepcounts were still significant, and positively and strongly related to PA in both formats. At day camps the social-level variables accounted for 42.4% of the variance in the dependent variable \((R^2 = .424)\). Peer group stepcount was the only significant variable with each step taken by the friend group resulting in 0.76 of an additional step taken by the individual camper who designated that friend group. At resident camps the social-level variables explained 31.3% \((R^2 = .313)\) of the variance in the dependent variable stepcount. Only the peer group stepcount variable was significant, with every one step taken from by the friend group resulting in 0.66 more of a step taken by the individual camper designating that group.
Table 4.10

Ordinary Least Squares Regression of Social-Level Variables and Day and Resident Camper Physical Activity

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
</tr>
<tr>
<td>Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2183.24</td>
<td>1273.31</td>
</tr>
<tr>
<td>Counselor steps</td>
<td>.07</td>
<td>.09</td>
</tr>
<tr>
<td>Friend steps</td>
<td>.76</td>
<td>.12</td>
</tr>
<tr>
<td>Resident</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>8012.30</td>
<td>3828.22</td>
</tr>
<tr>
<td>Counselor steps</td>
<td>-.07</td>
<td>.14</td>
</tr>
<tr>
<td>Friend steps</td>
<td>.66</td>
<td>.12</td>
</tr>
</tbody>
</table>

Note. ** p < .01. Day camp (N = 91). Resident camp (N = 87).

For day campers, the number of steps taken by their direct counselors and peer groups were significant correlates of PA in bi-variate statistical tests. Only the number of steps taken by campers’ peer groups remained significant in multiple regression modeling. In resident camps, counselor stepcount was not significantly related to camper PA in bi-variate or regression tests. The stepcounts of peers however, were significant in both bi-variate and regression tests.

Physical Environment-Level Variables and Camp Physical Activity

The fourth research question for this study sought to examine the relationship between the camp physical environment and camp PA. Refer back to Tables 3.6 and 3.7 for the physical characteristics of each individual camp. The variables examined for each
camp format (i.e., day or resident) varied due to the physical spaces used in each environment. Day camps were held primarily indoors so the variables considered were the number of PA areas, square footage of the indoor facilities, and land acreage for the camp. The activity areas variable was a count of the facilities at the camp that were used for physical activities. The programming schedule as well as confirmation from the camp director was used to determine the number of activity areas used. The PA areas counted were limited to those that were in use during the camp week and conducive to PA participation (i.e., basketball courts, swimming pools, soccer fields).

Some outdoor participation took place at day camps, but campers did not walk long distances to access outdoor facilities. Resident camps were different as they were held in larger outdoor environments. Therefore, acreage and the number of activity areas were explored along with the walking distance between each of the activities for the day. Resident campers routinely walked from activity to activity, walking up to an average of 926 steps between each activity area during the camp day. The walking distances were measured in feet using a contractor’s wheel and walking the most direct path from a common meeting point (i.e., dining hall) to each of the activity areas (including non-PA areas).

Weather was initially included as a physical environmental variable. However, since camps cannot control weather, it was eliminated from the physical environmental analyses. Weather was included in the full camp regression models as a control for camps
that had poor weather conditions during the camp week. Each physical environmental variable included was continuous and examined using Pearson correlation coefficients (see Table 4.11).

Table 4.11

Pearson Correlations of Camper Stepcount and Camp Physical Environmental Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity areas</td>
<td>150</td>
<td>.37**</td>
<td>.01</td>
</tr>
<tr>
<td>Acreage</td>
<td>150</td>
<td>.12</td>
<td>.13</td>
</tr>
<tr>
<td>Facility ft.²</td>
<td>150</td>
<td>.29**</td>
<td>.01</td>
</tr>
<tr>
<td><strong>Resident</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity areas</td>
<td>114</td>
<td>.46**</td>
<td>.01</td>
</tr>
<tr>
<td>Acreage</td>
<td>114</td>
<td>.53**</td>
<td>.01</td>
</tr>
<tr>
<td>Walk distance</td>
<td>114</td>
<td>.48**</td>
<td>.01</td>
</tr>
</tbody>
</table>

*Note.** p < .01.

At day camps three variables were analyzed: (a) number of PA areas, (b) camp acreage, and (c) square footage of the indoor facilities used. Two of the variables, number of PA areas and facility square footage were moderately, positively, and significantly correlated with the stepcounts of the campers. The acreage of the day camps was not significant.

Three variables were also analyzed at resident camps. Activity areas and acreage were included, but indoor facility square footage was not because most resident camps did not have these types of facilities. Walking distance between activity areas was
included as many of the activity areas in the resident camps were far apart. All three variables were positively correlated with the stepcounts of campers. The correlations were stronger than in the day camps indicating significant, moderate-high relationships for the number of activity areas, acreage, and walking distance between activity areas.

A multiple regression model was then used to determine the relative strength of the individual and joint contribution of the variables in determining the stepcounts of campers (see Table 4.12). This multiple regression model was the first with any substantial multicollinearity, or strong relationships between independent variables. For day camps, the square footage of facilities and number of activity areas were highly correlated with one another \((r = .92)\). To control for this potential limitation these two variables were standardized and combined into a single variable (i.e., facilities). At resident camps a similar issue arose with a high correlation between the acreage and walking distance between activity areas \((r = .97)\). For this instance, acreage was eliminated from the model and walking distance was used to indicate the size of the camp.
Table 4.12

*Ordinary Least Squares Regression of Physical Environmental-Level Variables and Day and Resident Camper Physical Activity*

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$</td>
<td>$SE$</td>
</tr>
<tr>
<td>Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>11179.30</td>
<td>320.55</td>
</tr>
<tr>
<td>Facilities</td>
<td>677.35</td>
<td>125.52</td>
</tr>
<tr>
<td>Acreage</td>
<td>6.76</td>
<td>2.05</td>
</tr>
<tr>
<td>Resident</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>3835.18</td>
<td>2180.36</td>
</tr>
<tr>
<td>Activity areas</td>
<td>593.40</td>
<td>149.13</td>
</tr>
<tr>
<td>Dist. btwn. areas</td>
<td>8.75</td>
<td>1.98</td>
</tr>
</tbody>
</table>

*Note.* ** $p < .01.$ Day camp ($N = 153$). Resident camp ($N = 121$).

When simplifying the day camp model to the two variables of facilities and acreage, both were positively and significantly related to camper PA. These two variables explained 17.8% ($R^2 = .178$) of the variance in the dependent variable. The facilities variable had a stronger effect size than the acreage of the camp. Since the facilities variable was statistically standardized, the results were more difficult to interpret. The standardization converted the numbers into relative values (i.e., z-scores), so an unstandardized beta coefficient was not available. Therefore, a one-fold increase in the combination of the size of indoor facilities and the number of activity areas resulted in 677 additional steps per camper. The interpretation of the acreage variable was clearer with each camper taking about 7 more steps for each additional camp acre.
Activity areas and distance walked to activity areas were examined in the resident camp model and both were significantly related to camper stepcount. The combination of these two variables explained a larger amount of variance in the dependent variable (33%, $R^2 = .330$) than the day camp variables. The walking distance between each activity area was the strongest correlate followed by the number of activity areas at the camp. For each additional one foot of distance between camp activity areas, campers took about 9 more steps. Each additional activity area resulted in campers taking an additional 539 steps per day.

For day camps, both the size of the indoor facilities and number of activity areas were significantly related to camper PA in bi-variate tests, but the outdoor acreage of the day camps was not. For the multiple regression model of day camp physical environmental characteristics, the size of the facilities and number of activity areas had to be merged because of high multicollinearity. Both the merged variable (facilities) and acreage were positively and significantly related to day camper PA. In resident camps, the number of activity areas, acreage, and distance walked between activities were all significantly related to camper PA in bi-variate tests. Acreage had to be removed from regression tests because of high multicollinearity with walking distance between activities, but both the walking distance and number of activity areas were significantly related to camper PA.
Organizational-Level Variables and Camp Physical Activity

The fifth and final research question for this study focused on the relationship between intentional organizational variables and camper PA. The two variables explored were camp programming and camper-staff ratio. Camp program schedules for each camper were converted into numerical data using METs for each activity and summed for each day (see Table 4.13). The top 10 resident and day camp activities measured by the number of programming periods allocated for them are presented in Table 4.14. Camper-staff ratios were created by dividing the total number of campers for the week by the total number of full-time staff (refer back to Table 3.1, 3.3). For example, Camp AEF had 302 campers and 65 full-time staff members resulting in a ratio of 4.65 (i.e., five) campers for every one full-time staff member. The camper-staff ratio and camp programming variables were continuous and analyzed using Pearson correlation coefficients.
Table 4.13

Average Energy Expenditure in Metabolic Equivalency Ratios per Day at Day and Resident Camps

<table>
<thead>
<tr>
<th>Site</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>AEf</td>
<td>1361.94</td>
<td>1381.01</td>
<td>1185.91</td>
<td>999.30</td>
<td>1092.69</td>
</tr>
<tr>
<td></td>
<td>RLL</td>
<td>1470.30</td>
<td>1260.30</td>
<td>1185.90</td>
<td>1530.00</td>
<td>1470.30</td>
</tr>
<tr>
<td></td>
<td>CBP</td>
<td>1899.60</td>
<td>1572.30</td>
<td>787.30</td>
<td>1754.64</td>
<td>1635.04</td>
</tr>
<tr>
<td></td>
<td>DEJ</td>
<td>1564.13</td>
<td>1446.10</td>
<td>1338.27</td>
<td>1516.67</td>
<td>1770.54</td>
</tr>
<tr>
<td>Resident</td>
<td>BJP</td>
<td>2341.49</td>
<td>1935.97</td>
<td>2372.07</td>
<td>2390.63</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>BCH</td>
<td>2653.47</td>
<td>2766.14</td>
<td>2587.48</td>
<td>2353.48</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>PCR</td>
<td>3002.22</td>
<td>2496.50</td>
<td>2782.50</td>
<td>2447.50</td>
<td>2694.64</td>
</tr>
<tr>
<td></td>
<td>WCK</td>
<td>2733.58</td>
<td>2829.98</td>
<td>2767.15</td>
<td>2740.70</td>
<td>2557.50</td>
</tr>
</tbody>
</table>

Pearson correlation analyses of the two organizational-level variables indicated differences between the day and resident camps (see Table 4.15). At day camps, neither the program index nor the camper-staff ratio was significantly related to camper PA. However, both variables were significant at resident camps. The program activity index was moderately and positively correlated with camper stepcounts while the camper-staff ratio had a moderate, but negative correlation. The negative correlation for the camper-staff ratio should be interpreted inversely, meaning that as the ratio decreases, the amount of PA increases (e.g., five campers to one counselor is a greater PA influence than nine campers to one counselor).
Table 4.14

*Most Common Resident and Day Camp Activities by Programming Periods*

<table>
<thead>
<tr>
<th>Activity</th>
<th>N&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Activity</th>
<th>N&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident Swimming</td>
<td>493</td>
<td>Playground</td>
<td>509</td>
</tr>
<tr>
<td>Canoeing/kayaking/sailing</td>
<td>266</td>
<td>Swimming</td>
<td>422</td>
</tr>
<tr>
<td>Misc. all-camp programs&lt;sup&gt;b&lt;/sup&gt;</td>
<td>223</td>
<td>Tennis</td>
<td>387</td>
</tr>
<tr>
<td>Archery/riflery</td>
<td>210</td>
<td>Free play</td>
<td>342</td>
</tr>
<tr>
<td>Art</td>
<td>117</td>
<td>Basketball</td>
<td>312</td>
</tr>
<tr>
<td>Horseback riding</td>
<td>93</td>
<td>Art</td>
<td>281</td>
</tr>
<tr>
<td>Cabin activities</td>
<td>61</td>
<td>Open gym</td>
<td>255</td>
</tr>
<tr>
<td>Water games</td>
<td>57</td>
<td>Kickball</td>
<td>222</td>
</tr>
<tr>
<td>Dance</td>
<td>52</td>
<td>Dance</td>
<td>215</td>
</tr>
<tr>
<td>High/low ropes course</td>
<td>51</td>
<td>Dodgeball</td>
<td>206</td>
</tr>
</tbody>
</table>

<sup>a</sup>The day and resident camp program schedules were used to count the number of periods for each specific activity per camper. <sup>b</sup>Most of the miscellaneous all-camp programs were group relay activities held in large open spaces.

Multiple regression models were then used to determine the association between organizational-level variables and stepcount as well as identify the relative contribution of the two variables (see Table 4.16). While all previous multiple regression models were significantly related to stepcount ($p < .01$), the model for the day camp organizational-level variables was not significant ($p = .056$). If the model was significant, the organizational-level variables would have explained only 3.8% ($R^2 = .038$) of the variance in the campers’ stepcounts.
Table 4.15

Pearson Correlation of Camper Stepcount and Camp Organizational Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program index avg.</td>
<td>150</td>
<td>-.15</td>
<td>.07</td>
</tr>
<tr>
<td>Camper-staff ratio</td>
<td>150</td>
<td>.07</td>
<td>.41</td>
</tr>
<tr>
<td><strong>Resident</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program index avg.</td>
<td>112</td>
<td>.43**</td>
<td>.01</td>
</tr>
<tr>
<td>Camper-staff ratio</td>
<td>114</td>
<td>-.58**</td>
<td>.01</td>
</tr>
</tbody>
</table>

Note. ** p < .01.

The resident camp model mirrored the bi-variate findings for resident camps. Both the activity index and camper-staff ratio were significant. The model explained a larger percentage of variance in stepcount than the day camp model (44.4%, $R^2 = .444$). Camper-staff ratio was the greatest organizational-level correlate in resident camps resulting in about 3,167 additional steps for each additional one-fold increase in the ratio (e.g., from 5:1 to 4:1). The activity index was also a positive and moderate correlate, with each additional MET added to the camp programming schedule resulting in an additional 5 steps per camper.

For day camps, neither the programming schedule nor the camper-staff ratio was significantly related to camper PA in bi-variate tests. In addition, the day camp organizational-level regression model was not significant. For resident camps, both the
programming schedule and the camper-staff ratio were significantly related to camper PA in bi-variate and regression tests.

Table 4.16

Ordinary Least Squares Regression of Organizational-level Variables and Day and Resident Camper Physical Activity

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( B )</td>
<td>( SE )</td>
</tr>
<tr>
<td><strong>Day</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>15095.76</td>
<td>1896.67</td>
</tr>
<tr>
<td>Act. index</td>
<td>-3.30</td>
<td>1.45</td>
</tr>
<tr>
<td>Camper-staff ratio</td>
<td>200.41</td>
<td>127.07</td>
</tr>
<tr>
<td><strong>Resident</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>18256.20</td>
<td>3699.28</td>
</tr>
<tr>
<td>Act. index</td>
<td>5.47</td>
<td>1.14</td>
</tr>
<tr>
<td>Camper-staff ratio</td>
<td>-3166.95</td>
<td>447.73</td>
</tr>
</tbody>
</table>

Note. * \( p < .05 \). ** \( p < .01 \). Day camp \( N = 153 \). Resident camp \( N = 119 \).

Four-Factor Day and Resident Camp Multiple Regression Models

Following the analysis of each of the independent variables and conceptual factors, all variables studied for day and resident camps were entered into a multiple regression model to determine the most influential correlates of camp PA participation. Many of the variables were significant in bi-variate analyses and factor-level regression models, but this model differentiated the variables with the most explanatory power when all of the variables of study were entered. Like each of the previous multiple regression models, the models were run using the “enter” method. One note of caution was that the sample size
for each of the formats (day, \( N = 65 \); resident, \( N = 79 \)) barely meets requirements. The enter method requires at least 5 cases for each of the independent variables and there were 11 independent variables in each of the models (Garson, 2009).

Under the enter method each of the factors were entered in blocks or as groups. Per the social ecological model the individual variables were entered first, followed by the social, physical environmental, and organizational variables. This order operated on the assumption that children have the most control over themselves (i.e., individual characteristics), followed by their social environment, physical environment, and organizational environment. This block format was used to determine the change in variance (i.e., \( R^2 \)) based upon the entry of each subsequent factor.

*Day Camp Full Regression Model*

Bi-variate analyses indicated that significant correlates of day camper PA were gender, race, BMI, peer group stepcount, counselor stepcount, and the size of the facility/number of activity areas. When all of the variables were entered into a full day camp multiple regression model the many variables did not retain their significance (see Table 4.17). Age, pre-camp PA, acreage, camper-staff ratio, and the MET activity index remained non-significant correlates of camp PA. Race, peer group stepcount, and the facility size/number of activity areas were significant in bi-variate tests, but not in the final model. Although it was not significant, the facilities variable had the largest effect size (\( \beta = .36 \)) of any variable in the model.
Table 4.17

**Full Day Camp Ordinary Least Squares Regression Model (N = 65)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>B</td>
<td>SE</td>
<td>β</td>
</tr>
<tr>
<td>Constant</td>
<td>8374.97</td>
<td>5130.40</td>
<td>.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Block one</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>156.56</td>
<td>645.96</td>
<td>.02</td>
</tr>
<tr>
<td>Gender</td>
<td>-1923.43</td>
<td>586.22</td>
<td>-.32**</td>
</tr>
<tr>
<td>BMI</td>
<td>-1063.93</td>
<td>524.31</td>
<td>-.17*</td>
</tr>
<tr>
<td>Race</td>
<td>-558.25</td>
<td>696.36</td>
<td>-.09</td>
</tr>
<tr>
<td>Pre-camp act. mean</td>
<td>385.97</td>
<td>419.62</td>
<td>.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Block two</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counselor steps</td>
<td>0.14</td>
<td>0.15</td>
<td>.15</td>
</tr>
<tr>
<td>Friend steps</td>
<td>0.28</td>
<td>0.16</td>
<td>.23</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Block three</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilities</td>
<td>597.40</td>
<td>318.02</td>
<td>.35</td>
</tr>
<tr>
<td>Acreage</td>
<td>2.63</td>
<td>2.72</td>
<td>.10</td>
</tr>
<tr>
<td>Weather</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Block four</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act. Index</td>
<td>1.37</td>
<td>2.36</td>
<td>.08</td>
</tr>
<tr>
<td>Camper-staff ratio*</td>
<td>139.98</td>
<td>219.97</td>
<td>.09</td>
</tr>
</tbody>
</table>

*Note. Weather had to be removed from this model because of high multicollinearity with the camper-staff ratio. The model was re-run without camper-staff ratio and weather was not significant. * p < .05. ** p < .01.*

In the full model of day camper PA, gender and BMI were the greatest correlates of PA in day camps. Gender had the largest impact on camp PA participation with males taking about 1,923 more steps than females. Campers below the 85th percentile (i.e.,
normal weight to underweight BMI) took about 1,064 more steps than individuals with BMI’s above the 85\textsuperscript{th} percentile.

The 11 independent variables from each of the four social-ecological factors in this study explained 67.9\% \( (R^2 = .679) \) of the variance in the dependent variable camper stepcount per day at day camps (see Table 4.18). Therefore only 32.1\% of variance in day camper stepcounts was not explained by the variables included in this study. Individual characteristics explained a large amount of the variance while the second block of variables (i.e., social) significantly contributed to an increase of the \( R^2 \) for the model. Adding the physical environmental and organizational variables both resulted in \( R^2 \) increases, but they were not significant.

**Table 4.18**

*Change in Explained Variance of Day Camper Stepcount by Factor-Level*

<table>
<thead>
<tr>
<th>Model</th>
<th>( R^2 )</th>
<th>( R^2 \Delta )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (I)</td>
<td>.456</td>
<td>.456**</td>
<td>.01</td>
</tr>
<tr>
<td>2 (I + S)</td>
<td>.648</td>
<td>.192**</td>
<td>.01</td>
</tr>
<tr>
<td>3 (I + S + PE)</td>
<td>.675</td>
<td>.028</td>
<td>.10</td>
</tr>
<tr>
<td>4 (I + S + PE + O)</td>
<td>.679</td>
<td>.004</td>
<td>.72</td>
</tr>
</tbody>
</table>

*Note.* I = individual characteristics, S = social environment, PE = physical environment, O = organizational environment. ** \( p < .01 \).

**Resident Camp Full Regression Model**

Significant correlates of resident camper PA determined by bi-variate analyses were gender, race, BMI, peer group stepcount, number of activity areas, acreage, walking
distance between activity areas, MET activity index, and camper-staff ratio. In a final multiple regression model including all of the variables of study, the number of significant correlates was reduced (see Table 4.19). The relationship between camper and counselor stepcount remained non-significant. Race, BMI, peer group stepcount, and number of activity areas were significant in bi-variate tests, but not in the final model. The camper-staff ratio variable had to be removed from the final model because of high multicollinearity with three other variables.

One unexpected change was that age, which was not significant in bi-variate tests or the individual-level regression model, was significant in the overall resident camp model. When considering all variables of study, campers between ages 8-to-10-years-old took 2,776 more steps than 11-to-12-year-old campers. Gender, distance walked between activity areas, and programming activity index continued to be significantly related to resident camper PA. The activity index was the strongest correlate of resident camper PA with each additional planned MET for each camp day resulting in 7.91 additional steps. The distance between the program areas also had a large effect size and each extra one-foot of average distance between areas resulted in 9.33 additional steps. Finally, males took about 2,750 more steps than females during the resident camp week.
Table 4.19

Full Resident Camp Ordinary Least Squares Regression Model – Resident Camps (N = 79)

<table>
<thead>
<tr>
<th>Model</th>
<th>Variable</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>SE</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>3391.84</td>
<td>12419.18</td>
</tr>
<tr>
<td>Block one</td>
<td>Age</td>
<td>-2775.89</td>
<td>801.88</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td>-2577.39</td>
<td>886.17</td>
</tr>
<tr>
<td></td>
<td>BMI</td>
<td>184.02</td>
<td>964.67</td>
</tr>
<tr>
<td></td>
<td>Race</td>
<td>-45.20</td>
<td>1276.16</td>
</tr>
<tr>
<td></td>
<td>Pre-camp act. mean</td>
<td>350.96</td>
<td>742.00</td>
</tr>
<tr>
<td>Block two</td>
<td>Counselor steps</td>
<td>.05</td>
<td>.14</td>
</tr>
<tr>
<td></td>
<td>Friend steps</td>
<td>.09</td>
<td>.14</td>
</tr>
<tr>
<td>Block three</td>
<td>Activity areas</td>
<td>177.66</td>
<td>249.98</td>
</tr>
<tr>
<td></td>
<td>Dist. btwn. areas</td>
<td>9.88</td>
<td>2.58</td>
</tr>
<tr>
<td></td>
<td>Temp. (weather)</td>
<td>-132.61</td>
<td>99.71</td>
</tr>
<tr>
<td>Block four</td>
<td>Act. index</td>
<td>7.91</td>
<td>1.51</td>
</tr>
<tr>
<td></td>
<td>Camper-staff ratio</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Note. The camper-staff ratio variable had to be removed from this model because of high multicollinearity with the weather, activity area, and walking distance variables. A second model including camper-staff ratio was run, and the variable was not significant. ** p < .01

The 11 variables used to explore resident camp PA participation explained 62.9% of the variance in camper stepcount (see Table 4.20). This finding indicates that only 37.1% of the variance in the steps taken by resident campers was not explained by the variables.
included in this study. As with day camps, individual characteristics were the largest contributor to the total $R^2$. All resident-camp factors were significant contributors to the explanation of variance in camper stepcount.

Table 4.20

<table>
<thead>
<tr>
<th>Model</th>
<th>$R^2$</th>
<th>$R^2$ Δ</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (I)</td>
<td>.216</td>
<td>.216**</td>
<td>.01</td>
</tr>
<tr>
<td>2 (I + S)</td>
<td>.407</td>
<td>.190**</td>
<td>.01</td>
</tr>
<tr>
<td>3 (I + S + PE)</td>
<td>.478</td>
<td>.072*</td>
<td>.03</td>
</tr>
<tr>
<td>4 (I + S + PE + O)</td>
<td>.629</td>
<td>.151**</td>
<td>.01</td>
</tr>
</tbody>
</table>

*Note.* I = individual characteristics, S = social environment, PE = physical environment, O = organizational environment. * $p < .05$. ** $p < .01$.

Chapter Four Summary

Descriptive statistics, bi-variate tests, and multiple regression models were used to analyze the data for the five research questions of study. Gender, race, BMI, friend group stepcount, counselor stepcount, size of indoor facilities, and the number of activity areas were significant bi-variate correlates of day camper PA. In resident camps gender, race, BMI, friend group stepcount, number of activity areas, acreage, walking distance between activity areas, camper-staff ratio, and the MET activity index were significantly related to camper PA in bi-variate tests. Ordinary least squares regression models were also run for factor-levels and a full model of all day and resident camp variables. In day camps, only gender and BMI were significant in the full model. Age, gender, walking distance between
activity areas, and the programming schedule were all significant in the resident camp model. Individual variables explained the largest amount of variance in day and resident camp PA, followed by social-level variables. Physical environmental- and organizational-level variables were significant for resident camps, but not for day camps.
CHAPTER V: DISCUSSION

The purpose of this study was to examine youth PA in summer camps and explore correlates of camper PA participation. In this final chapter the study findings are summarized and interpreted. Also, limitations, management implications, and future research opportunities are discussed. The social ecological framework, which specifies behaviors are influenced by individual characteristics as well as social, physical, and organizational environments was used to guide the research questions for this study:

1. What is the baseline level of PA in day and resident camps?
2. Are individual attributes (i.e., age, race, BMI, typical PA participation) related children’s PA in camp settings?
3. How are social characteristics, specifically activity levels of peers and counselors, associated with individual PA participation in camps?
4. Are physical environmental characteristics of camps associated with campers’ PA (e.g., size/acreage of facilities, availability of facilities, distance walked to facilities)?
5. How are organizational plans, including programming and camper-staff ratio, related to camp PA?

Stepcounts, including non-ambulatory activity, were collected to determine levels of PA for resident and day campers. Participants at resident camps took 19,699 steps per day during approximately 13 hours of camp participation. Day campers took 11,916 steps per day during approximately 7.5 hours of camp participation. The campers’ stepcounts
were then used to determine the relationship between their PA and four social ecological factors (i.e., individual characteristics and social, physical, and organizational environments).

Individual-level variables significantly contributed to explaining campers’ stepcounts in both resident and day camps. Factor-level regression of individual characteristics indicated that female gender and non-minority race were significant and negative correlates of resident and day camper PA. Race was the strongest correlate of camper PA at the individual-level, but gender was the only variable in the study that was significant in bi-variate, individual factor-level, and full model testing for both day and resident camps. Body Mass Index was significant in the individual factor-level and full model for day camps, but not for resident camps. Therefore, a BMI below the 85th percentile was a strong correlate for day campers, but not resident campers. Results for the relationship between age and camp PA participation were indefinite. There were no significant differences between 8-to-10-year-old campers and 11-to-12-year-old campers other than in the resident camp full model. Pre-camp PA participation was the only individual-level variable that was not significantly related to camp PA in any statistical test.

Social variables also significantly contributed to explaining variance in camper stepcount in day and resident camps. Counselor stepcount was not related with camper stepcount in most statistical tests. The stepcounts of the counselors were positively associated with day campers’ PA in bi-variate tests, but were not significant in social
factor-level or full model regression at resident or day camps. Peer group stepcount explained the majority of variance in camper PA at the social-level. Peers’ stepcounts were significant in bi-variate tests and social factor-level regression at resident and day camps. Individuals who associated with highly active peer groups were more likely to be active.

Physical environmental variables contributed significantly to the explanation of stepcount variance for resident camps, but not for day camps. The two physical environmental variables differed for resident and day camps. At resident camps the two physical environmental variables were the number of activity areas available and the distance walked from activity to activity during the camp day. The number of activity areas was significant in bi-variate and physical environmental factor-level tests, but not in the full resident camp regression model. A greater number of activity areas (e.g., climbing walls, lakes, ropes courses) resulted in more PA for resident campers. The distance walked variable was significant in bi-variate tests and in the physical environmental factor-level and full resident camp models. It was the strongest physical environmental-level correlate for resident campers. Longer distances between activity areas resulted in more walking (i.e., more PA) for resident campers.

The two day camp physical environmental-level variables were indoor facilities (i.e., square footage + number of activity areas) and outdoor acreage. The indoor facilities were the strongest physical environmental-level correlate in bi-variate and factor-level tests, but were not significant in the full day camp regression model. Larger indoor
facilities with more activity areas (e.g., sport courts, swimming pools) resulted in more day camper PA. The amount of outdoor acreage was significant in physical environmental factor-level regression, but not in bi-variate or full day camp model tests. Therefore the findings were indeterminate, but results from the physical environmental factor-level indicate that larger outdoor spaces were associated with more day camper PA.

Organizational variables also significantly contributed to the explanation of variance in resident camps, but not for day camps. Both the camper-staff ratio and MET index of activities were significant in bi-variate and organizational factor-level regression at resident camps. Camper-staff ratio was the strongest correlate of resident camper stepcount at the organizational-level. A larger staff with fewer campers resulted in more PA for the campers. Resident camp MET index was the only organizational-level variable that was significant in the full resident camp regression model. Programmed activities with a higher expected MET value facilitated more resident camper PA.

The camper-staff ratio and MET index of activities were not significant in bi-variate or full model tests at day camps. In addition, the organizational-level day camp regression model was not significant. However it should be noted that the model was nearly significant ($p < .056$), and the MET index was significant and negatively associated with day camper PA.
Conclusions

The results from this study indicated that 8-to-12-year-old children participated in adequate amounts of PA while attending summer camps. Resident campers exceeded the number of steps equivalent to 60 minutes of moderate-vigorous PA recommended by the USDHHS. Day campers took enough steps to meet or nearly meet the USDHHS guidelines depending upon the stepcount criterion used. Individual-level variables, especially gender and race, were strong correlates of PA in resident and day camps. Most females and minorities were less physically active than their counterparts during the camp week, which is a condition that often persists in neighborhood and school environments. Social-level variables were also significant correlates of resident and day camper PA. Peers were the greatest social influence of camper PA and highly active campers associated with highly active peer groups.

The camp physical environment and organizational controls were greater contributors to explaining PA in resident camps than in day camps. However, the number of PA facilities available was a strong correlate for both resident and day campers. The findings also suggested that using large walkable outdoor spaces may be more conducive to PA than indoor facilities. Organizational controls, including larger staffs and PA programming, were positively associated with PA in resident camps. This finding suggests that those variables were closely related with camp PA if implemented adequately. The
lack of significance for those variables in day camps may suggest that day camp organizations need to improve in those categories.

Summer camps provide a venue for children to maintain healthy levels of PA during the summer months. Previous research indicates that children may be more susceptible to physical inactivity and obesity during the summer, so attending camp may allow many children a chance to be active while also participating in other positive youth development opportunities (Carrel et al., 2007; von Hippel et al., 2007). Using the evidence from this study to structure the camp setting based upon individual, social, physical environmental, and organizational correlates could allow camp administrators to maximize the potential for camp PA. In addition, this research contributes to the burgeoning body of knowledge on children’s PA in built and natural environments.

Interpretation of Findings

Little to no research has been conducted on camp PA, but a base of research on youth PA in similar settings was used to help design this study. Children participated in equal or more PA in summer camps compared to other environments (e.g., schools). The findings from my study also confirmed that correlates of children’s PA in summer camps were similar to other environments (e.g., parks, schools). Individual characteristics and camp social, physical, and organizational environments all had associations with campers’ PA participation.
Baseline Levels of Camp PA Participation

A primary aim of this study was to determine levels of daily PA participation for youth summer campers. One camp week of pedometer monitoring at both day and resident camps provided evidence that resident campers took 19,699 steps per camp day and day campers took 11,916 steps. Camper stepcounts nearly met (i.e., day campers) or exceeded (i.e., resident campers) USDHHS guidelines for youth PA. The stepcount results suggested that a day of summer camp facilitates equal or more PA than a regular school day (Flohr et al., 2006; Laurson et al., 2008; Tudor-Locke, Pangrazi et al., 2004).

School and camp settings are similar because they are structured and designed to facilitate a range of outcomes for participants. Schools have a primary objective to educate children and PA can be part of school programming. However, many schools differ based upon state legislation and requirements for PA offerings. Story et al. (2006) suggested that mandates are necessary to improve the school environment for PA opportunities. The researchers determined that physical education programs, recess, and extracurricular programs are a necessary part of each school day to positively encourage PA participation. Camps have no legislative mandate to provide PA for children, but evidence suggested that intentionally planned opportunities during the camp day may increase children’s levels of PA. If PA is included as one of many desired outcomes of the camp experience, then camps may be able to successfully facilitate PA participation for most campers.
Intervention techniques were not used in this study. Camps offered their usual activities and made no modifications to increase PA participation. Therefore, the assumption that summer camps are a place where PA naturally occurs may be partially true. However, camper PA may vary depending upon a number of conditions. Campers at one of the camps (i.e., DEJ) took considerably fewer steps than campers at the seven other camps. This finding indicates if individual characteristics and social, physical environmental, and organizational factors were not adequately considered and planned for, camper PA may have been less likely to occur.

*Interpreting Individual-Level Correlates of Camp Physical Activity*

The first level of the social ecological framework is the individual (i.e., camper). To explore the relationship between individual-level characteristics and camp PA participation, data were collected on campers’ typical levels of PA (i.e., week prior to camp) and demographics including age, gender, race/ethnicity, and BMI.

*Pre-camp Physical Activity Participation*

Camper PA participation patterns for the week prior to camp were not consistent with PA during the camp week. This finding was contrary to previous researchers’ findings that PA is constant from setting to setting (e.g., Pate et al., 1996; Wickel et al., 2007). If campers’ PA patterns are not static between home and camp settings, this finding may mean that camps serve as an equalizing agent allowing all participants opportunities to be
physically active. However, further analyses of demographic characteristics indicated that traditional demographic-based PA disparities persisted in camps.

*Age*

Age has been an inconsistent correlate of PA participation during middle-late childhood (Caspersen et al., 2000; Heitzler et al., 2006; Sallis et al., 2000). For children at summer camps, results for the relationship between middle-late childhood age and PA participation were also inconclusive. Age was not significantly related to PA participation other than in the full resident camp model where 8-to-10-year-old children were more active than 11-to-12-year-old children. This significant finding was potentially a statistical aberration due to a small sample size in the variable-dense full camp models.

One study by Trost et al. (2002) suggested that children in middle-late childhood experience the greatest decreases in PA participation. The researchers noted that children in grades four through six were less active than they were during grades one through three. Although unclear, my study seemed to provide further evidence that PA participation, especially in the camp setting, did not vary through elementary school ages. More likely, PA participation for young people and potentially for campers may not diminish until the subsequent life stage of adolescence.

Research by Caspersen et al. (2000) found that the greatest erosion of PA across the lifespan occurs during the ages of 15 – 18. Kimm et al. (2002) uncovered similar results that nearly 44% of white and black girls did not participate in any leisure time PA by the
age of 17-years-old. A primary reason is that many correlates of PA change during adolescence including social support and other time demands (Sallis et al., 2000; van der Horst et al., 2007). Further study may be required to determine if there are differences between child and adolescent PA participation patterns in camps.

**Gender**

One of the most commonly acknowledged PA disparities is the difference between males and females of all ages (e.g., Jago, Anderson et al., 2005; Sallis, 2000; Sallis et al., 2000; Telford et al., 2005; Trost, Pate et al., 2002). My study reinforced previous research findings that young boys were more physically active than young girls. Gender was one of the strongest correlates for explaining PA in both resident and day camps. Some researchers have suggested that because studies consistently find that males are more active than females, a lower threshold of PA participation should be set for females (e.g., Rowlands & Eston, 2005; Tudor-Locke, Pangrazi et al., 2004; Vincent & Pangrazi, 2002b).

These sentiments about thresholds, however, are contrary to public health logic if preventing health risks is the primary goal of PA participation. Young girls should be held to the same standards as young boys for meeting the USDHHS guidelines of 60 minutes per day of moderate-vigorous PA. Addressing, not accepting, the disparity between these two groups should be a goal of all health-centered organizations. Corbin (2002) suggested that females and males would have similar PA patterns if they had equal opportunities for desirable activities. Many females, including young girls, frequently mention their activity
preferences differ from choices they are offered (e.g., Morgan et al., 2003; Vilhjalmsson & Kristjansdottir, 2003). Girls prefer to participate in lifestyle-type PA and commonly choose biking, walking, swimming, jogging, dance, rollerblading, and tennis (Telford et al., 2005). Data from my study indicated that some of the most common summer camp activities may match girls’ PA preferences, but camp programmers should specifically consider activities that girls prefer (refer back to Table 4.15).

Intentionally planning programs and activities for girls may increase the likelihood that they participate in higher levels of PA. Some researchers have suggested more PA participation could be achieved by offering female-specific programming where females could participate together without being compared to males (e.g., Autry, 2001; Little & Wilson, 2005; McDermott, 2004). Camp programmers could also request that all campers (including females) provide their favorite physical activities on sign-up sheets prior to camp. This information could allow the programmers to determine which activities girls prefer so they can schedule those activities into the camp day.

Race and Ethnicity

The results from my study also supported previous researchers who found that race/ethnicity was associated with PA participation (e.g., Gordon-Larsen et al., 2004; Kimm et al., 2002; Morgan et al., 2003, Sallis et al., 1993). Minorities in day (i.e., predominantly African-Americans) and resident (i.e., predominantly African-Americans and Native-American Indians) camps were less active than non-minorities (i.e., Caucasians). Race was
significant in bi-variate and regression tests at the individual-level, but not in the models including all day and resident camp-related variables.

One issue that differs for minorities in camps is access to PA participation. While at camp, children of all races and ethnicities have equal access to the facilities and programs. However, outside of camps they may not have the same opportunities. Researchers have suggested that a primary reason for minorities’ physical inactivity is the communities they live in. Because of racial stratification and lower socioeconomic status, some minorities may live in neighborhoods that are less conducive to PA participation (Caprio et al., 2008; Williams & Collins, 1995). For example, Powell et al. (2004) found that communities with more minorities had fewer PA settings than predominantly non-minority neighborhoods. Other researchers have suggested that these facility inequities also extend into the school environment (Richmond et al., 2006).

Since the camp setting offers equal opportunities for all racial and ethnic groups, the finding that minorities were less active than non-minorities suggested that other factors such as social groups, culture, and biology may be a source of this disparity. Moore (2001) suggested that hierarchies exist in summer camps and race may be an exclusionary characteristic for entry into non-minority-dominated peer groups. Minorities may be more likely to participate in PA if they have fellow campers who identify with them and allow entry into their peer circles. In this case, more diversity should be encouraged in camps. Caucasians make up the majority of campers at both day (70%) and resident camps (78%);
American Camp Association, 2008). Although these percentages are not higher than national minority rates, greater diversity in camps may benefit racially and ethnically diverse participants.

Culturally, many African-American and Mexican-American children may place less of an emphasis on health behaviors (e.g., PA) before they visit camps (Morgan et al., 2003; Lewis-Moss, Paschal, Redmond, Green, & Carmack, 2008). These feelings may continue during the camp week and are unlikely to be changed over a one week period. At the biological level, African-American females frequently mention that sweating from vigorous PA has undesirable effects on their hair (Harley, Odoms-Young, Beard, Katz, & Heaney, 2009). The summer heat during outdoor activities may keep this group from participating in high levels of PA. In addition, some minority groups (e.g., African-Americans, Mexican-Americans) are also more likely to be overweight which could increase their likelihood of being physically inactive (Delva, Johnston, & O’Malley, 2007).

**Body Mass Index**

Previous research on children’s BMI has yielded indeterminate results (e.g., Guerra et al., 2006; Rennie et al., 2005; Sallis et al., 2000; Thompson et al., 2009). For this study, BMI findings were also mixed. Bi-variate tests indicated that BMI was a correlate of all camp PA, but BMI was only significant in factor-level and full model regression for day camps. This finding was potentially associated with the visitation structure of resident versus day camps.
A major difference between resident and day camps is the amount of time spent in the camp setting. At day camps children return home each evening where they may re-immersing themselves in sedentary activities. Marshall, Biddle, Gorely, Cameron, and Murdey (2004) found that obese children spent more time with media-based devices (i.e., television, video games) than healthy weight children. Although the researchers concluded television and video games were not the sole reason for children’s obesity, their findings may help explain PA differences between overweight children in day and resident camps. Since resident campers do not have the opportunity to return to sedentary choices at home, they may be more likely to embrace and participate in the active opportunities offered to them.

A second difference between day and resident camps is attendance patterns. Because day camps are often selected for their low cost and close distance to the home, children are more likely to be repeat visitors for multiple weeks throughout the summer. Although long-lasting relationships are developed at resident camps they are usually limited to one to four weeks of camp participation. Peer groups may be more developed in day camps because of the frequency of repeat visitors. These peer groups could potentially be exclusionary for obese youth as children of healthy weight have indicated that they are less likely to associate with children who are obese and have lower perceptions of their social worth (Zeller et al., 2008). Obese children also frequently cite
social exclusion as one of the greatest deterrents to their PA participation (e.g., Janssen, Craig, Boyce, & Pickett, 2004; Sallis et al., 1999).

My study confirmed that individual PA disparities persisted within the camp environment. Pre-camp PA was not a significant correlate of camp PA, indicating that camp may equalize the potential for all campers to be physically active. However, males were more active than females, non-minorities were more active than minorities, and children who were overweight or at risk for being overweight were less active than normal weight children during camp. The relationship between middle-late childhood age and camp PA was inconsistent. Many of the potential reasons for individual disparities were further explained by other social ecological factors including the role of social groups in facilitating PA.

Interpreting Social-Level Correlates of Camp Physical Activity

Children’s social relationships have been inconsistently related with children’s PA (e.g., Beets et al., 2006; Duncan et al., 2005; Prochaska et al., 2002). However, a majority of this research has focused on the impact that parents’ PA has on their children’s PA. Other social relationships, with non-parental adults (e.g., teachers and counselors) and peers, have shown more consistent associations (e.g., Beets et al.; Frenn et al., 2005; McKenzie et al., 2006). To explore the role of social relationships in summer camps, the PA of campers was correlated with PA of camp staff (i.e., direct counselors) and self-identified peer groups.
Counselors

The multiple duties of a camp counselor include setting an example, leading campers to positive decisions, and facilitating an interest in camp activities (Meier & Mitchell, 1993). Implicit in these duties is a role in facilitating PA experiences for campers. However, this study found no relationship between counselor PA and camper PA in most tests. Only a day camp bi-variate test indicated that counselor PA was significantly correlated with camper PA.

There were some issues with the measurement of the role of counselors in facilitating camper PA. No data were collected on verbal support or tendencies of counselors to encourage camper PA. Previous research on the role of school teachers in facilitating children’s PA has suggested that their encouragement is one of the greatest influences of PA participation (Coleman et al., 2008; McKenzie et al., 2006). For my study, data were only collected on the link between the PA of the counselor and the PA of his or her assigned campers. An issue with this analysis was that resident camp counselors sometimes served as programming experts throughout the camp day. Therefore, they were only with their assigned campers during meal-time, programming breaks, and sleep. Physical activity may have differed based upon the different programs resident camp counselors and campers participated in, not a lack of leadership and role modeling from the counselors.
Day camp counselors are more likely to spend the entire day with their campers leading various activities and monitoring safety. Therefore, the finding in bi-variate testing that day camper PA was associated with counselor PA had greater validity than the equivalent resident camp test. This finding indicates that if counselors were active participants in PA with their campers, the campers may use them as a role model and do the same. However, most tests from this study indicated that counselor PA participation was not associated with camper PA participation. This finding supports previous researchers who have found that parents’ PA was not associated with children’s PA (e.g., Beets et al., 2006; Duncan et al., 2005; Sallis et al., 2000; Zabinski et al., 2003). Both parents and counselors may influence and discourage PA simultaneously, which could have a cancelling effect. For example, their presence and encouragement may influence PA, but their rules and regulations may inhibit PA. Further exploration of the relationship between counselors’ and campers’ PA should be conducted, but evidence suggested that peer groups were a stronger correlate of children’s PA participation in camp.

Peer Groups

Child and adolescent peer groups are a relatively consistent correlate of PA and they can either influence or discourage participation (e.g., Prochaska et al., 2002; Hohepa et al., 2007; Zabinski et al., 2003; Zeller et al., 2008). For my study, peer PA participation was the strongest social correlate of camper PA participation and was the primary social-level contributor to explaining camper PA variance. This finding supported results from
Voorhees et al. (2005) that active friend groups were associated with more PA for individuals belonging to those groups. The role of peer groups in facilitating PA is more pronounced during adolescence, but my study supports findings that peer groups formed during late childhood can have positive and negative relationships with individual’s PA (Sallis, Taylor, Dowda, Freedson, & Pate, 2002).

Some individual-level disparities in camps may have been related to peer groups. Evidence suggested that active children associated with other active children, but there may have been exclusionary characteristics to joining these active groups (e.g., non-minority race, obesity). Although peer groups may be formed around specific characteristics, summer camps offer an opportunity to develop new peer groups in an unfamiliar setting. Jago et al. (2009) suggested that children may have multiple peer groups and these groups could have different influences on PA participation. While peer groups may be previously established in schools or neighborhoods, camp participants are less likely to know each other from prior engagements. Therefore, children may be able to attempt to join different peer groups in camps compared to their everyday peer groups. This opportunity could be a positive gateway for learning about and participating in PA with peers.

Peers were the greatest social influence on campers’ PA. Evidence suggested that counselors’ PA was not likely related to campers’ PA, but there were some measurement issues with this analysis. In addition, other roles that counselors play in facilitating
campers’ PA should be examined in future research. The camp physical environment was
the next social ecological factor that was examined in relationship to camper PA.

*Interpreting Physical Environment-Level Correlates of Camp Physical Activity*

Researchers have found that physical environments including parks and schools
can have a positive impact on PA participation depending upon the size of the space and
availability of facilities (e.g., Cradock et al., 2007; Kaczynski & Henderson, 2007). The camp
physical environment was positively associated with day and resident camper PA in bi-
variate tests and factor-level regression, but only the resident camp physical environment
significantly contributed to a further explanation of camp PA variance. One of the largest
differences between day and resident camps was the physical environment, so the
interpretations are discussed separately.

*Day Camp Physical Environments*

Day camp administrators in my study planned the majority of their activities for
indoor facilities. These air conditioned facilities shielded children from heat exposure, but
may have limited PA opportunities. Although the day camp physical environment was not
a significant contributor to overall day camp PA participation, bi-variate and factor-level
regression tests indicated that the square footage of the indoor facilities and the number
of activity areas within (e.g., basketball courts, open gym space) were positively related
with camper PA.
These results supported previous findings that large indoor spaces with many multifunctional use areas were conducive to PA participation (e.g., Cradock et al., 2007; Kaczynski & Henderson, 2007; Limstrand & Rehrer, 2008). Facilities with more space and unique areas could allow campers to have more room to expend their energy as well as a broader array of opportunities to choose. If the facilities are limited without different types of courts and markings that can support a variety of programming, campers may be less likely to identify and select activities that will encourage them to be physically active.

A third day camp variable was the acreage of the land surrounding the indoor facilities. Each day camp was nested within a park or park-like natural environment that included outdoor playing fields and walking trails. However, the findings for acreage were inconsistent. The variable was significant in social-level regression, but not in bi-variate testing or the full day camp model. The conflicting findings are likely due to the infrequent use of outdoor facilities at the day camps. Although each day camp had outdoor facilities, only one of the camps used them daily. The use of outdoor facilities was most likely limited because of weather and supervision concerns, but allowing more time outdoors may have helped increase campers’ PA. Some researchers have supported this claim, finding that more time spent outdoors was related to higher levels of PA participation (e.g., Cleland et al., 2008; Sallis et al., 1993).
**Resident Camp Physical Environments**

The use of the resident camp physical environment differed from day camps. A majority of resident camp activities took place outdoors. Time spent indoors was typically limited to dining, rest, and sleep periods. Resident camps used strategies including tarp-covered shade shelters in open areas and encouraging water consumption to negotiate the hot summer weather. The two variables used to measure the resident camp physical environment, number of activity areas and walking distance between activity areas, were both significant in bi-variate and physical environment-level regression tests.

A positive correlation between the number of activity areas and PA supported findings from day camps and parks (e.g., Kaczynski & Henderson, 2007; Kaczynski et al., 2008; Potwarka et al., 2008). A variety of programming areas including swimming pools, lakes, sports fields, open spaces, high/low ropes courses, and walking trails was associated with more camper PA. Although many camps already provide multiple activity opportunities, the findings indicated that a greater variety of facilities increases the likelihood that campers will find PA opportunities.

The large outdoor physical environment of resident camps also increased PA through walking from place to place. Because resident camps are often expansive environments, campers often walk moderate distances from area to area (e.g., cabin to campfire circle, dining hall to sports fields). Therefore, longer distances between areas results in more walking-based PA for campers. This opportunity could be beneficial for
camps because campers may not perceive walking as PA. In addition, all campers participate equally because they must walk the same distance to get to their destination.

The physical environment was related to campers’ PA in both day and resident camps. The number of available activity areas and the size of the environment influenced camper PA in both indoor and outdoor environments. However, only resident camp PA significantly contributed to explaining camp PA variance in full regression models.

Interpreting Organizational-Level Correlates of Camp Physical Activity

The fifth research question for this study sought to analyze organizational controls that could be made by camp administrators prior to the start of camp. Two policies that can be modified are the amount of staffing available (i.e., camper-staff ratio) and the planned program schedule. The camper-staff ratio was not significant in any of the day camp statistical tests, but was significant in resident camp bi-variate and factor-level analyses. The program schedule was significant in all statistical tests for resident camps, but not significant beyond a negative association in the insignificant day camp organizational factor-level regression. Organizational-level variables significantly contributed to the total amount of variance explained in resident camp PA, but not for day camps.

Camper-Staff ratio

Camper-staff ratio equals the number of campers compared to the number of full-time staff available to assist their camp experience. No previous research was located
specifically on camper-staff ratio, but the American Camp Association (2009) suggests a higher camper-staff ratio is better for responding to a variety of needs. In day camps camper-staff ratio was not a significant correlate of PA participation, but it played a much greater role in resident camps. This finding both supported and refuted results from Sallis et al. (2001) that a greater number of teachers supervising students positively influenced school PA participation.

Because they spend their whole week at the campsite, resident campers are susceptible to a many issues including homesickness, illness, and injury (Thurber & Walton, 2007; Yard et al., 2007). For these reasons, resident camps maintain high camper-staff ratios (e.g., 7 campers to 1 counselor versus 16 campers to 1 counselor) to help address these issues. The individualized attention available to resident campers through high camper-staff ratios may positively influence their PA participation. A large staff with varied PA interests may have a greater ability to lead and support campers to select fulfilling PA opportunities. For further discussion on the social roles of staff for facilitating PA, please refer back to the section entitled Interpreting Social-level Correlates of Camp Physical Activity.

Camp Activity Programming

The second organizational variable explored in my study was camp programming. Program schedules with a high frequency of activities that facilitate moderate-vigorous PA produced greater amounts of PA participation in resident camps, but not in day camps.
These findings suggested that resident camps were offering ample periods for PA throughout the duration of the camp day. The findings supported results from a systematic review by Fairclough and Stratton (2006) who suggested that organizations (i.e., schools) that intentionally planned for PA fostered higher levels of PA.

Resident camp programs included nature-oriented experiences, arts, song, dance, and times for spiritual reflection. With this variety, only a limited amount of time could be allotted for PA. However, the resident camp schedules for the sample in this study adequately addressed PA opportunities while allowing rest during other less intense activities. A strength of the resident camp schedules was that they frequently included all-camp games where all of the participants congregated in an open area and played PA-type games. This strategy allowed all camp participants the opportunity to be physically active regardless of the other events they were assigned to or chose throughout the camp day. This finding supported previous research by Fairclough and Stratton (2005) who suggested large-scale games, mostly invasion-style, were the best opportunities for large groups of children to be physically active.

The day camp findings were less clear. The least active day camp (i.e., DEJ) had one of the most PA-dense programming schedules while the most active day camp had the least planned PA (refer back to Table 4.14). Therefore, programming too much PA may not be beneficial. While planning for a specific amount of PA seems to be effective in helping children meet the national guidelines of 60 minutes of PA per day, including too many
periods for camp PA may have diminishing effects as children tire physically and mentally during participation.

Both camper-staff ratios and the program schedule were related to camper PA in resident camps, but not in day camps. Programming intentional amounts of PA accompanied by other non-physical activities seemed to elicit high levels of PA while allowing time for other positive youth development opportunities. Having staff members that can recommend and assist participation in these activities may also facilitate higher levels of PA.

*Application of the Social Ecological Framework*

The variables selected for this study and the interpretations about their impact on camper PA were guided by the social ecological framework. This framework emphasizes the relationship between individuals and their contextual surroundings and the impact this combination can have on behaviors (McLaren & Hawe, 2005). The framework is nested and begins with the individual, who has further relationships with social, physical environmental, and organizational (e.g., policy, rules, institutional) surroundings (refer back to Figure 1.1). The social ecological framework was selected for this study because it allowed for a broad conceptualization of camper PA participation.

A strength of the social ecological framework was that it could be adapted for analyzing specific groups (i.e., campers) in their contextual setting (i.e., camps). For example, camp PA participation was determined by individual characteristics as well as the
social, physical environmental and organizational surroundings in the camp setting. The characteristics of the campers and the camp setting as individual elements contributed to understanding camp PA participation, but the combination of the two allowed for a bigger picture of the greatest barriers and facilitators.

An additional strength of the social ecological framework was the ordered structure. Dating back to Bronfenbrenner (1979), the factors have been ordered by proximity and responsiveness to the individual. For example, my study used multiple regression modeling to first determine the PA variance explained by individual characteristics, and then included the further contributions of social, physical environmental, and organizational factors. The framework was ordered by conditions and settings that individuals have the most influence over (i.e., themselves, then social, physical environmental, and organizational factors) and this classification was used to prioritize the order of analysis of camp PA-related variables.

Overall the social ecological framework was functional as a container for conceptually separated variables (i.e., factors) and examining multiple levels of influence on camper PA. The framework directed this research to determine correlates of camper PA and this information can be used to further refine camp PA-related variables into a specific model that can be used for guiding future research and assisting camp directors with PA implementation. However, there were a number of limitations with the social ecological framework and other aspects of this study.
Limitations

The major contribution of this study is that it established a baseline for PA in youth summer camps and identified significant correlates of camper PA participation. However, the study findings are subject to several limitations. In addition to weaknesses within the social ecological framework, other issues included: (a) the difficulty of doing camp-based research, (b) measurement of PA, (c) missing data, and (d) the data collection assistants.

Theoretical Framework Limitations

The social ecological framework was functional for guiding this research, but there were some limitations with its application in the study. Some researchers have commented that the emphasis on many variables and expansiveness of the social ecological framework makes it too complex and unmanageable (e.g., Giles-Corti et al., 2005; Green, Richard, and Potvin, 1996; Winett, 1985). The nested structure of the framework suggests that interaction effects between factors (i.e., levels) should be analyzed. One limitation with my study was that no interaction effects (e.g., gender by race by PA) were considered. However, the small sample size was not adequate for examining interactions. As an exploratory study, the focus was on determining main effects (i.e., correlates) of camp PA. The main effect-driven social ecological framework was purposeful, but excluding interactions may have limited its utility.

A further challenge related to the social ecological framework was the number of variables involved in the analysis. It was not feasible in this exploratory study to examine
every possibility that may have fit in the social ecological framework. Most, but not all potential correlates of camper PA were included in my study. One correlate of particular importance that was not analyzed was the psychological profile of campers. Psychological characteristics are typically part of the individual-level in the social ecological framework and may have helped further explain camper PA. The EOC-Q was designed to collect information about campers’ perceptions of PA and other psychological constructs, but poor instrument reliability resulted in the exclusion of that data.

In addition, the variables included in the social ecological framework must be determined before the study. Previous research is typically used to guide the variables selected for the framework. For my exploratory study, a priori variables for analyzing PA in camps were not available, which could have led to exclusion or addition of variables that may not have been the most pertinent. The variables included were selected from research on similar environments including neighborhoods, schools, and parks but the number of variables identified for each factor (i.e., individual, social, physical environmental, organizational) was unbalanced. The individual factor had five variables, while the social, physical environmental, and organizational factors only had two apiece. A larger number of variables did not place a greater emphasis on a factor, but more research on camps could have been helpful for determining other variables.
Conducting Research in Camps

One reason why a large amount of information on camps does not exist is the difficulty of collecting data in a camp setting. There are many constraints to collecting data in camps, including recruitment and administration of the study. For this study to take place, recruitment had to be secured from camp directors. Many directors were hesitant to participate in the study because the camp day was already dense with time commitments and parents expected camp staff to focus on programming for their children. The schedule left little time for campers to complete questionnaires or provide other information.

After access was allowed to recruit campers, parents had to provide consent for their children to participate in the study. Some parents or campers exercised their right to decline participation in the study, which further complicated the data collection. Only a select group of children at each camp participated in the study and they were not all in the same cabin or activity group. Campers were assigned to groups based upon age or group size and study participants were scattered throughout the camp environment at any given time during the camp day.

Because of the recruitment difficulties and the extensive data collection process, a small number of camps participated in this exploratory study. Although 277 campers participated in the study, they came from only eight camps. The small number camps especially limited the physical environment data. These data were further separated into
day and resident camps with only four camps from each category. Because of this limitation, the findings about the camp physical environment should be interpreted with caution.

The small number of camps also limited the generalizability of the study. The study was exploratory and the results cannot be generalized to all camps because of the non-random sample. The campers came from one southeastern state in the United States and their characteristics were not nationally representative. Baseline information was provided about each of the variables of study, but further research with larger camp and camper samples would be necessary to evaluate and generalize the results for campers’ PA.

Physical Activity Measurement Issues

Another limitation was the measurement of the dependent variable, PA. Some of the instruments used had restricted capabilities (e.g., pedometers) or had suspect reliability (e.g., CPAQ-C). Pedometers were selected as the objective instrument for collecting camper PA data and there were some limitations with these devices. Pedometers can only collect information on ambulatory movement (i.e., stepcount) and do not measure upper body movement or intensity of participation. Therefore, the PA unit stepcount was generic and could not be classified as sedentary, moderate, or vigorous.

A further limitation of pedometers was that they could not be submerged in water. A moderate amount of camp programming, especially in resident camps, occurred in
swimming pools and lakes so this information could not be captured by the pedometer. To adjust for missing information, stepcounts were added for non-ambulatory activities including swimming and boating. The INT and SIM methods developed by Miller et al. (2006) were used with slight modifications to estimate and add non-ambulatory activity into the total stepcount of the campers. Campers indicated their intensity of participation on a scale of one to three for activities where they did not wear the pedometer. This addition helped capture a greater amount of camp PA, but may have been less accurate because of the element of self-report.

Self-reports of PA are less precise than more objective measurements (i.e., pedometers, accelerometers). In addition, children are especially prone to estimation errors when self-reporting their daily or weekly PA (Matthews, 2002; Sirard & Pate, 2001). One variable of study, pre-camp PA, was measured solely by the self-reported CPAQ-C. This instrument was used to determine campers’ PA for the week prior to camp. The use of the CPAQ-C lowered the reliability for comparing pre-camp PA to camp PA for two reasons: (a) the use of a self-report instrument and (b) the inaccuracy of comparing a self-report measure (i.e., pre-camp) to a more objective pedometer measurement (i.e., camp PA). Pre-camp pedometer data could not be collected from participants because most did not provide consent for participating in the study until they arrived at the camp site. However, a consistent measure of pre-camp PA and camp PA would have been more reliable for determining if campers participate in more or less PA while at camp.
Missing Data

Pedometers were also a contributor to an additional limitation of this study, missing data. Missing data occurred in some form for most of the variables of study. Physical activity data were missing because of lost, reset, and improperly worn pedometers. Programming schedule data were lost due to incomplete counselor reports. Body Mass Index data were lost as some participants declined to be measured for weight. Other data including survey information was missing from campers who were not available to provide or complete the information during administration periods.

The greatest impact of the missing data was a reduced sample size for many of the statistical tests conducted. Although 123 resident campers and 154 day campers participated in the study, only 79 resident campers and 65 day campers provided data for all variables of study. Cases were deleted listwise in analyses if they did not have the necessary data points. To control for missing data, some data were replaced using estimation methods.

Only two of the variables with missing data were addressed with value replacement: stepcount and programming schedule. It was imperative that stepcount (PA) data were replaced because stepcount was the dependent variable measured against all of the independent variables in the study. These data were replaced using the expectation-maximization approach. Although this method uses other variables in the dataset to estimate and replace missing values, it could have centralized the stepcount
data. Centralizing the data would have led to a decreased chance of significant differences between the dependent and independent variables. To safeguard against this possibility, data were analyzed with and without replacement and there were no substantive differences.

Programming schedule data also were replaced. In many cases, camper activities were missing in program schedules for one or more hours of the camp day. To avoid losing entire days of program schedule data, replacement values were used. An arbitrary value, 3.01 METs, was used based upon the estimation if daily camp activities were combined; the result would be low‐moderate intensity (Pate et al., 1995). This data replacement could have resulted in some inaccurate depictions of the camp programming schedules. Overall, missing data and replaced data may have had some effect on the conclusions about camp PA.

*Data Collection Assistants*

Another issue that may have been related to missing data was the staff used for data collection. Because campers were spread throughout camps in many groups and cabins, many data assistants were necessary. Counselors were selected as the primary data collectors because they had the closest contact with campers. If student or paid research assistants would have been used, a large number would have been necessary. Counselors were not paid a stipend for their assistance, but training and administrative support was used to gain their investment in the study.
However, counselors only participated in a brief training session prior to the camp week and were asked to help with intensive data collection. The counselors also served as monitors for the study, assuring that campers wore and removed their pedometers during the proper times throughout the camp day. Some counselors were very committed, while others had to be persuaded to complete their tasks each evening. Therefore, the data collected by the counselors, especially program data, were highly variable. Data variability may have occurred with trained assistants as well, but it may have been a higher degree with the counselors because of the lack of incentive and their relative research inexperience. A larger research staff may have been able to collect a more complete and reliable dataset for this study.

The overall limitations for this study were the application of the theoretical framework, the difficulty of conducting research in camps, measurement of PA, missing data, and the data collection assistants. The combination of these limitations may have influenced the findings, but the most accurate and available methods were used to collect and analyze children’s PA in the camp setting. Further, this study was exploratory in nature and part of the process was to ascertain some of the issues that might be addressed for camp management as well as future studies.

Management Implications

Although this study provided some evidence that camps are places where PA occurs naturally, identifying PA as an intended outcome for a diverse body of camp
participants and making social, physical environmental, and organizational adjustments to maximize the potential for PA could be a priority for camp managers. An outcome- or benefits-based approach (Driver, Brown, & Peterson, 1991) could be used to identify, create, and evaluate different strategies for facilitating PA in the camp environment.

Research by the American Camp Association (2007) suggests that some, but not all, camp staffs have begun to implement strategies for camp-based PA. A sample of 334 camp directors indicated they had used the following strategies to address PA in their camps: (a) increased frequency of program options incorporating vigorous PA (32%), (b) required participation in programs that incorporate vigorous PA (15%), (c) decreased the frequency of any minimally active program options (5%), (d) provided instruction to campers about the value of PA (17%), and (e) encouraged staff to set a better example by being more physically active (43%). However, 41% responded they had used no new strategies to address PA in their camps.

The next step for researchers and camp administrators is to evaluate existing or recently designed strategies for implementing PA in camps. My study identified that individual characteristics, as well as social, physical environmental, and organizational surroundings can all be related to PA in camps. Individual characteristics and social relationships were significantly related to camper PA in all camps, while physical environmental and organizational environments differed between resident and day camps. For all camp types, administrators could consider that:
• Campers’ PA dispositions and preferences vary based upon their individual characteristics. Females, minorities, and overweight children are less likely to be active than their counterparts. Soliciting and including activities that cater to the interests of each group may encourage them to be more physically active during the camp week.

• Age-specific programming (e.g., limiting any activity to a certain age group) may not have an effect on camper PA, but camp directors might consider that all age groups have equal opportunities for PA.

• Some individual differences, especially for minorities and children with high BMI’s, may be related to social groups. Highly active peer groups may coalesce around specific characteristics (e.g., white race, normal BMI). Assigning diverse groups with small numbers may circumvent this issue.

• Mixed evidence suggests that positive PA modeling and direction from counselors may be associated with campers’ PA. To ensure that the staff has the capabilities to facilitate campers’ PA, information about PA could be provided at camp training sessions prior to the start of the camp season. Trained PA specialists or PA-related literature could be used to introduce counselors and other staff members to techniques and suggestions for directing campers toward preferable and enjoyable PA opportunities.
• Surplus funds should be used to purchase new equipment or improve facilities that may influence PA participation. A spectrum of opportunities may increase the likelihood that campers identify a physical activity they attach to and enjoy.

• If outdoor facilities are available, they should be used. Children have more space and potentially more opportunities for PA when they are outdoors. Heat is an issue during the summer months, but shade areas and water consumption can be used as buoys for time spent outside.

• The camp natural environment can be used for programs that mix PA and other positive outcomes (e.g., nature identification, orienteering). Trail walks and other nature experience activities can be designed to include moderate PA through walking.

• During the camp day there is ample time to program for multiple outcomes. Using a benefit-based or outcome-based approach, desired camp outcomes should be pre-determined and programs should be designed with the intention of achieving the intended outcomes. Physical activity is just one outcome that can occur in summer camps and offering a constant stream of PA programming may result in diminished returns.

• Providing activities where all campers can participate simultaneously may have the most influence on overall camper PA. Ainsworth et al.’s (2000) Compendium of Physical Activities can be used to select activities that require high levels of PA
intensity for large groups. Programmers should consider activities where all
participants are moving (e.g., soccer, dodgeball, lacrosse) versus those with long
periods of inactivity (e.g., baseball, kickball).

Overall, camps are a place where children can participate in adequate amounts of
PA while learning new skills and activities. The unique camp physical environment
including lakes, swimming pools, climbing walls, gymnasiums, sport fields, and natural
surroundings should be used to stimulate camper PA. Strategies and programming can be
designed to limit inhibitors to camp PA such as typical individual disparities (e.g., gender,
race, BMI) and exclusory social groups. Continuously evaluating camp PA strategies may
result in identifying the best opportunities for PA encouragement. The positive
opportunities for PA in camps can then be communicated to the public and used in
advocacy for recommending camps as places for children to visit and be active during the
summer.

Future Research

Researchers should continue to explore the relationship between youth PA and
settings. Children’s PA has been examined in neighborhoods, schools, and parks, but little
information exists about camps. Millions of young people go to camp each year and the
camp setting could have a profound impact on children’s PA during the summer. As the PA
literature base develops, more theory-driven research is needed to determine salient
correlates of youth PA in particular settings including summer camps. Once these
correlates are determined, directors of camps and other youth-serving organizations will be able to focus on providing opportunities that will influence the greatest amount of PA for all participants.

Adapted and refined frameworks and models will be necessary to continue this line of research. The social ecological framework used for this study was effective for broadly analyzing variables that may be associated with camp PA, but it did not examine the interaction between variables and their joint relationship with PA (e.g., the relationship between gender and peer groups and camp PA). Further research on PA in camps using the social ecological framework will allow researchers to identify a priori variables, create more specific models, and explore camp PA more thoroughly.

For micro-level analyses, theories that are less general than the social ecological model may be useful. For example, Ajzen’s Theory of Planned Behavior (1991) could be used to examine children’s intentions and actions when participating in PA inside and outside of camps. Activities and social circles in the camp environment differ, so children may have different feelings toward PA and potentially modify their behaviors. Psychological variables were not examined in my study and they may contribute a further understanding of participation in camp PA.

Attitude toward PA and PA participation prior to and following camp is a topic that requires further research. Although my study collected data about pre-camp PA and PA during camp, no information was collected about campers following the camp week.
During the camp week children have the opportunity to learn and participate in a wide array of new activities. Future research could examine if the new skills acquired at camp have any impact on PA participation following the camp experience. My study indicated that there was no relationship between pre-camp PA and PA during camp. However, issues existed with comparing a self-report of PA (i.e., pre-camp measure; CPAQ-C) to an objective PA measure (i.e., during camp measure; pedometer). A longitudinal study could be designed to examine PA trends of children who participate in summer camps. Pre-camp, during camp, and post-camp data all collected using the same instrument (e.g., pedometers) could be used to determine if skills and activities learned at camp were continued and used for greater levels of PA following the camp week.

In addition, a study using a random sample should be conducted to establish a baseline for camp PA levels. My study provided preliminary information about PA in camps, but the results were not generalizable. An added benefit of a larger sample of camps would be that researchers could use newer statistical procedures such as hierarchical linear modeling to compare camps to one another. This procedure would allow researchers to compare the data at multiple levels. For example, camper to camper data could be compared as they were in this study, but camp to camp data could also be compared. Therefore it could be determined if camps were using their facilities to influence PA effectively in comparison to similar camps.
Research opportunities also exist for each of the four factors used in my study. At the individual level, traditional disparities in PA (e.g., males are more active than females) persisted in the camp environment. This issue should be further analyzed to determine if: (a) these differences are already established prior to camp and one week is not enough to change them, or (b) camp administrators are not doing enough to eradicate disparities.

Camps are a unique environment because they offer equal opportunities. In most cases campers are not denied access to equal participation privileges and they can select their activities. Ideally, if children have optimal choices for PA, disparities should not exist between groups. However, this assumption did not seem to be true based on my study and further research in camps can be used to determine if offering choices preferred by disparate user groups is a way to “close the gap” in PA participation.

At the social-level, my study identified that peer relationships with active individuals were a positive influence on PA participation. This finding has implications that stretch beyond the camp environment. Researchers might design experiments to determine if children select peer groups because they are active or are more likely to consequently become active because of their peer group. Previous research suggests that some exclusory characteristics of peer groups including race and BMI may exist and further research should also be conducted to determine common criterion for acceptance into active peer groups.
The physical environmental factor had the least data for this study, but it may be one of the most powerful correlates of children’s PA. Results indicated that more facilities equal more PA, but future research should determine which types of facilities are most conducive to PA in camps and other youth settings. Most camps cannot afford to frequently add or improve facilities, so identifying facilities that yield the greatest amounts of PA would help administrators determine which improvements and purchases to make. Another physical environmental research opportunity is examining the relationship between time spent outdoors and PA. Resident camp physical environments were more closely associated with camper PA than day camp environments. This difference could have been due to the amount of time spent outdoors. Perhaps outdoor environments can offer more PA opportunities than indoor environments.

Finally, future research should focus on camp programming and recreation programming in general. Camp programming offers an opportunity for intervention studies because camps may be willing to experiment with different program schedules to determine how to facilitate PA in the most positive manner during the camp week. In these intervention studies researchers could attempt to determine an equilibrium point for how much PA can be included in a programming session before participants begin to become tired and need to rest. In addition, researchers could use a qualitative approach to analyze programming schedules and information to identify activities where many
children can be active simultaneously. This would allow programmers to use large-group activities to mitigate issues such as non-participation and afternoon heat.

With the limited knowledge that exists about PA in youth camps, many opportunities for future research exist. Replicating this study or examining some of the independent variables in depth could be used to further develop social ecological frameworks for the camp setting. If researchers determine that the camp environment is a setting that influences PA, it may be a positive venue for children to visit and experience during the summer.

Chapter Five Summary

This study identified that camps are a place where children can participate in substantial amounts of PA and meet nationally recommended PA standards. Many correlates of camp PA were similar to correlates in other settings (e.g., parks, schools). Traditional individual disparities (e.g., males are more active than females) persisted in camps, but the unique social, physical, and organizational environment provided by camps may be used to circumvent these issues. The interpretations in this study should be considered with caution as limitations were evident. However, the exploration raised new questions. To further assess the evidence provided by this study and increase the body of knowledge on camp PA, additional research should be conducted.
REFERENCES


Appendix A – North Carolina State University IRB Approval

North Carolina State University is a land-grant university and a constituent institution of The University of North Carolina

NC STATE UNIVERSITY

Sponsored Programs and Regulatory Compliance
Campus Box 7514
1 Lesar Hall
Raleigh, NC 27695-7514
919.515.7200
919.515.7721 (fax)

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

Date: May 25, 2007

Project Title: The Role of the Environment and Programming in Understanding Children’s Physical Activity in Camp

IRB#: 232-07-5

Dear Mr. Hickerson;

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 from its date of review. This protocol expires on May 25, 2008, 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.
2. The IRB must be notified of any changes that are made to this study, and must approve those changes prior to their implementation.
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 a copy of this letter to your faculty sponsor. Thank you.

Sincerely,

Debra Paxton
NCSU IRB
Appendix B

2007 Physical Activity in Camps Research Study

Study Purpose

The purpose of this study is to explore what relationships exist between the physical activity of campers and staff during a typical camp session in relation to camp programming and facility design. Data will be collected using pedometers, questionnaires, and recording sheets. (Note: To our knowledge, camps have never been studied in this manner).

Benefits to the Camp

- Each participant will be rewarded with a new pedometer at the end of the data recorded camp session.
- Camps will be provided feedback about the data from their campers/staff related to the camp study objectives.
- Camps will have an opportunity to make a contribution to the body of knowledge about childhood obesity and healthy living.

Study Group Participants

Day and resident camps in North Carolina (primarily the central region) will be invited to participate for one session during June-August 2007. Campers targeted will be boys and girls aged 9-12 years. Approximately 300 campers and 40 staff will encompass the entire sample for this preliminary study.

Each camp will be invited to have about 40 campers and 4-5 staff members involved. Study data will include:
- The recording of pedometer readings for each camper and staff member at the end of each camp day.
- The recording of camp activities participated in (programming data) for each camper and staff member at the end of each camp day.
- The completion of two short questionnaires. One will be completed at the beginning of camp to determine regular activities. A second questionnaire will be completed at the end of camp concerning demographics and feelings about physical activity.
• Measurement of height and weight.
• The collection of observational data (facilities checklist) at each camp sometime during the summer.

Data will be collected during one camp session at each camp during June-August 2007.

**What the Researchers Need from Each Camp (may differ slightly depending on camp setting)**

Access to addresses for appropriately aged campers for one session in June-August 2007. The researchers will work with the camp to obtain informed consent from each camper and his/her parent or guardian.

One individual in each cabin group or one camp staff member who will be responsible for all cabin groups involved during the week who will spend 15 minutes in training (to occur the week prior to data collection) and then assist with data collection in the morning (pass out pedometers) and in the evening (record pedometer data and verify program activities of each camper). This individual will also assist with the distribution of the questionnaires at the beginning and end of camp.

Opportunity to observe the camp for a short period of time (camp may or may not be in session) to collect data about the design features and environmental attributes of the camp.

**Questions?**

Contact Benjamin Hickerson at 919.323.6879 (c) or 919.513.0353 (w) or bdhicker@ncsu.edu
Appendix C – Informed Consent Letter to Parents

Dear Parent or Guardian,

For the week of July 16-20 while your child is attending camp at the A.E. Finley YMCA we will be conducting a research project about the physical activity of children in camps. We write to you asking for your permission (in the form of a signature on the attached consent letter) for your child to participate in this study which will include wearing a small box that measures steps called a pedometer to measure physical activity, answering short physical activity related questions, collecting height and weight, and collecting activity participation data. This data collection will not alter your child’s camp participation in any way. Please read the attached informed consent letter for more information about the components of the study.

Obesity and physical inactivity have been identified as problems that can cause future health issues including heart conditions, weakened immune systems, and the onset of Type II diabetes. Research from the Centers for Disease Control has indicated that only 35.8% of America’s youth are reaching physical activity goals instated to reduce illnesses and retain health (60 minutes of physical activity per day, 5 days per week). To understand the role of camps in preventing these health issues, we ask you to please sign and date the attached informed consent form and keep a copy for yourself. Please remember that participation in this study is optional and can be discontinued at any time.

Please return the signed inform consent letter with your child to camp before Monday of next week.

Thank you for your camp participation,

Benjamin D. Hickerson
Doctoral Student
Parks, Recreation, and Tourism Management

Forrest Perry
Camp Director

College of Natural Resources
Campus Box 8004
Raleigh, NC 27695-8045
919.515.3276
919.515.3687 (fax)
The Role of the Environment and Programming in Understanding Children’s Physical Activity in Camps

Benjamin Hickerson

Your child is being asked to participate in a research study. The purpose of this study is to explore the relationship between organized summer camp environments for children and their levels of physical activity at camp.

INFORMATION
If you agree for your child to participate in this study, he or she will be asked to
- Wear a device that measures steps called a pedometer during his or her waking hours while at camp
- Report daily activity participation
- Be measured and weighed (This will be done one camper at a time with only the camper and the staff member making the measurements present.)
- Complete entry and exit questionnaires concerning perceptions of physical activity, attitudes about wearing a pedometer, and demographics

Participation in this study will require approximately 33 to 62 minutes.

RISKS
There are no foreseeable risks associated with this study.

BENEFITS
Camp programmers will benefit from this research. Data will be shared with camps concerning levels of physical activity in camps, the relationship of programming and physical activity, and the influence of the environment on physical activity. These results will allow camp programmers to plan accordingly for physical activity and fun!

CONFIDENTIALITY

The information in the study records will be kept strictly confidential. Data will be stored securely in the office of Benjamin Hickerson under lock and key. Data will be collected using a coding scheme of the camper’s initials plus their birthday. This or any other
identifiers of personal data will be destroyed once the data is entered into a software program. No reference will be made in oral or written reports which could link you or your child to the study.

COMPENSATION
For participating in this study your child will be presented with a new, high-quality pedometer at the end of the camp period. If he or she withdraws from the study prior to its completion, he or she will still receive the pedometer. This pedometer can then be used by the child or any others interested!

CONTACT
If you have questions at any time about the study or the procedures, you may contact the researcher, Benjamin Hickerson, at Campus Box 8004, Biltmore Hall, North Carolina State University, or (919) 513-0353. If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. David Kaber, Chair of the NCSU IRB for the Use of Human Subjects in Research Committee, Box 7514, NCSU Campus (919/513-3086) 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 him or her to participate without penalty. If you decide for your child to participate, he or she may withdraw from the study at any time without penalty and without loss of benefits to which he or she is otherwise entitled. If your child withdraws from the study before data collection is completed the data can 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 we may withdraw at any time.”

Participant name(s) __________________________________________________________

Participant signature ________________________________ Date ___________

Parent or Guardian signature ______________________________ Date ___________
Appendix D – Informed Consent Form for Counselors

North Carolina State University
INFORMED CONSENT FORM for RESEARCH (for counselors)

The Role of the Environment and Programming in Understanding Children’s Physical Activity in Camps

Benjamin Hickerson

You are being asked to participate in a research study. The purpose of this study is to explore the relationship between organized summer camp environments for children and their levels of physical activity at camp.

INFORMATION

If you agree to participate in this study, you will be asked to

- Wear a device that measures steps called a pedometer during your waking hours while at camp
- Report daily activity participation
- Be measured and weighed (This will be done one person at a time)
- Complete entry and exit questionnaires concerning perceptions of physical activity, attitudes about wearing a pedometer, and demographics

Participation in this study will require approximately 33 to 62 minutes.

RISKS

There are no foreseeable risks associated with this study.

BENEFITS

Camp programmers will benefit from this research. Data will be shared with camps concerning levels of physical activity in camps, the relationship of programming and physical activity, and the influence of the environment on physical activity. These results will allow camp programmers to plan accordingly for physical activity and fun!

CONFIDENTIALITY

The information in the study records will be kept strictly confidential. Data will be stored securely in the office of Benjamin Hickerson under lock and key. Data will be collected
using a coding scheme of your initials plus your birthday. This or any other identifiers of personal data will be destroyed once the data is entered into a software program. No reference will be made in oral or written reports which could link you to the study.

COMPENSATION
For participating in this study you will be presented with a new, high-quality pedometer at the end of the camp period. If you withdraw from the study prior to its completion, you will still receive the pedometer.

CONTACT
If you have questions at any time about the study or the procedures, you may contact the researcher, Benjamin Hickerson, at Campus Box 8004, Biltmore Hall, North Carolina State University, or (919) 513-0353. If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. David Kaber, Chair of the NCSU IRB for the Use of Human Subjects in Research Committee, Box 7514, NCSU Campus (919/513-3086) or Mr. Matthew Ronning, Assistant Vice Chancellor, Research Administration, Box 7514, NCSU Campus (919/513-2148).

PARTICIPATION
Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to you are otherwise entitled. If you withdraw from the study before data collection is completed the data can 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 to participate in this study with the understanding that I may withdraw at any time.”

Participant name _____________________________________________________________

Signature _____________________________ Date ____________
Appendix E

Physical Activity in Camps Study Protocol

Equipment and Instruments

*Specific numbers will differ depending upon participation numbers (30 - 40)

• New Lifestyles Digi-Walker SW200 pedometer (for data collection; 1 per)
• New Lifestyles At-80 pedometer (for compensation; 1 per)
• Camp Physical Activity Questionnaire (Modified PAQ-C; 1 per)
• End of Camp Physical Activity Questionnaire, 1 per
• Activity Participation Sheet, 1 per
• Healthometer beam scale (height/weight)
• Clipboard for data entry

Participants

This study is only seeking 9-12 year olds for participation. The number of participants will be limited to 40, with a minimum of 30. Participation numbers will be determined by enrollment numbers and securing informed consent (refer to the following section). If requested, campers not participating in the study will be allowed to wear pedometers (up to 30 additional). However, these participants will not need to report any data.

Informed Consent

For campers to participate in the study, a letter of informed consent must be signed by their parent or guardian. This letter describes the details and procedures of the study (attached). This informed consent form must be signed before the camper can participate. Options for gaining informed consent include mailing forms with return envelopes (postage will be covered), getting signatures upon parental arrival to camp, and getting signatures at open house or visitation days.

For the campers who have been given permission to participate from their parents, a letter of assent must also be read to the child (attached). This letter can be read to each participant before they are given their pedometer to confirm their interest in participating in the study.
Data Collection

*Note - Some techniques may differ between camps, especially resident and day. For example, pedometer pickup times will differ between day and resident camps.

Once the participants are secured different types of data will be collected from them.

Each participant will:

- Wear a device that measures steps called a pedometer during his or her waking hours while at camp
- Report daily activity participation to a data collection assistant (researcher/counselor/nurse) at the end of the day
- Be measured and weighed by a data collection assistant
- Complete entry (1) and exit (1) questionnaires asking about their feelings about physical activity, attitudes about wearing a pedometer, and demographics

Throughout the data collection, participants will be identified only by a code that consists of their initials plus their birthday. For example, my code would be BDH05131981. This code will be placed on all forms (activity sheet, questionnaires, height/weight) so that an individual’s data can all be grouped.

The Pedometer

The pedometer used for data collection in this study is a New Lifestyles Digi-Walker SW 200. This pedometer does not need to be calibrated for participants stride length, meaning that the participant can use the pedometer directly out of the box.

Each pedometer will be numbered and a specific pedometer will be assigned to each participant. A data sheet will be included where the pedometer number that corresponds with each participant can be recorded. Participants can be asked to remember their number, but this way there are records.

Each morning the pedometer will be distributed to the participants. The data collection assistant should also make sure that the participants wear the pedometer correctly. According to New Lifestyles, correct pedometer placement is on the hip over the knee on the right leg. The pedometer should be level to the ground (straight) and not tilted up or downward. The attached safety strap (gator clip) should also be attached to reduce the risk of pedometer loss.
At the end of each evening the pedometer will be collected from the participants. Pedometers should be stored in a safe location, where they can be easily redistributed to the participants. Additionally at the end of each evening, the steps from the pedometer will be recorded on the Activity Sheet.

In the case that a participant forgets to put the pedometer on before or after an activity, this should be noted on the Activity Sheet. The camper should indicate the exact time that the pedometer was not on and for how many hours the pedometer was not in use.

The Activity Sheet

At the end of each camp day, the programming schedule for each camper will be collected. This will include all of the activities that the camper participated in throughout the day. During each ½ hour period for the day, the data collection assistant will ask the camper what activity he or she participated in. In some instances, this information will be standardized and pre-filled on the activity sheets. However, periods including free time and activities that cannot be recorded by the pedometer must still be collected. If the camper has a choice in which activity they will participate, this must be recorded. Since this decision will differ from the programming of other participants, it is imperative that it is included in the data for that specific camper. If the activity is one that the pedometer could not be used (swimming, boating, horseback riding) participants should be asked to identify their participation on a 3-point scale:

1 - I spent most of the time swimming/rowing/riding
2 - I spent some of the time swimming/rowing/riding, and some of the time sitting/resting
3 - I spent most of the time sitting/resting instead of swimming/rowing/riding

For this data collection, the participants will need to report to a data collection assistant (researcher, counselor, nurse). It would be ideal that the participants are assigned to groups with a counselor to collect the data, this way travel to report would not be necessary. Up to five data collection assistants will be recruited. The activity data may then be recorded before lights out or at the end of the day by the counselor or data collection assistant.

Some of the activities may span multiple hours in which space can be left blank on the sheet until the next activity time period.
Questionnaires

During the camp period, the participants will complete two questionnaires. These questionnaires should be read to the campers by a research assistant in order to help the campers keep a steady pace. With this method, the campers will all be done at approximately the same time. The first questionnaire, the Camp Physical Activity Questionnaire (Modified PAQ-C), is to be completed at the beginning of camp. This questionnaire should be given to the participants as a group as soon as possible on the first day of the camp week. The purpose of this questionnaire is to determine differences in home activities versus camp activities, so it is important that the entry questionnaire is taken as soon as possible to capture their week before camp. Guidelines for the questionnaire are included at the top, but the campers should be reminded that it is related to their previous seven days. If participants have questions or need help, they can be answered.

The participants will also complete the End of Camp Physical Activity Questionnaire. This questionnaire should be completed as close to the end of camp as possible. Resident camps may complete this questionnaire on the second to last day of camp to avoid problems with camper pickup. This questionnaire asks about feelings about physical activity and the pedometer.

Height and Weight

At some point during the camp period the height and weight of the campers must be recorded. This will be used to obtain the Body Mass Index (BMI; a predictor of obesity) for the campers. This data can be collected at any point during camp because change over the camp period is not being measured. This data should be collected one by one, or in small groups. It is recommended that during a specific activity that it would be convenient for the participants to be measured, a small number could be done each day. For example, at lunch on each of the 5-7 days, a small group of participants (6-7) or one at a time (6-7) could be measured quickly. This information should be recorded on a single data sheet using the participant codes.

Counselors

Selected counselors (5 - 8 participants) will also be recruited to participate in this study. It is preferred that the participants for the study could be placed in groups that have one counselor to oversee them. These counselors could also be participants in the study, wearing pedometers and reporting the activities that they led and participated in.
Although campers will not always be with one specific counselor, physical activity levels of the counselors could be attributed back to the counselors in the form of role modeling. Therefore, the role of the counselors would not only be to help with the data collection, but also to collect data on themselves.

Data Collection Assistant Training

Each data collection assistant will be required to participate in a short training session prior to the start of camp. This training session will last approximately 15 minutes and will consist of information on how to monitor participants and carry out the data collection detailed in this protocol correctly. Multiple data collection assistants are welcome, but counselors who have groups of participants are preferred.

Any questions or problems can be reported to Benjamin Hickerson at (919) 513-0353 (W) or (919) 323-6879 (C) at any time.

First Day

1. Determine the campers who have informed consent forms from parents.
2. Determine staff members who will participate in the study and those who will assist in data collection for the study. Optimally, those that collect the data and participate in the study will be direct counselors or cabin leaders of groups of campers who are participating in the study.
3. A short training session will be conducted with counselors participating as data collectors (~15 minutes). This may be done before the start of camp.
4. **Distribute and have the campers complete the first day Physical Activity Questionnaire (Modified PAQ-C).**
5. Attached to this questionnaire will be the statement of assent. **Make sure that campers have checked either yes or no for participation.**
6. After the survey assign pedometer numbers to participating campers and record these numbers on the pedometer assignment sheet. Show the campers correct pedometer placement (on the right hip, above the knee, parallel to the ground).
7. **At the end of the day, collect the pedometers from the campers. Record their activity data on the Activity Participation Sheet.** Some of this information may be pre-filled, but be sure to have activity data for each time included on the sheet for each participant.
During the week

1. Redistribute the pedometers to the campers in the morning. Make sure that the pedometer number corresponds with the participant’s number on the sheet.
2. For counselors who are with the campers during the day, make periodic checks for pedometer placement (right hip, above the knee, parallel to the ground).
3. Remind campers to replace pedometers after activities where they are not used (e.g., swimming).
4. At the end of the day, collect the pedometers from the campers. Record their activity data on the Activity Participation Sheet. Some of this information may be pre-filled, but be sure to have activity data for each time included on the sheet for each participant.
5. At a decided point during the week, record the height and weight of each of the participants. This data should be recorded one at a time or in small groups, not as one large group.

Final Day

1. Redistribute the pedometers to the campers in the morning. Make sure that the pedometer number corresponds with the participant’s number on the sheet.
2. For counselors who are with the campers during the day, make periodic checks for pedometer placement (right hip, above the knee, parallel to the ground).
3. Remind campers to replace pedometers after activities where they are not used (e.g., swimming).
4. Distribute and have the campers complete the End of Camp Physical Activity Questionnaire (different than the original questionnaire).
5. At the end of the day, collect the pedometers from the campers. Record their activity data on the Activity Participation Sheet. Some of this information may be pre-filled, but be sure to have activity data for each time included on the sheet for each participant.
6. Award each of the participants with one of the new New Lifestyles At-80 pedometers. Make sure to collect the New Lifestyles Digi-Walker SW200 pedometers and save them.
7. Thank the participants!
Appendix F – Counselor Quick Reference Sheet

NC State Pedometer Study
Information Sheet

What you need to record:
• Write the daily schedule for the group of campers on one activity log sheet. For choice activities that differ among campers, note variations on individual sheets.
  1. If certain components of the schedule are at a consistent time over the week (such as breakfast or snack), you can indicate this by drawing arrows across the row for that time block.
  2. If there is an overall camp activity, such as general swim or a large-group game, specify as much as you can what the time was actually spent doing or what the game entailed
• For activities where the pedometer could not be worn or would not pick up steps accurately, rate each camper’s physical activity level on a scale of 1 - 3 and record this number on his or her sheet.
  1. Very little effort or activity
  2. Approximately half the time being physically active, or some to moderate activity for the majority of the time
  3. Lots of energy exerted the entire time
• VERY IMPORTANT: Right before bedtime (for resident camps) or departure (for day camps) check each camper’s pedometer and write the number of steps on the corresponding activity sheet in the bottom row.
• If a camper forgets or loses his or her pedometer, be sure to indicate the specific time it was not worn on the activity sheet.

Other notes:
• Remind campers to put their pedometers on first thing in the morning. Check for proper placement on the right hip parallel to the ground.
• Shaking the pedometers will add extra steps to the daily total. Please discourage campers from doing this.
• Campers should remove their pedometers for the following activities:
  1. Anytime they will be in or around water (showers, swimming, boating)
  2. Horseback riding
  3. Bicycling
  4. Sleeping
Appendix G

**Camp Physical Activity Questionnaire (Modified PAQ-C)**

CODE (initials + birthday [mm/dd/yy]): _______________________________

Age: _______   Grade Entering: _______

Gender: Male ☐   Female ☐

Which of the following best describes you?

☐ Black or African-American   ☐ Hispanic or Latino
☐ White or Caucasian         ☐ Biracial or Multiracial
☐ Native American Indian    ☐ Asian or Pacific Islander
☐ Other _________________________________

When you are at home, do you participate in organized sports (like soccer, baseball, basketball teams, etc.)?

☐ Yes   ☐ No

We are trying to find out about your level of physical activity from *the last 7 days* (in the last week). This includes activities that make your legs feel tired or cause you to sweat or breathe hard like tag, skipping, running, climbing, and others.

**There are no right or wrong answers - this is not a test.**

1. **Physical activity in your spare time:**

Have you done any of the following activities in the *past 7 days (last week)*? If yes, how many times? *(Mark only one box per row.)*

<table>
<thead>
<tr>
<th>Activity</th>
<th>No</th>
<th>1-2</th>
<th>3-4</th>
<th>5-6</th>
<th>7+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skipping</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Activity</td>
<td>No</td>
<td>1-2</td>
<td>3-4</td>
<td>5-6</td>
<td>7+</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>----</td>
</tr>
<tr>
<td>Boating/canoeing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-line skating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tag</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking for exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicycling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jogging or running</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aerobics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseball, softball</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Football</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tennis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skateboarding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soccer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor, street hockey</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volleyball</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basketball</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ice skating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. In which of these activities did you spend the most time last week?

__________________________________________________________________

3. In the last 7 days, **where** did you most frequently participate in physical activity like sports, dance, or games in which you were very active? *(Please mark only one box)*

- [ ] Home
- [ ] Neighborhood
- [ ] Local Park
- [ ] Camp
- [ ] Other: ___________________________

4. Which one of the following describes you for the last 7 days? *Read all five statements before deciding on the one answer that describes you. Circle the one that describes you best.*

   A. All or most of my free time was spent doing things **with little physical effort**
   B. I sometimes (1 - 2 times last week) did physical things in my free time (played sports, went running, swimming, bike riding, did aerobics)
   C. I often (3 - 4 times last week) did physical things in my free time
   D. I quite often (5 - 6 times last week) did physical things in my free time
   E. I very often (7 or more times last week) did physical things in my free time

5. Were you sick last week or did anything prevent you from doing your normal physical activities?

- [ ] Yes
- [ ] No

6. **Where were you last week (before camp starts this week)?** *(Please mark only one box)*

- [ ] At Home
- [ ] Vacationing
- [ ] Staying with a Relative
- [ ] This Summer Camp
- [ ] A Different Summer or Sports Camp
- [ ] Other: ___________________________
Appendix H

END OF CAMP PHYSICAL ACTIVITY QUESTIONNAIRE

Please take 10 minutes to complete these questions. There are no right or wrong answers. You may stop at any time and return the form to a staff member. Thank you.

CODE (initials + birthday): _____________________________________________

Please check in the box how much you agree or disagree with the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Agree a Lot</th>
<th>Agree a Little</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree a Little</th>
<th>Disagree a Lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am a physically active person</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity is fun</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compared to others of my age and gender, I am more physically active than they are</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I spend most of my free time indoors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>During camp, I was more physically active than I would be in an average week at home</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The physical activities provided at camp were fun</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree a Lot</td>
<td>Agree a Little</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree a Little</td>
<td>Disagree a Lot</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>----------------</td>
<td>-----------------------------</td>
<td>-------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>My camp counselors were physically active</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wearing a pedometer made me want to be more physically active</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wearing a pedometer helped me understand my physical activity level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I liked wearing the pedometer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What was your favorite camp activity?

____________________________________________________________________________________

When you are not at camp, what is your favorite free time activity?

____________________________________________________________________________________

Enter the codes of up to five of your closest friends at camp:

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

Thank you for participating in this study! 😊
Appendix I – Camp Audit Instrument

Section I: General Information

1. Name of camp: _________________________________

2. Location: _________________________________

3. Date of Review: _________________________________

5. Weather: _______________ degrees  Cloudy  Rain  Sunny

6. # of campers attending session: ____________

7. # of staff members involved in camper supervision/activities: ____________

8. What are the sources of shading in the main activity areas?

   Trees  Buildings
   Shelters  Other: ____________

9. Estimate the % coverage of shading in the camp

   0 - 24  25 - 49  50 - 74  75 - 100
10. Camp Design

Centralized  Decentralized

11. Mark the distances from location to location:

Dining Hall to:  __________ ft.

Dining Hall to:  __________ ft.

Section II: Facilities

12. Camp size:  ______________ acres

13. Place a checkmark beside the items below found at the campsite.

Playground Equipment  Open Areas  Climbing Wall
Sports Field(s)      # _________  Swimming Pool  Archery
Basketball Court(s) # _________  Lake  Riflery
Tennis Court(s)      # _________  Walking/Biking Trail  __________
Recreation Center  Zipline
14. Rate the overall aesthetic appeal of the camp:

   Very Unpleasant       Neutral       Somewhat Pleasant
   Somewhat Unpleasant    Neutral       Very Pleasant

15. How attractive is the overall landscaping in the camp?

   Very Unattractive       Neutral       Somewhat Attractive
   Somewhat Unattractive    Neutral       Very Attractive

16. Rate the condition of the overall landscaping in the camp

   Poor                 Average        Above Average
   Below Average        Average        Excellent

17. *Using an additional piece of paper, draw a map of the camp layout including the overall shape and size and location of facilities in a general scale.*
**Section III: Courts (may be repeated)**

Is the court:  Indoor  Outdoor, uncovered  Outdoor, covered

What structures are present on the court?

<table>
<thead>
<tr>
<th>Tennis Net</th>
<th>Volleyball Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tennis Boundaries</td>
<td>Volleyball Boundaries</td>
</tr>
<tr>
<td>Practice Wall</td>
<td>Basketball Boundaries</td>
</tr>
<tr>
<td>Basketball Hoop</td>
<td>Other: ____________</td>
</tr>
</tbody>
</table>

What is the intended purpose of this court?

<table>
<thead>
<tr>
<th>Tennis</th>
<th>Multipurpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basketball</td>
<td>Other: ____________</td>
</tr>
<tr>
<td>Volleyball</td>
<td></td>
</tr>
</tbody>
</table>
How many games can be played simultaneously on this court?

Explain: _______________________________________

Visible markings       Yes       No

Lighting              Yes       No

Surface Quality       1  2  3  4  5

Section IV: Athletic Fields (may be repeated)

What structures are present on the field?

   Soccer Goals       Benches
   Soccer Boundaries   Other: __________
   Backstop

What is the intended purpose of this field?

   Soccer       Multipurpose
   Baseball    Other: __________
How many games can be played simultaneously on this field?
Explain: ________________________________

Visible markings  Yes  No
Lighting  Yes  No

Section IV: Athletic Fields (cont.)

Condition:  1  2  3  4  5
Flatness:  1  2  3  4  5

Section V: Playground Structures

What type of surfacing is present?

Grass  Wood Chips  Rubberized  Sand
Other: ________________________________

What color is the equipment (Dull, Neon, Raw)?
Explain: _________________________________________

What is the number of climbers

_____________________________

What is the number of swing bays (can hold more than one seat)

_____________________________

Provide a short description of what type of equipment is available on the playground:

**Section VI: Open Space**

Total open space available: _________________ ft.

<table>
<thead>
<tr>
<th>Shading</th>
<th>0 - 24</th>
<th>25 - 49</th>
<th>50 - 74</th>
<th>75 - 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flatness</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

| Unpaved material: | Grass | Dirt | Gravel |

General uses:
Section VII: Indoor Facilities

Size of facilities: ________ sq. ft

Condition:   1   2   3   4   5

General description of indoor facilities:

Section VIII: Individual Facilities - Trails

% paved: ________  % unpaved: ________

Total trail length: __________ ft.

Unpaved material:  Grass  Dirt  Gravel

Condition:   1   2   3   4   5

Flatness:   1   2   3   4   5

<table>
<thead>
<tr>
<th>Shading:</th>
<th>0 - 24</th>
<th>25 - 49</th>
<th>50 - 74</th>
<th>75 – 100</th>
</tr>
</thead>
</table>
### APPENDIX J – Camp Daily Activity Participation Form

<table>
<thead>
<tr>
<th>CODE: (initials + birthday) =</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>8:00 AM</td>
</tr>
<tr>
<td>9:00 AM</td>
</tr>
<tr>
<td>10:00 AM</td>
</tr>
<tr>
<td>11:00 AM</td>
</tr>
<tr>
<td>Noon</td>
</tr>
<tr>
<td>1:00 PM</td>
</tr>
<tr>
<td>2:00 PM</td>
</tr>
<tr>
<td>3:00 PM</td>
</tr>
<tr>
<td>4:00 PM</td>
</tr>
<tr>
<td>5:00 PM</td>
</tr>
<tr>
<td>6:00 PM</td>
</tr>
<tr>
<td>7:00 PM</td>
</tr>
<tr>
<td>8:00 PM</td>
</tr>
<tr>
<td>9:00 PM</td>
</tr>
<tr>
<td>Pedometer Reading</td>
</tr>
</tbody>
</table>