

5-2010

The Ecological Influences of Community Trail Use and Physical Activity Among Female Trail Users

Sarah N. Moulton
Utah State University

Follow this and additional works at: <https://digitalcommons.usu.edu/etd>

 Part of the [Public Health Education and Promotion Commons](#)

Recommended Citation

Moulton, Sarah N., "The Ecological Influences of Community Trail Use and Physical Activity Among Female Trail Users" (2010). *All Graduate Theses and Dissertations*. 563.
<https://digitalcommons.usu.edu/etd/563>

This Thesis is brought to you for free and open access by the Graduate Studies at DigitalCommons@USU. It has been accepted for inclusion in All Graduate Theses and Dissertations by an authorized administrator of DigitalCommons@USU. For more information, please contact dylan.burns@usu.edu.



THE ECOLOGICAL INFLUENCES OF COMMUNITY TRAIL USE AND
PHYSICAL ACTIVITY AMONG FEMALE TRAIL USERS

by

Sarah Nelson Moulton

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Health, Physical Education and Recreation

(Health Education)

Approved:

Phillip J. Waite, PhD
Major Professor

Julie Gast, PhD
Committee Member

Mary Doty, PhD
Committee Member

Byron Burnham, EdD
Dean of Graduate Studies

UTAH STATE UNIVERSITY
Logan, Utah

2009

Copyright © Sarah Nelson Moulton 2009

All Rights Reserved

ABSTRACT

The Ecological Influences of Community Trail Use and
Physical Activity among Women

by

Sarah Nelson Moulton, Master of Science

Utah State University, 2009

Major Professor: Dr. Phillip J. Waite
Department: Health, Physical Education, and Recreation

Despite great effort to improve physical activity, little success has come to pass. Due to this, some researchers have shifted from individual approaches to promoting physical activity to multilevel environmental approaches. One of these multifaceted environmental approaches is through community trails. A small body of research has suggested that community trails may be a successful ecological approach to promoting physical activity. However, the research is minimal and inconsistent in supporting effectiveness of community trails for promoting physical activity.

This study sought to examine ecological factors to learn if and how they might influence trail use among women. The ecological factors measured in this study were intrapersonal (age, time, race/ethnicity), sociocultural (income, education, social support), and physical environmental (cost, convenience, safety). A survey was conducted among 67 women using a community trail in St. George, Utah during the spring of 2008. Multiple

linear regression models and Pearson correlations performed measured the predictive value of the ecological influences of physical activity, studied the relationship between community trail use and physical activity, and gained a clearer understanding of the characteristics of women trail users.

Eighty-four percent of the sample reported using trails for physical activity and 74% reported since they began using trails, they participated in more physical activity. Physical activity and trail use were significantly and positively correlated. Convenience, outdoors and aesthetics were reported as motivators to use trails. Sixty-nine percent of the sample perceived the trail to be very convenient and convenience significantly predicted trail use. Convenience was also significantly and negatively correlated with the distance one traveled to the trail. The remaining ecological factors failed to predict trail use.

Promoting community trail use among women who live within close proximity to trails may be an effective approach to reaching out to more people in an effort to promote physical activity. This conclusion is supported by the findings that women trail users were significantly likely to use trails regularly, participate in physical activity, and live within close proximity to trails. It is inconclusive what and how other ecological factors might influence community trail use among women.

DEDICATION

This thesis is dedicated to health educators, city planners, researchers as they seek out approaches to help women improve their health. Most importantly, this thesis is dedicated to women everywhere. May you be inspired and dedicated to creating a healthier lifestyle for yourself, your family, and all who are within your influence.

ACKNOWLEDGMENTS

I would like to thank Dr. Phillip Waite for his guidance from the early exploration and study to carrying out the research and writing. I am grateful for his commitment, wisdom, and friendship. I would also like to thank my committee members, Dr. Julie Gast and Dr. Mary Doty, for their support and counsel.

I would especially like to thank my family and friends for their never-ending moral support and patience. Special thanks to my dear husband, David, for believing in me and encouraging me to the end.

Sarah Nelson Moulton

CONTENTS

	Page
ABSTRACT	iii
DEDICATION	v
ACKNOWLEDGMENTS.....	vi
LIST OF TABLES	xi
CHAPTER	
I. INTRODUCTION.....	1
Purpose of the Study	5
Limitations	6
Assumptions.....	6
Definitions of Terms	7
Summary	8
II. REVIEW OF LITERATURE.....	9
Physical Activity Recommendations for Adults.....	9
Trends in Physical Activity among Adults	10
Gender Differences Regarding Participation in Physical Activity.....	12
Background	14
Overview of Ecological Models.....	14
Ecologically based Interventions	15
Ecological Influences of Physical Activity	17
Intrapersonal Influences	17
Sociocultural Influences.....	26

Physical Environmental Influences.....	32
Policy.....	36
Community Trails as an Ecological, Physical Activity Intervention.....	37
Convenience Correlates.....	37
Opportunity for Physical Activity.....	40
Summary.....	44
III. METHODOLOGY.....	44
Theoretical Framework.....	44
Research Design.....	46
Sampling Procedures.....	46
Sample size.....	46
Sample Characteristics.....	47
Physical Activity Characteristics.....	54
Instrumentation.....	57
Surveys and Tools.....	57
Survey Development Process.....	58
Survey Type and Description.....	59
Scoring Procedures.....	59
Institutional Review Board Approval.....	69
Pilot Test.....	69
Survey Procedures.....	70
Factor Analysis.....	71
Correlation.....	74
Regression.....	75
Summary.....	76

IV. RESULTS	77
Research Question Number One.....	77
Research Question 1a.....	77
Research Question 1b.....	78
Research Question Two	82
Research Question Three	82
Research Question Four.....	85
Summary	95
V. DISCUSSION	956
Research Question 1a.....	956
Age	98
Time	99
Race and ethnicity.....	100
Research Question 1b.....	101
Income.....	101
Education.....	102
Social Support.....	103
Research Question 1c.....	104
Cost	105
Safety.....	106
Convenience.....	107
Research Question Two	109

Research Question Three 109

Research Question Four 111

 Physical activity 111

 Community trail use 112

Implications for Health Education 114

Recommendations for future research..... 115

REFERENCES 119

APPENDIXES 125

LIST OF TABLES

Table		Page
1	NHIS-Reported Trends in Physical Activity Among Women.....	21
2	Trends in Physical Activity Among Adults	23
3	NHIS-Reported Trends in Physical Activity Across Race/Ethnicities	25
4	NHIS-Reported Trends in Physical Activity by Educational Attainment.....	29
5	Demographic Characteristics of Survey Sample.....	51
6	Reported Trends in Community Trail Use Among Survey Sample.....	53
7	Reported Trends in Physical Activity Among Survey Sample	57
8	Composite Score Rankings for Trail Use.....	62
9	Trail Use Composite Scores of Survey Sample	63
10	Composite Score Rankings for Physical Activity.....	64
11	Safety Composite Scores of Survey Sample.....	65
12	Social Support Composite Scores of Survey Sample.....	67
13	Research Questions, Instrument Items, and Data Analysis Procedures.....	77
14	Coefficients with Time and Age as Predictor Variables of Trail Use.....	79
15	Coefficients with Social Support, Education, and Household Income as Predictor Variables of Trail Use	80
16	Coefficients with Cost, Convenience and Safety as Predictor Variables.....	81
17	Coefficients for Trail Convenience	82
18	Coefficients for Overall Trail Use and Overall Physical Activity	85
19	Qualitative Summation of Motivation to Participate in Physical Activity.....	87

20	Qualitative Summation of Motivation to Use Community Trails.....	91
21	Analysis of Data and Conclusions	97

CHAPTER I

INTRODUCTION

Community walking/biking trails are very appealing as evidenced by the increased prevalence of community trails throughout cities, parks, and neighborhoods across the United States and many industrialized nations. One place where trails are appearing is in areas of rapid economic and residential growth. In a Utah-based study, surveys were administered to policy makers in 74 municipalities across the state (Librett, Yore, & Schmid, 2003). Forty-two percent of respondents from high growth areas reported they had policies in place for building sidewalks and walking/biking trails. An additional 16% reported they intended to create policies to build these facilities within one year (Librett et al., 2003). Although labeled in a variety of ways, including community paths, pedestrian trails, pathways, parkways, and walkways, and composed of a variety of surfaces ranging from asphalt, lime chip, and gravel, the potential end result of increased pedestrian utilization may be an increase in overall physical activity.

The United States Department of Health and Human Services (USDHHS) established in 1996 physical activity recommendations for the general adult population to maintain and/or improve health. The USDHHS recommended at least 30 minutes of moderate intensity physical activity on most if not all the days of the week. For greater health benefit to be achieved, a higher intensity and/or duration were recommended (United States Department of Health and Human Services, 1996, 2000).

The Behavior Risk Factor Surveillance System (BRFSS) and the National Health Interview Survey (NHIS), conducted under the direction of the Centers for Disease Control

and Prevention (CDC), reported that nearly a quarter of adults in the United States did not participate in any leisure time physical activity (Ham, et al., 2004; Hughes et al., 2006) and less than half of adults met the physical activity recommendations to maintain or improve health (Centers for Disease Control and Prevention, 2005, 2006; Ham et al.). In Utah, the BRFSS reported higher physical activity rates although still similar to national trends (Hughes et al.).

More specific data from these reports indicated differences across gender regarding general physical activity. The *Healthy People 2010* document reported that only 13% of women participated in the recommended amount of physical activity compared to 16% of men (United States Department of Health and Human Services, 2000). More recently, the BRFSS in 2004 and the NHIS in 2005 reported lower rates of physical activity participation among women than men (Kruger, Ham, & Kohl, 2005; National Center for Health Statistics, 2005). Although these differences were small, various research findings consistently indicated men were more physically active than women.

It was suggested by some that the development of trails may have been a more viable means to improve physical activity as an environmental approach than traditional approaches involving individual behavior change (Librett, Yore, & Schmid, 2006; Reed, Ainsworth, Wilson, Mixon, & Cook, 2004; Task Force on Community Preventive Services, 2002). Recent research has provided some evidence for this assertion (Evenson, Herring, & Huston, 2005; Wang et al., 2003, 2004). This assertion is also supported by the fact that walking was the most popular form of physical activity and the most common mode of activity on community trails (Evenson et al., 2005). Wang et al. (2003) found from

a survey of trail users that 40.6% used trails for walking. Wang et al. (2004) reported in another study that trail users typically were more likely to report participating in regular physical activity when compared to the general population. Community trails were also supported by research indicating that trails were a viable low cost facility to build and were most often free of cost to users (Wang et al., 2003, 2005).

Trails may also have been of particular benefit to women (Brownson et al., 2000; Eyler et al., 2002a; Reed et al., 2004). Women, more so than men, preferred walking for physical activity (Brownson et al., 2000; Siegel, Brackbill, & Heath, 1995; Ewing, Schmid, Killingsworth, Zlot, & Raudenbush, 2003). This preference for walking was also reflected in trail census data that reported higher trail use among women than men (Brownson et al.; Reed et al.). Barriers women face to participating in physical activity included but are not limited to safety, health, accessibility, and cost. The development of trails may have aided women in overcoming these barriers (Eyler & Vest, 2002; Eyler et al., 2002b).

The ecological models of behavior change (Sallis et al., 2006; Sallis & Owen, 2002) supported the paradigm shift to environmental approaches such as community trails to improve physical activity. This model asserts that multiple levels of influence were necessary to bring about widespread and sustained improvements in behavior. These multiple levels influence included intrapersonal, sociocultural, policy and physical-environmental influences (Eyler et al., 2002b). Each of these influences also interacted in influencing human behavior.

Ecological models were also applied to help explain how people interacted with the environment to participate in physical activity (Sallis & Owen, 2002). A large body of

research was found that related to the ecological influences upon physical activity among the general population as well as among women (Sallis & Owen). However, to date, little research has been generated relating to the ecological influences of trail use, and more specifically regarding trail use among women.

Although ecological models supported the notion that the environment likely played a role in influencing participation in physical activity, they also raised a cautionary flag that the development of community trails alone was unlikely to motivate a large percentage of the population to participate in the recommended amount of physical activity. Ecological models suggested that in order for trails to be an effective physical environment approach, the intrapersonal, sociocultural, physical environment, and policy levels of influence must be utilized to promote widespread and sustained changes in behavior (Sallis et al., 2006; Sallis & Owen, 2002).

While ecological models generally support the notion that there are multiple influences on physical activity, it is unknown what the specific influences of trail usage were at each level. A clearer understanding of the multiple influences associated with trail usage is necessary to help promote trail usage as a means of participating in the recommended level of physical activity to maintain and improve health.

Purpose of the Study

The purpose of this study was to examine the relationship between the ecological influences (intrapersonal, sociocultural, and physical environment) of physical activity and community trail use among Utah women trail users.

Research Questions

The research questions which guided this research are as follows:

1. How do ecological influences of physical activity influence trail use?
2. Are the intrapersonal factors, motivation, age, time and race/ethnicity significantly associated with community trail usage among women?
3. Are the sociocultural factors, income, education, and social support significantly associated with community trail usage among women?
4. Are the physical-environmental factors, cost, convenience and safety significantly associated with community trail usage among women?
5. How do sociocultural, intrapersonal, and physical-environment factors interact to predict community trail usage among women?
6. Is there an association between trail use and participation in physical activity?
7. What is the perceived motivation among women to use community trails and to participate in physical activity?

Limitations

The limitations of this study are as follows:

The primary limitation of this study was due to the limited variation in the characteristics of the sample.

Because study participants were volunteers, time constraints experienced by trail users may have resulted in a decline in participation or an incomplete survey.

The interview relied upon self-report measures, which may not accurately reflect the behaviors being measured.

The number of survey participants who used bicycles on the trail was limited as they were not always easily accessible to invite to participate in the survey.

Delimitations

The delimitations of this study are as follows:

This sample consisted of conveniently selected volunteers.

Data were collected for this study on community walking trails located in the St. George, Utah area in the spring season of the year.

The sample study included only adult women ages 18 and older.

Assumptions

Assumptions made in this study include:

The instruments utilized in this study accurately measured what they intended to measure.

The instrumentation was valid and reliable.

All interview questions were answered honestly.

All participants lived in an urban community within close proximity to the trail where the survey took place.

Definitions of Terms

Community Trails: Pathways built throughout communities sometimes connecting residential, commercial, recreation, and employment areas. Community trails are available for a variety of uses, but most commonly for non-motorized use.

Ecological: Models, frameworks, or perspectives that describe the relationship between individuals and their environments (Sallis & Owen, 2002).

Ecological models of health behavior: Models proposing that behaviors are influenced by intrapersonal, sociocultural, policy, and physical-environment factors; these variables are likely to interact, and multiple levels of environmental variables are described that are relevant for understanding and changing health behaviors (Sallis & Owen, 2002).

Environment: “The space outside the person, contrasted with intrapersonal variables” (Sallis & Owen, 2002, p. 463).

Intrapersonal: Refers to factors that are characteristic of an individual. These may be biological or psychological factors.

Model: the use of numerous theories as well as empirical findings to aid in understanding a “specific problem in a particular setting or context” (Glanz, Rimer, & Lewis, 2002, p. 27).

Physical activity: “Any bodily movement produced by skeletal muscles that results in energy expenditure” (Casperson, Powell, & Christenson, 1985, p. 126).

Physical-environment: Refers to the actual environment outside of an individual and is influenced by climate, season and other types related to nature.

Policy: “Legislative, regulatory, or policymaking actions that have the potential to affect health behaviors, sometimes unintentionally; policies are sociocultural influences that can alter physical environments” (Sallis & Owen, 2002, p. 463).

Sociocultural: Refers to the social environment outside of the individual.

Theory: “A set of interrelated concepts, definitions, and propositions that present a systematic view of events or situations...to explain and predict” an event or situation (Glanz et al., 2002, p. 25).

Summary

Chapter I provided a rationale and supportive research for the proposed study. This chapter has also discussed the purpose of the study, research questions, limitations, delimitations, and assumptions of this study. Chapter II will review the current literature supporting the need for the study. Chapter III will discuss the methodology and data analyses. Chapter IV will present the results of the study and Chapter V will discuss these results.

CHAPTER II

REVIEW OF LITERATURE

This literature review will present a comprehensive overview of the current research that has been conducted concerning (a) physical activity recommendations among adults, (b) trends in physical activity among adults, (c) a review of ecological models of health behavior change, (d) the ecological influences of physical activity, and (e) community trails as an ecological, physical activity intervention.

Physical Activity Recommendations for Adults

Recommendations for a healthy amount of physical activity required to maintain and improve health have been established by several health organizations. The development of physical activity recommendations were established as a result of the poor health evident among many adults as well as the significant health benefits associated with participating in physical activity.

In the past, the terms exercise and physical activity have been used synonymously. However, as more detailed research has emerged in recent years, physical activity has emerged into an umbrella term to describe any form of movement. This includes even small bouts of activity that produce health benefits (Casperson et al., 1985; United States Department of Health and Human Services, 1996). Physical activity may include any form of exercise as well as any daily activity one participates in requiring energy above one's resting level.

The United States Department of Health and Human Services (1996) has established physical activity recommendations for the general adult population including frequency, duration, and intensity of activity. The USDHHS recommends 30 minutes of physical activity on most, if not all days of the week. The recommended intensity of physical activity for each session is described as moderate intensity. The Surgeon General explains moderate intensity as an increase in heart rate and breathing. An example of a moderately intense activity is a brisk walk for 30 minutes. For greater health benefit to be achieved, a higher intensity activity is recommended.

Trends in Physical Activity among Adults

Although specific guidelines have been established for participating in physical activity, most adults do not adhere to these recommendations. Current rates of physical activity as well as trends over the past 20 years indicate a low rate of participation in physical activity among adults. The BRFSS and the NHIS are two national health surveys which gather and report prevalence and trend data regarding physical activity in the United States.

The BRFSS is the world's largest ongoing health survey and is conducted via telephone surveys (Centers for Disease Control and Prevention, 2007a). The BRFSS is overseen by the CDC and administered by individual states through each state's health department. The BRFSS covers a variety of health topics, including physical activity. In a trend report of BRFSS data from 1994 to 2004, the prevalence of no leisure time physical activity declined from 29.8% to 23.7% ($p < 0.001$; Kruger et al., 2005). These trends offer

promising and optimistic reports regarding adult participation in physical activity. However, these reports still leave room for considerable improvement as nearly one quarter of Americans still fail to participate in any leisure time physical activity.

In addition to adults who do not participate in any leisure time physical activity, the NHIS has more recently reported information regarding adults who do participate in regular leisure time physical activity (Centers for Disease Control and Prevention, 2007b). The NHIS is a large survey administered by the National Center for Health Statistics (NCHS) through the CDC. This survey has been conducted since 1957 and is used for the purpose of gathering information on a variety of health topics to gain a better understanding of the health of residents of the United States. The NHIS is a cross-sectional telephone survey administered to approximately 43,000 households yearly.

The NHIS reported in 1997 that 30.6% of adults participated in regular leisure time physical activity (Schoenborn, Barnes, & Division of Health Interview, 2002). This is little change from the most recent report from the NHIS that reported that 30.1% (95% *CI* = ± 0.7) of American adults 18 years or older participated in regular leisure time physical activity (National Center for Health Statistics, 2006). This represents virtually no change in regular physical activity participation among American adults over a 10 year span.

In addition to the NHIS, the BRFSS most recently reported that 49.1% of adults 18 years or older participated in enough physical activity to meet the national recommendations (Centers for Disease Control and Prevention, 2005). The data by the NHIS differs by 19 percentage points from the BRFSS data for the same year. The reported disparity between these two surveys is unreported, but may be due to differences in

sampling procedures, sample size, or measurement error. Regardless as to which survey system is more accurate, the fact remains that at least 50% of adults do not participate in regular physical activity. Clearly, there is still a need to encourage the adult population who is physically inactive to integrate physical activity into their lives. There is also a great need to reach those who are now participating in some physical activity to participate in the recommended amount to maintain and improve their health.

Gender Differences Regarding Participation in Physical Activity

The reports discussed above regarding physical activity encompass the general adult population of the United States. To further understand disparities in health, it is valuable to look at health data by various groups. Gender is a common socio-demographic variable examined in much of the research concerning physical activity.

Trends typically indicate that men are slightly more physically active than women (National Center for Health Statistics, 2005, 2006; United States Department of Health and Human Services, 1996, 2000). However, differences are usually small and rarely statistically significant. For example, *Healthy People 2010* reported that 16% of men and only 13% of women participate in the recommended amount of physical activity (United States Department of Health and Human Services, 2000). In addition, the 2004 BRFSS survey reported 21.4% of men did not participate in any leisure time physical activity compared with 25.9% of women (Kruger et al., 2005).

The most recent information from *Health, United States, 2006* reported that 38.1% of males and 40.6% of females participate in no leisure time physical activity. In contrast,

31% of males and 29.1% of females reported participating in 30 minutes of regular physical activity on 5 or more days per week (National Center for Health Statistics, 2006).

Gender differences in physical activity are also evident in private research efforts. Huston, Evenson, Bors, and Gizlice (2003) conducted a cross-sectional telephone survey of adults ($N = 1,796$) to measure the correlates of leisure time physical activity. Huston et al. found that men were slightly more physically active in general. Seventy-four percent ($n = 480$) of men and 70.3% ($n = 734$) of women reported participating in any physical activity in the past month. Huston et al. also reported that men were more likely to reach the recommended level of physical activity with 27% ($n = 256$) of men and 24% ($n = 172$) of women reported meeting national recommendations (Huston et al.).

While most research demonstrates similar trends across gender, Siegel et al. (1995) found a unique trend regarding physical activity across gender. Siegel et al. measured how demographic variables influenced general physical activity as well as walking from BRFSS data ($N = 18,557$). Siegel et al. did report that men participated in slightly more physical activity than women (72% and 68.6%, respectively). However, approximately 26% of women reported participating in regular walking (20 minutes, 3 or more days per week) compared to only 16% of men. Although trends typically support the notion that men are more physically active than women, walking was demonstrated to be more popular among women than men.

Despite national recommendations established to help adults participate in enough physical activity to maintain and improve health, less than one half of adults are participating in regular physical activity and nearly one quarter of adults do not participate

in any physical activity. Variability in physical activity across gender is very small, but consistently indicates that men are more physically active than women. It has also been reported that women report walking more than men and are also more likely to report walking regularly.

Ecological Models of Health Behavior Change

Background

In the past, interventions to promote physical activity have largely been founded upon theories of individual health behavior including the Transtheoretical Model, Social Cognitive Theory, Health Belief Model, as well as behavior modification strategies (Kahn et al., 2002; Orleans, Kraft, Marx, & McGinnis, 2003; Robison & Rogers, 1994; Sallis et al., 2006; Sallis & Owen, 2002). However, Schmid, Pratt, and Howze (1995) explain that although individual efforts are effective in bringing about narrow behavior change, there is an urgent need to not simply reach individuals, but entire populations globally. As a result, ecological models of health behavior change are gaining more research interest as a potentially effective approach in promoting physical activity among large groups of people.

Overview of Ecological Models

Ecological research and interventions are typically derived from theoretical models. Models are distinguished from theories in that theories attempt to explain a single phenomenon from a specific perspective. However, because health behavior is far too

multifaceted to be explained by a single theory, models are created as a method of integrating multiple theories to explain a problem or phenomenon (Glanz et al., 2002).

Ecological models of health behavior attempt to explain how people interact with the environment by analyzing multiple factors and levels that influence human behavior (McLeroy, Bibeau, Steckler, & Glanz, 1988; Sallis et al., 2006). Factors that influence behavior include those that act both as barriers and enablers to promoting behavior change (Sallis & Owen, 2002). Although ecological models place great emphasis on the influence of the physical environment in promoting health behavior change, ecological models do not go so far as to claim that physical environmental influences alone are sufficient to bring about sustained change in physical activity behavior (Sallis, Bauman, & Pratt, 1998).

Based on a review of the literature, Sallis and Owen (2002) synthesized existing ecological models and indicated four general categories of environmental influence of health behavior. These categories are (a) intrapersonal, (b) sociocultural, (c) policy, and (d) physical-environmental influences (Sallis et al., 2006; Sallis & Owen, 2002). Each of these influences interact with one another to influence human behavior. The multiple influences of behavior supported by ecological models are based upon the key assumption that many factors influence human behavior and that single-level interventions to change health behavior are alone insufficient to bring about widespread and sustained change in health behavior (Sallis et al.; Sallis & Owen).

Ecologically based Interventions

Sallis et al. (1998) defined four general guidelines to aid in the development of successful physical activity interventions. These guidelines are (a) due to multiple

influences associated with physical activity, intrapersonal, sociocultural, physical environmental and policy domains must be implemented to successfully promote healthy behavior change, (b) interventions should be carefully designed to meet the needs of a specific behavior setting, (c) environmental/policy action should be taken prior to educational efforts in promoting physical activity and (d) the behavior setting must be carefully considered in determining the arrangement of educational and environmental domains. Sallis et al. suggests that the implementation of these guidelines will provide for the best possible scenario in developing and carrying out physical activity interventions.

From the perspective of the ecological models, research and interventions are implemented in two ways (Sallis & Owen, 2002). First, the ecological framework can be used to implement multilevel interventions that make use of a variety of approaches to bring about health behavior change. The different levels of implementation may include environmental facilities (physical environment), community programs (sociocultural or intrapersonal), social marketing (sociocultural), and laws (policy) all directed to bringing about a particular health behavior change. A second approach to implementing ecological models is to evaluate or measure an intervention at multiple levels (Sallis & Owen). With this approach, an intervention can be measured for its effectiveness based upon intrapersonal, sociocultural, physical environment and policy influences of the target behavior. Both of these approaches are based upon the assumption that interventions are most effective when multiple influences are implemented (Sallis et al., 2006).

Ecological models of health behavior change state that single level influences are alone insufficient to bring about sustained and widespread change in behavior. This model

claims that multiple levels of influence including, intrapersonal, sociocultural, physical environment, and policy, are necessary to bring about successful health behavior change.

Ecological Influences of Physical Activity

Ecological models purport that multiple influences are necessary to bring about widespread and sustained changes in health behavior and specifically, physical activity. Ecological models categorize influences of health behavior into intrapersonal, sociocultural, physical environmental and policy factors. The related influences of physical activity will be discussed below.

Intrapersonal Influences

Intrapersonal influences are those that are unique to each individual and therefore affect everyone differently. Examples of intrapersonal influences of physical activity include biological factors, psychological, cognitive, emotional factors, and behavioral attributes and skills (Sallis & Owen, 2002). The more common intrapersonal influences of physical activity are motivation, time, age, and race/ethnicity.

Motivation. Motivation is unique to each individual and therefore may be categorized as an intrapersonal factor. Motivation is defined as the “factors influencing individuals to attend to and act upon information and knowledge” (Finnegan & Viswanath, 2002, p. 370). Variables that may act as motivators may be further categorized into each of the ecological influences.

Among focus groups gathered for this literature review, a common thread found in five of the seven focus groups was lack of motivation to participate in physical activity

among women (Nies, Vollman, & Cook, 1998; Richter, Wilcox, Greaney, Henderson, & Ainsworth, 2002; Sanderson, Littleton, & Pulley, 2002; Thompson et al., 2002; Young, He, Harris, & Mabry, 2002).

In one study, Sanderson and colleagues (2002) conducted a focus group among African American women living in the south eastern United States ($N = 61$) to explore barriers and enablers of physical activity. Participants from these focus groups described how being overweight attributed to their lack of motivation. They stated that being overweight made them tired, lazy and limited their desire to be active. On the other hand, one women stated that “It doesn’t have anything to do with how we work or what we do, it’s just the state of mind, we’re just not motivated to do it because we’re not used to doing it” (p. 77).

Women from this study also described factors that motivated them to be physically active. These included work satisfaction, being sexually active, and already being physically active. One woman explained that when you are already active, you have more energy and can be active for longer periods of time (Sanderson et al., 2002).

Young and colleagues (2002) also conducted focus groups to gain a better understanding of the enablers and barriers of physical activity among women ($N = 39$). Women from these focus groups described how various ecological influences acted as motivators as well as barriers to participating in physical activity. Among these influences laziness acted as a barrier and having a friend to exercise with was a strong motivator. Another strong motivator was living in the city where they felt many people were out and about, thus making it easier for them to get out and be physically active. However, while

many women stated they had access to a variety of facilities, they continued to lack the motivation get out and use them. One woman stated that, “the opportunity is right there, and I just don’t want it, don’t take advantage of it” (p. 33).

Motivation is unique to each individual. Women often face many barriers to participating in physical activity, which in turn may decrease an individuals’ motivation to participate. Each of the ecological influences of physical activity discussed may act as a motivator to women to participate in physical activity.

Time. Time is a significant barrier when it comes to implementing a physical activity program into an individual’s schedule. Although time is not frequently studied regarding participation in physical activity, it was found to be one of the most common barriers or enablers described by women who participated in physical activity-centered focus groups.

For example, one focus group of 61 African American women attempted to gain a better understanding of the barriers and enablers associated with physical activity (Sanderson et al., 2002). Participants from this focus group suggested that time was an important barrier to participating in physical activity. These women described the need to help women find time to exercise. Ideas presented by focus group participants included worksite policies that promote walking during the lunch break and extended hours of community exercise facilities.

Nies and colleagues (1998) conducted a qualitative focus group among European American women ($N = 16$) between ages 35-50 to explore the facilitators, barriers, and strategies for physical activity in daily life. In this study, Nies et al. found that activities

reported by participants that competed with their time to exercise included, working long hours, childcare responsibilities, and household duties. They felt there was a need to teach women about making time for physical activity throughout the day. Some ideas these participants felt were useful in making time for physical activity, included using the stairs instead of the elevator, walking to work instead of driving, and parking at the end of the parking lot.

In comparison to time as a barrier to participating in physical activity, some focus group participants felt that the ability to manage time effectively was a critical enabler to participating in physical activity. Participants explained that if a woman possessed good time management skills, she would easily be able to make time for physical activity (Nies et al., 1998).

Having extra time and the ability to manage time are important enablers to participating in physical activity. However, many women from various focus groups explain that being pressed for time due to the many responsibilities they have each day, limit their ability to schedule time for physical activity.

Age. Age is another intrapersonal factor that affects participation in physical activity across the lifespan. A trend that is commonly reported in the literature is a negative correlation between age and participation in physical activity meaning that as people get older, they typically participate in less physical activity (National Center for Health Statistics, 2006; United States Department of Health and Human Services, 2000).

The *Health, United States, 2006* report contains data from the 2004 National Health Interview Survey (National Center for Health Statistics, 2006; see Table 1). This most

recent document reported that on average, 29.1% of women participate in regular physical activity, 30.3% reported participating in some physical activity, and 40.6% participate in no leisure time physical activity. In addition, as women increase in age, the percent that do not participate in any physical activity increases and the percent that participate in regular physical activity decreases. For example, 37% of 18-44 year olds reported participating in regular physical activity compared to only 47 % of adults over 65 years of age and 66% of adults over 75 years.

In addition to the NHIS report, the CDC produced a ten-year trend report regarding no leisure time physical activity among adults in the *Morbidity, Mortality Weekly Report* (MMWR; Kruger et al., 2005). Physical activity data were compared with gender, ethnicity, and age. This report indicated that as adults got older, they were more likely to report that they did not participate in any leisure time physical activity. In fact there is a

Table 1
NHI-Reported Trends in Physical Activity Among Women

Age	Inactive	Some leisure-time physical activity	Regular leisure-time physical activity
18-44	36.7	31.4	31.9
45-54	36.7	32.3	31.0
55-64	42.7	29.9	27.4
65-74	46.5	28.9	24.6
75 +	65.6	21.0	13.5

Note. Information included in this table gathered from the 2004 National Health Interview Survey (National Center for Health Statistics, 2006)

sharp increase among adults over 70 years of age who reported no leisure time physical activity. Over 30% of adults 70 or older reported being completely inactive.

In another study, Siegel and colleagues (1995) found a similar trend among adults ($N = 18,557$) who were studied regarding the relationship between demographic variables and walking for physical activity. Siegel et al. utilized data from the 1990 BRFSS survey to conduct this analysis. Although the data from this survey are older, Huston and colleagues (2003) study indicated trends may not have changed much during the 10-year period.

In an independent study, Huston and colleagues (2003) conducted a cross-sectional telephone survey of adults ($N = 1796$) 18 years or older residing in North Carolina to measure how the neighborhood environment and accessibility to places for physical activity is associated with participation in leisure time physical activity. Huston et al. reported that 70.3% of women participated in some physical activity and 24% participated in regular physical activity (see Table 2).

In addition, Huston et al. found that the percentage of adults (both men and women) who reported participating in any activity declined with increasing age. However, contrary to nationally reported trends in age related physical activity, Huston et al. also reported that the percentage of adults who participated in the recommended amount of physical activity actually increased among adults over 65 years of age (see Table 2).

Siegel and colleagues (1995) findings support the outcome that participation in general physical activity steadily declines with increasing age. However, Siegel et al. also found that as participants got older, they were more likely to report walking for 20 minutes, three or more days per week, with only one exception among the oldest group of older than

Table 2
Trends in Physical Activity Among Adults

Age	Some leisure-time physical activity	Regular leisure-time physical activity
18-29 Years	74.2	23.6
30-44 years	74.1	23.3
45-64 years	71.7	25.2
65 + years	64.8	34.4

Note. Information included in this table obtained from a study conducted by Huston et al. (2003)

75 years. For example, 15.3% of respondents between 18-34 reported regular walking compared to 31% of adults between 65-74 years and 24.3% of adults 75 years or older. Although adults generally decrease participation in physical activity as they age, it is interesting to see an increase in the number of aging adults who walk for physical activity and do so regularly.

The NHIS and BRFSS surveys have both reported that physical activity generally decreases with age. Interesting findings from two studies, Huston et al. (2003) and Siegel et al. (1995) reported an actual increase in the number of older adults who participated in the recommended amount of physical activity and walking.

Race/Ethnicity. Race/ethnicity is an intrapersonal/biological factor with sociocultural implications often associated with cultural ties. Health disparities across ethnicities/race are so evident that *Healthy People, 2010* created an overarching goal to reduce health disparities across racial/ethnic groups (United States Department of Health and Human Services, 2000). The most commonly reported ethnicities in research are

White/Caucasian, Black/African American, Hispanic/Latino, and sometimes Native American/Alaska Native and Asian (Office of Management and Budget, 1997). Based upon this review, race/ethnic factors appear to be associated with barriers and/or enablers of physical activity.

The BRFSS reported from the 2004 survey that in general, 25.9% of women did not participate in any physical activity (Kruger et al., 2005). More specifically among race/ethnicity, 22.7% of White, non-Hispanic female respondents, 31.8% of American Indian/Alaska Native, 33.9% of Black, non-Hispanic, and 39.6% of Hispanic respondents reported no leisure time physical activity. Although Black, non-Hispanic, American Indian/Alaska Native, and Hispanic respondents reported a much higher rate of no physical activity in 2004, these numbers have steadily decreased over the previous 10 years. It is hopeful to see these trends declining, but these numbers clearly still represent a great need to promote physical activity among not only White, but other ethnicities/races as well.

Health, United States, 2006 provided differences in physical activity trends for White, Black/African American, American Indian/Alaska Native, and Hispanic/Latino (National Center for Health Statistics, 2006). Table 3 displays physical activity trends across these races/ethnicities regarding (a) no physical activity, (b) some physical activity and (c) regular physical activity. As shown in the table, white respondents were the highest percentage of adults who participated in regular physical activity and the lowest percentage of adults who did not participate in any physical activity. Nearly half of the remaining groups reported they did not participate in any physical activity.

Table 3
NHIS-Reported Trends in Physical Activity Across Race/Ethnicities

Race/Ethnicity	No physical activity	Some physical activity	Regular physical activity
White	38.0	30.7	31.3
Black/ African American	50.5	26.1	23.3
American Indian/ Alaska Native	44.4	33.7	21.9
Hispanic/Latino	52.8	24.8	22.3

Note. Information included in this table obtained from Health, United States, 2006 (National Center for Health Statistics, 2006)

Race/ethnic correlates of physical activity were also demonstrated by Siegel et al. (1995) who sought to determine how physical activity and walking were associated with socioeconomic status, age, gender, and race. Although Siegel and colleagues analysis of the BRFSS ($N = 81557$), the trends found in this report are similar to reports from more recent years. Siegel and colleagues found that White participants reported more physical activity than both Black and Hispanic ethnic groups. Data reporting prevalence of walking also indicated that White respondents reported walking for physical activity more than Black and Hispanic respondents.

Intrapersonal influences of physical activity are those that affect people at an individual level and in ways unique to each person. As discussed above, time, age, and race/ethnicity are each ecological influences that act as both enablers and barriers to participating in physical activity.

Sociocultural Influences

Sociocultural influences are those influences that affect an individual socially, either through family, friends, employment, community environment, and so forth. Examples of sociocultural influences are physician influence, social support from peers, and social support from family (Sallis et al., 2006; Sallis & Owen, 2002), income, education, and social acceptability (Eyler & Vest, 2002). Income, education, and social support were common demographic influences of physical activity found in this literature review. Social support is specifically one of the paramount influences of physical activity and therefore is clearly established as an important sociocultural influence of physical activity.

Income. Income is often reported as a sociocultural influence of physical activity. Established research commonly reports an increase in physical activity as income increases. However, there is an exception among urban living and low income individuals who typically report walking more. One reason people who report higher income also report more physical activity may be because they also live in communities that are considered safer and have more access to facilities for physical activity.

Siegel and colleagues (1995) used BRFSS data to determine how various demographic variables influenced physical activity and walking. Siegel et al. found that as income increased among respondents, the percentage of respondents reporting any physical activity also increased from 56.7% (< \$10,000/year) to 82.7% (> \$50,000). In addition, reports of regular walking (20 minutes or more on 3 days or more per week) also increased by income, although only slightly (19.6% to 21.4%). However, when Siegel et al.

compared walking with general physical activity, the relative prevalence of walking actually declined as income increased from 57.5% among the lowest income group to 44.6% among the highest income (Siegel et al., 1995). Whether out of necessity or for other reasons, walking may be an important part of promoting physical activity among lower income groups.

Another example comes from *Health, United States, 2006*, which reported that 56.7% of adults below poverty level reported participating in no physical activity in 2004 (National Center for Health Statistics, 2006). In addition, 22.8% below poverty participated in some physical activity and 20.4% participated in regular physical activity to meet national physical activity recommendations.

In another study, Huston et al. (2003) measured the neighborhood environment and how it influenced participation in physical activity. Huston et al. reported that income was positively associated with participating in physical activity. Of participants who reported a household income less than \$20,000, 60% reported participating in some physical activity, and 16.7% reported meeting national recommendations. Of participants who reported an income between \$20,000-49,999, 69% reported participating in some physical activity and 26% reported meeting national recommendations. Of participants who reported an income greater than \$50,000, 82.5% reported participating in some physical activity and 31% reported meeting national recommendations. This study reported a clear positive correlation between income and participation in physical activity.

Income is commonly associated positively with participating in physical activity. While an increase in income may provide more opportunity for a variety of physical

activity, walking is the most common form of physical activity and may be more common among lower income groups. Not only level of income, but various types of physical activity may influence people differently within different income brackets however it should be noted that different studies and reports group income differently and therefore may not be generalized very well. Future research regarding income should standardize the grouping of income in order to enhance the generalizability of research findings.

Education. In addition to income, education commonly influences participation in physical activity. Most research supports the notion that people with higher education generally are more likely to participate in regular physical activity.

For example, *Health, United States, 2006* (National Center for Health Statistics, 2006) reported physical activity trends in comparison to educational achievement. Table 4 shows how physical activity trends differ for adults with no high school diploma or equivalent, a high school diploma or equivalent, and some college education or more. A distinct difference in physical activity according to education is evident across physical

Table 4
NHIS-Reported Trends in Physical Activity by Educational Attainment

Educational attainment	Inactive	Some leisure-time physical activity	Regular leisure-time physical activity
No high school/GED	63.8	21.5	14.7
High school diploma /GED	48.6	28.5	22.8
Some college or more	28.9	34.3	36.9

Note. Information included in this table obtained from *Health, United States, 2006* (National Center for Health Statistics, 2006)

activity and education. Those with more education participated in more physical activity, than those with less education.

Eyler and colleagues (2002c) conducted a meta-analysis of 91 studies published between 1980 and 2000 to gain a clearer understanding of the influences of physical activity among women. The correlates of physical activity measured in this study were systematically determined through the use of ecological models. Although the majority of the studies included in this review were conducted among white women, other race/ethnicities included were Black, American Indian, Asian, and Hispanic women. Eyler et al. found from this review that physical activity was positively associated with education. However, some studies that reported an association between education and physical activity did not find statistically significant association and therefore should be considered cautiously.

In Huston and colleagues (2003) study regarding ecological influences of physical activity, an association was found between education and accessibility for physical activity. The more education reported by respondents, the greater accessibility they also reported saving to facilities for physical activity (Huston et al., 2003). This is notable, because accessibility is highly associated with participation in physical activity (Eyler & Vest, 2002).

Social support. Social support has been studied heavily regarding its influence on physical activity. Social support may be one of the most enabling individual factors related to overcoming barriers to participating in physical activity. Social support may be

manifested through family or friends and may be given through words of encouragement or having an exercise partner.

In one quantitative study, Young and Stewart (2006) evaluated a church based aerobic/stretching intervention among women. Although this study had little retention and impact in behavior change, the study did find that social support from friends and family significantly predicted change in overall physical activity throughout the program. In addition, social support from friends significantly predicted change in energy expenditure on a daily basis.

In another study, Litt, Kleppinger, and Judge (2002) also reported social support as the most significant predictor of participation in physical activity at three and 12 month follow up of an intervention to increase physical activity among women ($N = 189$) using estrogen replacement therapy. Litt et al. reported that women who indicated having higher than median levels of social support participated in physical activity more than 19 out of 30 days, whereas women indicating less than medial levels of social support participated in physical activity no more than 13 out of 30 days.

Eyler and Vest (2002) found social support as the single most significant individual enabler across six focus groups ($N = 33$) of rural white women in the United States. Eyler and Vest conducted these qualitative focus groups as part of a national qualitative research project of focus groups among women of various backgrounds and ethnicities to explore the facilitators and barriers of physical activity among women.

According to the women who participated in the focus groups (Eyler & Vest, 2002), different sources of social support provided different types of social support. Family

support was described mainly as encouragement or discouragement from family members to participate in physical activity. Social support from friends focused on the importance of having a partner to exercise with. The benefits of social support from a partner to exercise with as described by the focus groups was that exercise would be more enjoyable, the time would pass quickly, and they would be more motivated to begin and maintain an exercise program.

From another study (Eyler et al., 2002b), one woman in particular commented on the relationship between social support and motivation. She stated that seeing others outside would motivate her to get out and exercise with them. Participants in these focus groups suggested the availability of community programs and environments for individuals and families as a desirable and potentially successful way to overcome these barriers in promoting physical activity (Eyler et al.).

Nies et al. (1998) also describes the significance of social support in physical activity among European American women ($N = 16$). Women from these focus groups described the value of social support as providing accountability, someone to exercise with, encouragement and positive reinforcement. Social support was described by participants as critical in starting up as well as maintaining an exercise routine.

The role of social support in influencing physical activity has been established in the literature and represents a notable predictor of participation in physical activity whether from family or friends as well as in the form of encouragement or having an exercise partner.

Sociocultural influences of physical activity are part of the social environment of an individual. Common sociocultural influences are income level, educational attainment, and social support. Of these, social support is the most established and important enabling influence of physical activity among women.

Physical Environmental Influences

Any environment in which a physical activity takes place will likely influence physical activity. The environment may be an individual's home, an outdoor location whether on a street or at a park, or an exercise facility. In addition, the environment may be influenced by many things, including climate and seasonal factors, topography (Sallis et al., 2006), air quality (Sallis et al.), open space (Sallis et al.), access to facilities (Eyler & Vest, 2002), cost of programs (Eyler & Vest, 2002), community design, safety (Eyler & Vest), time spent outdoors (Sallis & Owen), and possession of home exercise equipment (Sallis & Owen). Among these the most commonly reported influences are cost, safety and accessibility.

Cost. The expense associated with physical activity may be characterized by the cost associated with an exercise facility, cost of equipment necessary for the activity, or transportation to a facility. The cost will be different based upon the type and location of activity. Cost influences accessibility to participating in physical activity as both an enabler and a barrier.

Eyler and Vest (2002) found cost to be an important influence of physical activity among women ($N = 33$) living in the midwestern United States. Eyler and Vest conducted focus groups of women to better understand physical activity behavior and attitudes.

Women from these focus groups frequently expressed the importance that participation in physical activity needed to be at least inexpensive, if not free.

Among women ($N = 61$) who participated in similar focus groups residing in the southeastern United States, low-cost interventions that encouraged walking were some of the most frequently suggested approaches to overcoming barriers to physical activity (Richter et al., 2002). Similarly, American Indian women ($N = 30$) who participated in additional focus groups, suggested providing an environment that promoted low-cost healthy behavior (Thompson et al., 2002). Specific environmental suggestions reported from this study included walking/bicycling trails in an aesthetic, clean, safe, and comfortable environment, a community fitness center, and a work site facility.

Young and colleagues (2002) found that urban living women ($N = 39$) participating in focus groups also expected that exercise should be inexpensive. However, not all agreed. In contrast to the expressed importance of low-cost facilities, some participants in this focus group explained that although low-cost facilities were desirable in promoting physical activity, they were, alone, inadequate in promoting physical activity. These women acknowledged that inexpensive or free facilities were available, however they did not take advantage of many of the free facilities available in their community. Some of these facilities included church exercise classes, use of stairs and sidewalks, parks, and shopping malls. These women explained that even though they had access to some facilities, they continued to lack motivation to use them.

Cost is an important correlate of participating in physical activity. The influence of cost may also be related to income in influencing physical activity. However, as reported

by Young et al. (2002), a low-cost or free facility may alone be insufficient in promoting physical activity.

Safety. Safety may be a significant physical-environmental barrier to participating in physical activity. Safety may be perceived or actual and be related to the environment or personal safety. Threats to safety may include heavy traffic, lighting, sidewalks, streetlights, crosswalks, crime, weather, and stray animals.

Eyler and Vest (2002) conducted focus groups among women ($N = 33$) regarding barriers and facilitators to physical activity participation. Women in these focus groups repeatedly described how safety was a significant barrier when participating in physical activity outdoors. Some of the safety issues discussed included lack of sidewalks, unpaved roads, heavy traffic, and poor lighting.

Other safety issues include stray animals, personal safety when exercising alone, crime and weather (Brownson, Baker, Housemann, Brennan, & Bacak, 2001; Eyler & Vest, 2002; Nies et al., 1998). Wilbur, Chandler, Dancy, Choi, and Plonczynski (2002) conducted six focus groups of 48 urban living African American women to better understand barriers/facilitators to physical activity. These women were concerned about limited police protection for themselves and others in the neighborhoods where they live. They described being concerned about drug dealers, gang bangers, drug addicts, and bullets (Wilbur et al.). These safety issues were a major deterrent to participating in physical activity.

To overcome safety barriers to participating in physical activity, Eyler and Vest (2002) found that social support and clean and secure facilities were valuable influences

for participating in physical activity. Safety may act as an important enabler or barrier to participating in physical activity, especially regarding physical activity outdoors. For any intervention that promotes physical activity, the physical and social environment must be assessed to ensure safety for the participants.

Convenience. The convenience of facilities for physical activity, are what makes physical activity accessible and achievable. Convenience may be based upon proximity to a facility, cost associated with the use of a facility, and any equipment required for an activity.

In one study, Eyler and Vest (2002) conducted six focus groups ($N = 33$) of rural living white women from the Midwest to determine barriers and enablers and attitudes toward physical activity. Participants explained how they were required to travel long distances to reach exercise facilities whether it was a gym, park, or other type of facility. They explained that the time and expense associated with it were not worth the effort to these women.

Humpel, Marshall, Leslie, Bauman, and Owen (2004) found interesting results from a study which evaluated a web-based physical activity program in a workplace setting. While the purpose of this study was initially to test the efficacy of a web-based physical activity program, the results provided interesting information regarding environmental perceptions toward physical activity. Humpel et al. found that regardless of actual accessibility and convenience to facilities for physical activity, how convenient or accessible a facility was perceived to be, was most strongly associated with increased walking for physical activity. Women who positively perceived the convenience of

physical activity were more than twice as likely to participate in physical activity compared to women who did not perceive physical activity as being convenient.

Accessibility is an important influence of physical activity and may very well be an important determining factor related to using community trails. If an individual perceives that they only have limited access to facilities for physical activity, they may be less likely to participate in physical activity. Therefore, measures that can be taken to increase accessibility, include lowering the cost of a facility, or building more parks and sidewalks.

Physical environmental influences of physical activity refer to those influences related to the outdoor environment as well as any facility where physical activity may take place. These may include, gyms, recreation centers, parks, homes, and sidewalks. Cost, convenience, and safety within the environment may be important influences of participation in physical activity. It is necessary to consider that not only do facilities need to be physically accessible, but work needs to be done to improve perceived accessibility of facilities for physical activity.

Policy

Policy is a broad approach to promoting physical activity or other health behaviors at the population level. Policies broadly play a role in influencing physical activity through zoning, development, land use, laws, transportation regulations, public recreation facilities, and traffic management policies (Sallis et al., 2006). Policy implementation may also be a part of the workplace, including exercise programs and/or facilities available to employees and incentives for being physically active (Eyler & Vest, 2002).

The promotion of physical activity at an environmental level is often the result of public policy. This is why policy is most often joined with environmental approaches in considering interventions to improve physical activity. Although policy may play an important role in influencing trail use, measurement of policies is beyond the scope of this research project and will not be further explored here.

Ecological models propose that multiple influences are necessary to effectively promote physical activity. The intrapersonal, sociocultural, physical environment and policy influences of physical activity have been discussed.

Community Trails as an Ecological, Physical Activity Intervention

A small body of recent research has demonstrated that community trails may be a successful ecological approach to promoting physical activity. Age, race/ethnicity, income, education, social support, convenience, and safety are specific ecological factors that may be related to the use of community trails. However, it is still unknown if there is any association between trail use and physical activity, or how the ecological influences of physical activity may influence trail use. Although community trails are growing in popularity, little research has been done and therefore is insufficient to establish clear relationships between trails and physical activity. There may also be a potential safety risk associated with trail use.

Convenience Correlates

As more and more trails are being built, they are coming in closer proximity to residential areas and mixed commercial areas as well as connecting homes to commercial

and outdoor areas. Having trails in convenient locations appear to make them more accessible and desirable to use. The convenience of walking/biking trails near one's home may help those women who feel lack of time is a significant barrier to participating in physical activity. Reports from focus groups and other quantitative research studies will discuss convenience as a correlate of trail use below.

Participants of focus groups from rural areas where community trails do not exist have repeatedly recommended building community trails to encourage participation in physical activity (Eyler & Vest, 2002; Thompson et al., 2002). For example, in Eyler and Vest's focus groups (2002), participants repeatedly expressed the concern that they did not have access to places to exercise. Barriers faced to participating in physical activity included no sidewalks, no paved roads, unsafe highway traffic, lack of time, etc. The efforts these women desired to make in their community to reduce barriers and promote physical activity included building facilities for women to use that were inexpensive, building sidewalks/community trails and improving outdoor lighting to make exercising safe (Eyler & Vest).

In another study conducted among rural living adults ($N = 1269$) in Missouri, respondents were asked what was the most appealing aspect of community trails (Brownson et al., 2000). Sixteen percent reported that having the trails in a convenient location was most appealing to them.

Gordon, Zizzi and Pauline (2004) surveyed adults ($N = 414$) on a new community trail regarding their physical activity patterns on the trail. The primary goal of this study was to determine if patterns of physical activity had changed with the addition of the

community trail to the community. The data from the surveys were used to categorize the surveys into two groups according to those who were habitual exercisers or met physical activity recommendations before the community trails were completed and those who were new exercisers who had not participated in a regular physical activity program prior to the completion of the trail. Gordon et al. reported that new exercisers rated convenience as the most enabling factor to using the trail and habitual exercisers rated convenience as the second most important enabling factor for using community trails. Convenience was important to both groups, but more important to new exercisers than habitual exercisers.

Reed and colleagues (2004) also studied trail use and sociodemographic variables of adults living in Sumter, South Carolina. In contrast to the studies discussed above, Reed et al. found no association between awareness and presence of trails. The GIS data from this study reported a large number of community trails throughout the county, however only 56% of survey respondents reported the existence of trails in their area. Although this study sampled a group of people living in an area with an abundance of community trails, their perceived accessibility to trails was low and therefore did not have any impact on use of the trails or participating in physical activity.

The evidence regarding convenience and accessibility of trail use is inconclusive. While most research reported indicates that convenience to trails is very important in promoting trail use/physical activity, some research has shown that although trails may be accessible, they may not be used, or even known about by local residents. This is supported by Humpel et al. (2004) found that actual and perceived accessibility influence participation in physical activity differently.

Opportunity for Physical Activity

Community trails provide an environment for various types of physical activity to take place and may reduce some barriers to participating in physical activity. Trails may be used for walking, jogging, bicycling, rollerblading, skateboarding, dog walking, equestrian use, and in the winter, cross-country skiing or snow-shoeing in some areas. Trails may reduce barriers of physical activity associated with cost, convenience, safety, and possibly other barriers. However, even though trails do provide a wide range of opportunities for physical activity, many studies demonstrate that many still do not use community trails to participate in physical activity and there are potential barriers associated with trails.

For example, Wang et al. (2004) surveyed trail users in Lincoln, Nebraska regarding their physical activity behaviors. Seventy-four percent ($n = 2,950$) of respondents reported that they had become more physically active when they started using community trails. In addition, not only were respondents simply more active, but most of the respondents also reported using trails an average of 4.3 times per week for an average of 69 minutes thus meeting national recommendations for physical activity.

In another study of adults ($N = 1796$) residing in North Carolina, community trails were found to be positively associated with physical activity (Huston et al., 2003). Respondents who reported having access to community trails were more likely to participate in physical activity. In fact, they were also more likely to participate in the recommended amount of physical activity compared to study participants who did not report using community trails.

Gordon and colleagues (2004) conducted a survey of trail users ($n = 414$) to compare differences between physical activity patterns of new versus habitual exercisers. If respondents reported exercising 3 or more days per week for 20 minutes or more before they began using the trails were considered habitual exercisers. If participants exercised less than regularly before they began using trails, they were considered new exercisers. Ninety-eight percent of new exercisers ($n = 93$) and 52% of habitual exercisers ($n = 321$) reported having increased the amount of physical activity they participated in since the onset of using community trails. The difference in the increase in trail use between the two types of users was statistically significant ($p < 0.05$).

While it is notable that new exercisers had increased the amount of physical activity by 98% since using the trails, only 52% of habitual exercisers reported an increase in physical activity (Gordon et al., 2004). This may be because the habitual exercisers were already reaching the recommended level of physical activity to maintain and improved health. However, it is significant that 98% of those who are not reaching the physical activity recommendations became more physically active.

In another study, Brownson and colleagues (2001) found among adults surveyed regarding environmental influences on physical activity that 24.8% of respondents who participated in physical activity, used community walking/jogging trails. Twenty-nine percent of respondents reported an increase of physical activity when they had gained access to trails. Although nearly one quarter of study participants reported using community trails, trails were not the primary place for physical activity. For example,

66.1% of respondents reported exercising on neighborhood streets and 29.6% reported exercising at a park.

Wang and colleagues (2004), Huston et al. (2003), and Gordon et al. (2004) have all reported positive results relating to trail use and physical activity. This may be an indication that trails may be a valuable approach to improving physical activity. However, these research findings are not always consistent. Librett et al. (2006) and Evenson et al. (2005) did not find the same support for community trails and physical activity as discussed below.

Librett and colleagues (2006) conducted a mailing survey among adults ($N = 3,717$) to analyze how physical activity was associated with trail use. Several findings were made relating to trail use. For example, 34% of respondents who reported being generally physically active, reported using trails once or more a week. Ninety-two percent of inactive respondents indicated rarely or never using trails. In addition, only 23% of women and 25% of men who responded to the survey reported using trails one or more times per week. Also, 66% of women and 60% of men indicated hardly or never using trails in this study. A large majority of those who participated in this study did not use community trails for physical activity.

In addition, Evenson et al. (2005) conducted a baseline and follow up study of community residents before and after a community trail was built in their community. Evenson et al. reported that at baseline, 61.3% of respondents reported having community trails. At follow-up, 66.9% reported a prevalence of community trails. Among respondents who had used the trail at follow-up, 78% of respondents indicated that they did not spend

more time being physically active. Also, 73.4% did not report an increase in frequency of physical activity participation since the trails were built. This study showed that although a community trail was present in the community, residents were unlikely to use them or participate in more physical activity.

While community trails may be an effective ecological approach to promoting physical activity, some research disputes these conclusions. At present, community trails have been researched very little and therefore little is known and can be drawn from the limited research that currently exists.

Summary

This literature review has presented the most pertinent body of literature regarding physical activity and community trails including the ecological influences of general physical activity. However, the literature contains very little information regarding the ecological influences of trail use among women. The purpose of this research project was to evaluate the multiple influences that motivate Utah residents to participate in physical activity on community walking trails as described by ecological models. The levels of analysis included intrapersonal, sociocultural, and physical-environmental influences on trail usage.

CHAPTER III

METHODOLOGY

The purpose of this study was to measure the association between ecological influences of physical activity and community trail use among women. This chapter will provide an overview of the procedures followed in carrying out this study. This chapter will cover the following topics: (a) theoretical framework (b) research design, (c) sampling procedures, (d) instrumentation, (e) data collection procedures, (f) analysis.

Theoretical Framework

Ecological models of behavior change provided the basis for data collection in this study. These models state that single level influences of a specific behavior are alone insufficient to bring about sustained changes in behavior (Sallis et al., 1998; Sallis & Owen, 2002). In this study, the targeted behavior was community trail use and physical activity. The ecological model defines four types of influences that can bring about optimal and sustained improvements in a behavior. These influences are intrapersonal, sociocultural, physical-environment, and policy (Sallis & Owen).

This study evaluated the intrapersonal, sociocultural, and physical-environment influences of trail usage among women. Intrapersonal variables studied included motivation, time, age, and race/ethnicity. Sociocultural variables studied included income, education, and social support. Physical-environment variables studied included accessibility, cost, and safety. The role of public policy in influencing trail usage was beyond the scope of this study and therefore was not evaluated.

One variable that was a consideration in this study was ecological fallacy.

Ecological fallacy is a term used to describe the inaccuracy of making individual level inferences from relationships observed from an aggregate level of data (Macintyre & Ellaway, 2000). Ecological fallacy was first described in William Robinson's 1950 paper titled "Ecological Correlations and the Behavior of Individuals." In this paper, Robinson utilized data from the 1930 census to demonstrate how population-wide correlations were dramatically altered when conducted for individuals (Robinson, 1950).

Ecological fallacy is a considerable problem in all social and epidemiological research. However, it should not be confused with the meaning of the term *ecology* in ecological models of health behavior. Today, ecological fallacy is more commonly referred to as generalizability in research. While ecological fallacy, or generalizability refers to making inferences to individuals or populations outside the sample being studied (Gall, Gall, & Borg, 2003), *ecology* in ecological models simply refers to the many elements outside of an individual that influence that individual's behavior (Sallis & Owen, 2002). In this study, aggregate data were not used to make inferences to individuals. This study utilized individual responses from surveys to conduct statistical analyses of the sample gathered to make limited inferences to the population in which the sample resided.

Although ecological fallacy is not directly and specifically connected to ecological models of health behavior, ecological fallacy is a real problem in all research and therefore a consideration in this study. It would be unrealistic and impossible for researchers to study each individual in every population to determine patterns in behavior and risk factors associated with each behavior. Therefore, researchers often use reasonable and

representative samples of the population of interest in order to draw general conclusions about the majority of the population. Because of this, specific measures are taken to account for this.

In this study, limitations were considered and inferences to individuals and/or other populations with caution. In addition, Multiple Regression was used as a multilevel analysis which provides more accurate results in comparison to the more simple Pearson r correlation which was conducted by William Robinson (1950) in his ecological fallacy analyses from the 1930 U.S. census.

Research Design

A one-group, non-random, cross-sectional research design was employed to measure the association between intrapersonal, sociocultural, and physical-environment variables with community trail use and physical activity among women. Data were gathered via a quantitative paper-pencil survey administered to adult-females using community trails. The study utilized a one-time data collection.

Sampling Procedures

Sample Size

The sample size necessary for this study was determined by a power analysis conducted a priori. The analysis was based upon an established alpha level = 0.05, an estimated power of 0.8 and Cohen's δ of 0.5. The power analysis was conducted under the

guidance of the Office of Methodological and Data Sciences at Utah State University. The established sample size from the power analysis was 63.

The alpha was chosen due to the general acceptance among researchers and professionals that $p = 0.05$ is a strong indicator that a relationship between variables is statistically significant (Cohen, 2001). The power of 0.8 and a δ of 0.5 are considered moderate in evaluating relationships between variables and were thus chosen to be appropriate for this study. Using moderate power in determining the sample size also balances the risk of making Type I or Type II errors (Cohen).

Sample Characteristics

The population from which the sample was gathered was among women using community trails. Participants of the survey were also required to be 18 years of age or older. A convenience sample of women trail users on the Virgin River Trail in St. George, Utah was gathered for this study.

St. George, Utah is a high growth city, and is located in one of the fastest growing counties in the United States (St. George Area Chamber of Commerce, 2005). St. George also maintains an extensive network of community trails and has plans for continued development of more trails throughout the city and region. St. George currently has 11 paved trails winding throughout the city connecting roadways, homes, recreation areas, and business areas. In addition to these trails, several parks throughout the city possess paved trails (City of St. George: Parks, Trails, & Facilities, 2005). Because community trails are a popular amenity being built in high growth areas, St. George was determined as an optimal location for this study to take place.

The age of the survey sample was positively skewed. Table 5 displays the demographic characteristics of the survey sample. The youngest participant was 18 and the oldest, 77 with the majority of participants between the ages of 18-29 ($n = 22$). The mean age was 40 and the median age was 36. Two participants did not respond to this item.

The number of participants in each age category declined as age increased, with the exception of a slight increase (4%) of participants between the ages of 60-69. This is a typical trend in the percentage of people who participate in physical activity by age. Data suggests that most people who are physically active are between 20-30 years of age and that rate steadily declines as age increases (Kruger et al., 2005; National Center for Health Statistics, 2006). In addition, some research has reported a disruption in this decline in physical activity among adults over the age of 60 (Huston et al., 2003; Siegel et al., 1995). It has been found among some research samples that while the rate of complete inactivity continues to decline among adults over the age of 60, the rate of adults over 60 who participate in regular activity actually increases.

The State of Utah where the study took place is primarily a Caucasian population. Therefore it was expected that the majority of the study participants would report being White. Also due to trends in physical activity participation across ethnic groups, which indicate a significantly higher rate of physical activity among White people, it was also expected in this study that a high number of trail users and survey participants would report being White. Sixty-six participants (94%) reported being White, one other participant checked *other* on the survey and wrote in, Caucasian/Hispanic (1.5%), two reported Native

Hawaiian or other Pacific Islander (3.0%), and one participant did not answer this question (1.5%, see Table 5).

The U.S. Census report for the year 2000 (United States Census Bureau, 2000), reported a total population of 90,342 in Washington County, where the study took place. Of this population, 94% reported White, five percent reported Hispanic, 1% reported American Indian and less than one percent of the population reported Black/African American, Asian, and Pacific Islander. In comparison to the survey sample, the proportion of women reporting White was representative of the county population. The remaining groups were too small to draw any meaningful comparisons.

The educational attainment of the sample was comprised mostly of women who had received some college or technical training ($n = 41$). No one reported never attending school or only receiving some schooling. Seven participants (10.4%) received a high school diploma or a GED equivalent, 13 participants (19.4%) reported a bachelors degree or equivalent, and five (7.5%) reported having received a post-secondary degree. One person did not answer this question.

In 2005, Washington County, Utah reported that the median household income was \$49,893 (St. George Area Chamber of Commerce, 2005). The annual household income reported from this survey was positively skewed with a mean income of \$25,000-49,999 ($n = 17$) and a median income of \$50,000-74,999 ($n = 22$). Seventeen participants reported \$75,000 or more and only five participants reported an annual household income less than \$25,000. Two participants indicated that they were retired and four did not respond to this question.

Table 5
Demographic Characteristics of Survey Sample (N = 67)

Characteristic	N	%
Age		
18-29	22	32.84
30-39	16	23.88
40-49	9	13.43
50-59	6	8.96
60-69	9	13.43
70 +	3	4.47
Race/Ethnicity		
Native Hawaiian or other Pacific Islander	2	3.0
White	63	94
Other: "Caucasian/Hispanic"	1	1.5
Education		
Never attended school	0	-
Some schooling	0	-
High school graduate or GED equivalent	7	10.4
Education		
Some college or technical training	41	61.2
Bachelors degree or equivalent	13	19.4
Post secondary degree	5	7.5

(table continues)

Characteristic	<i>N</i>	%
Income		
< 9,999	1	1.5
10,000-24,999	4	6.0
25,000-49,999	17	25.4
50,000-74,999	22	32.8
>75,000	17	25.4

Community Trail Use Characteristics

Five questions from the survey inquired about general attitudes and practices regarding community trails to gain further understanding about trail users. The sample characteristics of community trail use are reported in Table 6. This first item asked what the primary reason was for the person to use community trails. In response to this question, 84% ($n = 56$) reported physical activity, 12% ($n = 8$) reported recreation, and 3% ($n = 2$) reported walking a dog as the primary reason they used this and other community trails. Aesthetics, transportation, and stress reduction were also answer options to this item on the survey; however, none were marked on any of the surveys. One survey was excluded from this analysis because two answers were marked (1.5%).

Item two inquired about the most common type of activity participated in on trails. Thirty-six percent ($n = 24$) reported walking, another 36% ($n = 24$) reported jogging/running, and 25% ($n = 17$) reported bicycling as the most common activity they participated in on community trails. Skating and other were two additional answer options

Table 6
Reported Trends in Community Trail Use Among Survey Sample

Trail use factors	<i>n</i>	%
Primary reason for use of community trails		
Physical activity	56	83.6
Recreation	8	11.9
Walk dog	2	3.0
Most common activity on community trails		
Walking	24	35.8
Jog/run	24	35.8
Bicycle	17	25.4
Change in physical activity since using community trails		
No change	9	13.4
Increased very little	5	7.5
Somewhat increased	23	34.3
Definitely increased	28	41.8
Distance traveled to the trail		
1-5 minutes	23	34.3
6-10 minutes	17	25.4
11-20 minutes	14	20.9
> 20 minutes	14	20.9
Convenience of the trail		
Somewhat inconvenient	3	4.5
Somewhat convenient	15	22.4
Very convenient	46	68.7

to this question, however no one marked either of these as the most common activity on community trails (see Table 6).

The results from this sample indicate an equal amount of walkers and joggers/runners but few cyclists. However, two events may have biased the results, which were noted by the student researcher. It was noted that the majority of trail users who were walking or jogging/running on the trail arrived to the trailhead via a car and therefore were easy to offer an invitation to participate in the survey. On the other hand, trail users who were riding a bicycle, most often arrived at the trailhead already riding their bike from either another intersecting trail or from the street. Many cyclists did not stop at the trailhead. Therefore the student researcher was not always able to make contact with the trail user to invite them to participate in the survey. The number of cyclists who arrived at the trail via bicycle and did not receive an invitation to participate in the survey was not counted by was approximated at four. Because of this, the attitudes and behaviors of cyclists may not be accurately represented in the results.

The second note made by the student researcher, was that on the second morning of the survey administration, a 5k race took place near the trailhead. It is not known how this race may have impacted the sample. However, the student researcher did informally note that one woman drove to the trailhead and parked, however shortly after scanning the race event, left the trailhead. It was also noted that while the race may have deterred potential trail users, the race also might have encouraged more people to use the trail.

On another survey item, survey participants were asked if the amount of physical activity they participated in had increased since they began using community trails (see

Table 6). While approximately 22% reported little or no change in physical activity, 76% reported an increase in physical activity participation since they began using community trails.

Participants reported on two convenience variables. In the survey, participants reported the distance they traveled to the community trail. Thirty-four percent ($n = 23$) traveled between 1-5 minutes to arrive at the trail, 25% ($n = 17$) traveled 6-10 minutes, 21% ($n = 14$) traveled 11-20 minutes, and another 21% traveled more than 20 minutes to the trail. In regard to convenience, nearly 70% ($n = 46$) reported that the trail was very convenient. Twenty-two percent ($n = 15$) reported the trail as somewhat convenient, 4.5 % ($n = 15$) reported that the trail was somewhat inconvenient and only 3% ($n = 2$) reported that the trail was not at all convenient.

Physical Activity Characteristics

In addition to attitudes and characteristics of community trail use, participation in physical activity was also obtained from the survey. Information included the type of physical activity participated in most often, the location where they most often participated in physical activity, and how far they typically traveled to this location. Table 7 summarizes the physical activity characteristics of the sample.

Participants reported participating in walking, jog/running, swimming, bicycling, or other types of physical activity. Three of the participants marked other and wrote in, weights and elliptical, racquetball, and Curves (circuit training). Walking and jog/running were the most common types of physical activity reported. Nearly half of the participants ($n = 30$) jog/run most frequently for physical activity and 16% ($n = 16$) reported walking

most frequently. Thirteen percent ($n = 9$) reported bicycling and 1.5% ($n = 1$) reported swimming as the most frequent form of physical activity.

As expected, the most common location people reported participating in physical activity was outdoors ($n = 34$). Twenty-eight percent reported the gym ($n = 19$) and three percent ($n = 2$)-reported home as the primary location for participating in physical activity. No one marked other as an alternative location for participating in physical activity (see Table 7).

Similar to the responses for the distance traveled to community trails, 74% reported traveling less than 10 minutes to the facility where they most often participate in physical activity. The most commonly reported distance traveled to a facility was 1-5 minutes (32.8%, $n = 22$) and only 6% ($n = 4$) reported traveling longer than 20 minutes to a facility (see Table 7).

It is noted that 84% of participants use community trails for physical activity, approximately 55% of participants traveled less than 10 minutes to the trail, and 67% reported traveling less than 10 minutes to the facility where they most frequently participated in physical activity. Although participants did not specify the outdoor location where they most often participated in physical activity, it is possible that many who participated in this survey used trails as their primary location for physical activity (see Table 7).

On items 14-15 of the survey inquiring about the type and location of physical activity, some items were missing and others contained duplicate answers. Six surveys did not contain a response for items 14 and 15. In addition, nine surveys contained multiple

Table 7
Reported Trends in Physical Activity Among Survey Sample

Physical activity factors	<i>n</i>	%
Most common type of physical activity		
Walking	16	23.9
Jog/run	30	44.8
Swimming	1	1.5
Bicycling	9	13.4
Other	3	4.5
Most common location for physical activity		
Home	2	3.0
Outdoors	34	50.7
Gym	19	28.4
Distance traveled to facility for physical activity		
No distance	8	11.9
1-5 minutes	22	32.8
6-10 minutes	15	22.4
11-20 min	12	17.9
Longer than 20 min	4	6

answers for item 14. Item 14 inquired about the location where one most often participated in physical activity. The multiple responses may indicate multiple locations regularly used for physical activity. For item 15, thirteen surveys contained multiple answers. Item 15 inquired about the most common type of physical activity. The multiple responses for this item may indicate multiple types of activity participated in regularly. This was accounted

for by two reasons. First, some participants marked more than one response in which case the question was eliminated and second, some participants did not answer any of the questions on this page of the survey. It appeared some participants did not notice the second page of the survey and skipped it. This was not taken into consideration as a potential problem as it did not arise in the pilot study.

Instrumentation

Surveys and Tools

To determine an appropriate instrument to be used in this study, guidelines were followed for the search. The validity/reliability, time frame of the study, purpose of the survey, type of sample, variables being measured and the method of survey administration were each taken into consideration.

The search consisted of three approaches. First, ERIC, Medline and EBSCO, each research databases for the social sciences, were searched for surveys. Second, the BRFSS and NHIS surveys administrated through the Centers for Disease Control and Prevention were studied. Lastly, James Sallis, PhD. and Guijing Wang, PhD., two prominent researchers of physical activity, community trails and ecological models were contacted regarding surveys they had developed, had used, or were aware of which may be appropriate for this particular research project.

These approaches were conducted to determine an appropriate measurement tool to measure the ecological influences of trail use among women. No one instrument measured the research questions or met the guidelines for this study. Therefore it was deemed

necessary to develop a survey to measure the ecological influences of trail use among women. Elements of three surveys were used as models in the development of the survey.

The first survey was one developed by Gordon et al. (2004). This survey was used among trail users to measure physical activity and trail use. The second survey was the BRFSS, conducted through the CDC. From this survey, demographic, social support and physical activity items were deemed valuable (Centers for Disease Control and Prevention, 2007a). Lastly, the Social Support of Exercise Survey was identified which was developed by James Sallis (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). During communications with James Sallis, he referred the researchers to the Social Support for Exercise Survey, a survey available for public use. Each of the surveys identified contained elements and/or items that were deemed appropriate for this study.

Survey Development Process

In the development process of the survey, six steps were followed as outlined by Gall et al. (2003). The constructs measured in the survey were defined by the ecological models of behavior change. Within each construct, more specific variables were measured. The first construct, intrapersonal influence, included motivation, time, age, and physical health. The second construct, sociocultural influence, included, educational attainment, income, social support (family and friend; instrumental and emotional), and race/ethnicity. The third construct, physical-environment influence, consisted of accessibility, cost, and safety.

Additional steps in developing the survey included defining the target sample and reviewing similar tests. The Social Support and Exercise (Sallis et al., 1987) survey, the

Recreational Trail Evaluation Survey (Gordon et al., 2004), and the BRFSS survey (Centers for Disease Control and Prevention, 2007a) were each reviewed. They were analyzed regarding test format, methods, administration, and content.

After the initial survey was produced, a critical review was conducted by the student researcher, Phillip Waite, Ph.D., and Heather Chapman, M.S., a statistician for the Office of Methodological and Data Sciences at Utah State University. The prototype was evaluated for face and content validity. Based upon the review, adjustments were made to the survey. Upon meeting appropriate revisions and acceptability, based on thesis committee's assessment of the tool for face and content validity, the survey was revised again and prepared for a pilot study. Upon completion of the pilot study, the survey was once again revised to make further clarifications.

Survey Type and Description

The type of survey developed for this study is an attitude scale, which is defined to measure a person's knowledge, values and behavior toward a specific item or dependent variable (Gall et al., 2003). In terms of this study, the object or dependent variable was trail use and physical activity. The survey measured the occurrence of trail use, general physical activity and the established ecological influences of physical activity among the survey participants.

Scoring Procedures

Forty-five items on the survey were scored quantitatively and the remaining two items were scored qualitatively. Items 1, 2, 14, 15, and 43-45 were scored categorically and

numerically (i.e. 1, 2, 3...etc.), but not in ranking order. Items 3-6 and 8-13 were also scored numerically, but in ranking order. Item seven was scored via a four-point Likert scale and numerically.

Items 16-41 were scored via a traditional five-point Likert scale with the following answer options: (a) Never, (b) Rarely, (c) A few times, (d) Often and (e) Very often. When these answers were entered into SPSS, they were scored numerically one through five. Never = 1; Rarely = 2; A few times = 3; Often = 4; Very often = 5. Items 46 and 47 were open-ended qualitative questions regarding personal motivation. Composite scores were obtained for community trail use and physical activity. In addition, because multiple items were used to measure one variable, composite scores were also developed for the safety and social support variables.

Upon completion of the surveys, each item from each survey was entered into SPSS version 16.0 under the I.D. number assigned to each survey. The corresponding number circled for each question was entered into the database and coded to identify agreement toward the question or statement.

Trail use composite score. The trail use composite score was composed of responses to two items from the survey. Item three on the survey reads, "How often do you use this or other community trails?" Item four reads, "When using this or other community trails, how long do you use the trail?" The responses to these questions were charted to give each survey a composite interval score ranging between 1-18. A one indicated the lowest amount of trail use and an 18 indicated the largest amount of trail use. Initially, a total of 24 combinations of responses were possible.

However, no one on the survey reported using trails for less than 15 minutes, so this column was removed from the composite score. This left 18 remaining interval scores.

Table 8 shows the ranking of the composite scores of trail use. Table 9 represents the how many participants were assigned to each interval.

Physical activity composite score. Items 8-12 of the survey inquired about general physical activity practices. Question eight inquired about participating in physical activity. If a participant reported Hardly Ever participating in physical activity, they were instructed to skip this section of questions. Two participants from the survey responded Hardly Ever to this question. These two surveys were assigned a one for the composite physical activity score indicating Hardly Ever participating in physical activity.

Table 8
Composite Score Rankings for Trail Use

Frequency of trail use	<15 minutes	15-30 minutes	31-59 minutes	1 hr or more
Hardly ever	-	1	2	3
Couple times a month	-	4	5	6
Once a week	-	7	8	9
2-4 times per week	-	10	11	12
Almost daily	-	13	14	15
Daily	-	16	17	18

Note. Dashes indicate composite score options not obtained from surveys.

Table 9
Trail Use Composite Scores of Survey Sample

Frequency of trail use	Less than 15	15-30 min	31-59 min	1 hr or more
Hardly ever	-	4	3	2
Couple times a month	-	1	12	6
Once a week	-	-	7	3
2-4 times per week	-	2	8	12
Almost daily	-	-	1	4
Daily	-	-	1	-

Note. Dashes indicate composite score options not obtained from surveys.

The remaining items, 9-12 were used to assign each participant either a two for some physical activity or a three for regular physical activity. The composite score of physical activity for each survey was determined by the amount of moderate and/or vigorous physical activity reported on each survey (see Table 10).

If a participant reported participating in either regular moderate physical activity or regular vigorous physical activity, they were assigned a 3 for overall participation in physical activity. If participants did not meet national recommendations of physical activity in either moderate or vigorous physical activity, but when combined together, did meet the recommended level of physical activity, they were also assigned a 3. The remaining participants reporting less than regular physical activity, were assigned a 2 indicating participation in some physical activity.

Table 10
Composite Score Rankings for Physical Activity

Frequency of physical activity	< 15 min	15-30 min	31-59 min	1 hr +
Moderate intensity				
Hardly ever	2	2	2	2
Couple times a month	2	2	2	2
Once a week	2	2	2	2
2-4 times per week	2	2	2	2
Almost daily	2	2	3	3
Daily	2	2	3	3
Vigorous Intensity				
Hardly ever	2	2	2	2
Couple times a month	2	2	2	2
Once a week	2	2	2	2
2-4 times per week	2	3	3	3
Almost daily	2	3	3	3
Daily	2	3	3	3

Safety composite score. Items 16-20 and 23-27 inquired about various aspects of safety. Each item was scored on a 5-point likert scale. Each of the safety items with the exception of item 27 fell into one factor in the factor analysis. The results of the factor analysis are presented later in this chapter. Therefore, the scores for items 16-20 and 23-26 were summed on each survey to obtain a composite safety score. The greater the composite score, the greater influence safety plays in participating in physical activity. The safety

composite score as well as item 27 were used separately in the regression analyses. Table 11 presents the frequencies of the safety composite scores from the sample.

The possible range of points for the safety scores ranged between nine and 45. The mean composite score was 25 with a full range between nine and 45. The largest portion of scores ranged between 21 and 30 (45%, $n = 30$). Seven participants did not answer the questions to this section.

Social support composite score. Items 29-41 of the survey were made up of the Social Support for Exercise Survey (Sallis et al., 1987). As expected, not all items from the survey emerged in the factor analysis, as is discussed later in the chapter. Items 35 and 36 did not emerge, and were therefore excluded from the data analyses. As a result, the scores for items 29-34 and 37-41 were summed to obtain a composite social support score. These scores were used in the

Table 11
Safety Composite Scores of Survey Sample

Composite score	n	%
9-15	11	16.42
16-20	6	9.56
21-25	15	22.39
26-30	15	22.39
31-35	3	4.48
36-40	6	9.58
41-45	4	5.97

regression analyses. The composite scores were entered into SPSS via a simple data command. Table 12 presents the frequencies of composite scores for the social support survey.

The possible range of points for the composite score was between 11 and 66. The composite score indicates the strength of the influence of social support on physical activity. As composite scores increase, the strength of the influence increases.

The composite scores from the sample were slightly positively skewed with 32% ($n = 22$) scoring between 21 and 30. Sixteen percent ($n = 11$) of the sample scored between 11 and 20, 21% ($n = 14$) scored between 31 and 40, 25% ($n = 17$) scored between 41 and 50 and 3% ($n = 2$) scored above 51 points.

Motivation. The final two remaining items on the survey were open-ended questions that inquired about motivation to use community trails and to participate in physical activity.

Table 12
Social Support Composite Scores of Survey Sample

Composite score	<i>n</i>	%
11-20	11	16.42
21-30	22	32.84
31-40	14	20.90
41-50	17	25.37
51 +	2	2.99

Item 46 reads, “What motivates you to participate in physical activity?” Item 47 reads, “What motivates you to use community trails?” A blank space was provided below each question for an open-ended response.

In order to organized and quantify these responses, a modified thematic coding process was used. Most of the responses from the qualitative portion of the survey consisted of single word responses. Therefore it was deemed appropriate to analyze the responses deductively for quantitative descriptive statistics. The data from the two qualitative items on the survey were each analyzed by following the Stage Model of Qualitative Content Analysis as described by Berg (2004). The steps in the Stage Model of Qualitative Content Analysis are as follows:

Identify research question.

Determine analytic categories.

Read through Data and Establish Grounded Categories.

Determine systematic and objective criteria for sorting data chunks grounded categories.

Begin sorting data into various categories, and revise as necessary.

Conduct descriptive statistics, review textual materials, look for potential patterns.

Compare outcome with relevant literature, explain findings.

The first step in the Stage Model is to identify the research question, which for this study was research question four: What is the perceived motivation among women to use community trails and to participate in physical activity? Next, the analytic categories for the analysis were (1) motivation to participate in physical activity and (2) motivation to use

community trails. Each response to item 46 was categorized under motivation to participate in physical activity. Each response to item 47 was categorized under motivation to use community trails.

In the third step, the data were reviewed and a single list was made of each of the responses for each item. As duplicate responses emerged, they were grouped together into what were defined as grounded categories. Under physical activity, 14 grounded categories initially emerged and under trail use, 12 categories initially emerged. As the analysis progressed through steps five and six these categories were revised as needed and subcategories were created.

At the conclusion of sorting the data, six grounded categories and 10 sub-categories were established under motivation to participate in physical activity. Five surveys did not have any reported responses to item 46, therefore 62 surveys were included in the analysis for this item. Under trail use, seven grounded categories and four sub-categories were established. Eight surveys did not have any reported responses to item 47, therefore only 59 surveys were included in the analysis for this item.

The fourth step of the Stage Model in the content analysis was to determine an objective system that would define how each item would be categorized. Due to the simplicity of the responses on the survey and that the grounded categories were based upon duplicate responses, it was determined that if a response contained the same word, the main root of the word, or the word was contained in a supporting sentence, it would be categorized into the corresponding category. For example, one grounded category from item 47 was safety. If the response contained the word safety, a variation of the word or the

word in a sentence like “safer than roads” or “I use them because I feel safe” the response was categorized under safety.

On item 46, most of the responses were related to health. As the open coding process progressed through these responses, it was deemed appropriate to create two additional grounded categories. One for well-being and another for appearance because there were a large number of responses more specifically related to these factors. The grounded category, health, was redefined with three subcategories including, health, aging and physical fitness. Within well-being, four subcategories were created including, mental health, stress management, feeling good, and enjoyment. Three subcategories were created within the Appearance grounded category. The subcategories were In-shape, Weight management, and Body. The remaining grounded categories under physical activity were Location, Social Support and Competition.

On item 47, many of the categories that initially emerged were closely related to environmental influences. Four of these categories were separated into two grounded categories to clarify data and create greater ease in managing the data. Environment and outdoors were the two grounded categories created. Weather and terrain were subcategories of environment and outdoors and aesthetics were sub-categories of the outdoor grounded category. The remaining grounded categories were physical activity, cost, enjoyment, convenience and safety.

The remaining steps in the Stage model of qualitative content analysis included conducting descriptive statistics, comparing results with relevant literature and explaining findings. The outcomes from these steps are presented in chapters Four and Five.

Data Collection Procedures

Because no identifying information was obtained from the survey, the Internal Review Board (IRB) for Utah State University waived the need of an informed consent form. Instead, under the direction of the IRB, a Letter of Information was given to each participant of the survey. The Letter of Information provided information about the survey, risks and benefits of participating in the survey, and contact information for the researchers and the IRB at Utah State University.

Institutional Review Board Approval

The IRB for Utah State University in Logan, Utah reviewed and provided approval for the study and survey prior to conducting the survey. The pilot survey and administration of the final survey was not conducted until IRB approval was granted.

Pilot Test

The survey was pilot tested among 20 adult women, using community trails who met the requirements of the inclusion criteria. The purpose of the pilot test was three fold. First, the pilot test provided the student researcher the opportunity to become familiar with the testing procedure and minimize inconsistencies. Second, the pilot test brought to the attention of the researcher any confusion or misunderstanding the respondents may have experienced upon taking the survey. Third, after pilot testing, the test items were entered into SPSS version 16.0 for practice completing a preliminary analysis.

From the pilot test, a few errors were brought to the attention of the researcher. One question on the survey was duplicated and therefore needed to be erased. Another concern

from the pilot study was that a few participants of the pilot study marked multiple answers on a few questions of the survey. Additional clarity was made on the questions of the survey to encourage participants to only mark one response. After these adjustments were completed, the survey was deemed acceptable, and was prepared for the official survey administration.

Survey Procedures

The survey was administered by the student researcher to users of the Virgin River Trail located in St. George, Utah. The data collection took place on May 16th and May 17th, 2008 between the hours of 7:00 am to 8:00 pm. The Virgin River Trail is 8.15 miles long and is paved. This trail was chosen as the site for data collection because it is the longest trail in St. George, it meets American Disability Association accessibility standards, the trail is one of the most popular trails in the St. George area, and its' location is ideal for accessing recreational, residential, and business areas.

Women using the community trail were approached and asked to complete the survey using a standard invitation (see Appendix A). If the woman agreed to participate, she was asked if she fit the inclusion criteria for the study. If she answered "yes" to these questions, she then received a letter of information (see Appendix B). After receiving the letter of information, each participant was given a pencil and survey on a clipboard to fill out (see Appendix C).

Participation in the survey was anonymous therefore the survey did not require any identifying information. Upon completion of the survey, the respondents returned the

clipboard with survey and pencil. Each survey was then assigned an identification number, which corresponded with the Letter of Information.

Each respondent was thanked for her time and participation in the survey and was offered a cold bottle of water. Any survey respondents who requested additional information regarding the research findings or trails and physical activity, provided their email and/or mailing address on a separate sign-up sheet. This contact information was not linked to the survey in any way.

Sixty-eight surveys were administered. One of the survey participants reported she was 15, therefore this survey became invalid for the analysis. As a result, 67 surveys collected were valid for the analysis.

Data Analysis

The data from the surveys were entered into SPSS version 16.0 for analysis. After entering the data into the program, the data were randomly checked for accuracy in data entry.

Factor Analysis

The first analysis conducted from the survey data was a factor analysis. The purpose of factor analysis is to reduce or group a large number of variables into a smaller set of factors based upon the variables that are highly correlated (Gall et al., 2003). For a factor analysis to be most accurate, it is generally accepted that a minimum of 200 participants would be necessary. Due to the need for a larger sample, the data was not interpreted from the pilot study of 20 participants. The results of the factor analysis on the

official survey were only used to see general patterns of relationships and were still interpreted with caution.

A factor analysis of the safety items of the survey (items 16-20, 23-27) was first conducted. Among these variables, one or two safety factors were expected to emerge therefore, the Promax method was used.

From the factor analysis of the safety items, only one factor clearly emerged. The first factor that emerged accounted for 54% of the variance. All safety items, with the exception of item 27 emerged in this analysis. Because items 16-20 and 23-26 were so strongly correlated, it was confidently concluded that these safety items all measured the influence of safety regardless of the low number of items used in the analysis. Therefore, items 16-20 and 23-26 were summed to form a composite score to be used in the regression analyses.

The remaining item, item 27 is stated, “Do you generally feel safe when you participate in physical activity?” This item did not emerge in the factor analysis; therefore this item was not included in the composite safety score, but left independent for further analyses.

The social support items (29-41) of the survey were included in another factor analysis. Special attention was given to items 35-37. In the initial factor analysis conducted by Sallis et al. (1987), these items did not emerge in the factor analysis of the Social Support for Exercise Survey. However, instead of discarding these items immediately from the analysis, they were retained for the factor analysis to see how they might correlate differently in a different sample and among physical activity of trail users.

From the analysis of the social support section of the survey only one factor emerged as expected. The analysis produced similar results to Sallis et al. (1987) with the exception of item 37. While items 35 and 36 did not emerge as was the case in the original factor analysis conducted by Sallis et al., item 37 was strongly correlated with the remaining social support items. Therefore, items 35 and 36 were not included in the composite score for social support, but item 37 was added to the composite social support score. The social support composite score comprised of summed scores from items 29-34 and 37-41.

The final factor analysis conducted included the items related to safety, convenience, cost, time, and social support variables. Age, education, race/ethnicity, and income were excluded from this analysis because the answering system applied to these questions would not be appropriate for a factor analysis. Therefore, this analysis only included items 16-41 of the Physical Activity and Trail Survey for Women.

Two to three factors were expected to emerge in this analysis. One factor expected to emerge included income, education, and social support. However, income and education were excluded from this analysis, so it was expected to see the social support items stand alone. The second factor expected to emerge included physical-environment items related to cost, convenience, and safety. The last factor that may or may not have emerged was related to the intrapersonal influences, which included the items, age, time, and race/ethnicity. Because age and race/ethnicity were excluded from this analysis, it was uncertain how time would emerge in the analysis.

The overall factor analysis of the ecological variables yielded two factors. The first factor accounted for 28% ($N = 67$) of the variance and yielded all of the social support items with the exclusion of item 36. Because of the clear homogeneity of this factor, it may be safely called the sociocultural factor.

The second factor accounted for 24% ($N = 67$) of the variance and contained the safety items, 16-20 and 23-26 and once again excluded item 27. Also in the second factor emerged convenience and cost as expected. This factor clearly emerged as the physical environment factor.

The last item, measuring time, did not emerge in either factor. Age and race/ethnicity the additional two intrapersonal factors were not included in the analysis, therefore it is not known how these factors are correlated.

Correlation

Upon completion of the factor analysis, additional statistics were conducted which included an analysis of general demographic information and a correlation between trail use and physical activity. The correlation conducted measured the extent to which a positive or negative relationship existed between the amount of trail use and physical activity each participant reported. Another correlation coefficient conducted measured the strength of association between the distance one traveled to the community trail and their perceived convenience of the trail.

Regression

The primary statistical test of the data from the survey was the multiple linear regression analysis. Multiple linear regression is a statistical analysis designed to measure the relationship between one criterion variable (trail use or physical activity) and several predictor variables (ecological influences) (Gall et al., 2003).

Two models were initially conducted. For each of the models the criterion, trail use was organized differently. The dichotomy of the first model compared regular trail users to women who did not use community trails regularly. Women were categorized as using trails regularly if they used trails enough to meet the national recommendations for physical activity. The dichotomy of the second model compared women who rarely used trails to women who used trails sometimes or regularly.

The logistic regression analysis provided in-depth information regarding how each variable was associated with trail use and physical activity. In addition, the analysis provided information regarding how the variables interact with one another in influencing trail use (Cohen, 2001). An identical model was conducted with the exception that physical activity was used as the criterion variable instead of trail use.

Summary

This chapter has discussed the methodology for this research study of community trail use among female trail users. The topics covered were the theoretical framework, research design, sampling procedures, instrumentation, data collection and analysis (see Table 13).

Table 13
Research Questions, Instrument Items, and Data Analysis Procedures

Research question	Instrument items	Data analysis procedures
1. How do ecological influences of physical activity influence trail use?		
a. Are the intrapersonal factors, age, time and race/ethnicity significantly associated with community trail usage among women?	3,4, 26, 42, 44	Mean, Mode, Standard Deviation, Multiple Regression
b. Are the sociocultural factors, income, education, and social support significantly associated with community trail usage among women?	3,4, 29-41, 43, 45	Mean, Mode, Standard Deviation, Multiple Regression
c. Are the physical-environmental factors, cost, convenience and safety significantly associated with community trail usage among women?	3, 4, 16-27	Mean, Mode, Standard Deviation, Multiple Regression
2. How do sociocultural, intrapersonal, and physical-environment factors interact to predict community trail usage among women?	3, 4, 16-45	Mean, Mode, Standard Deviation, Multiple Regression
3. Is there an association between trail use and participation in physical activity?	3, 4, 8-12	Pearson r
4. What is the perceived motivation among women to participate in physical activity and use community trails?	46, 47	Qualitative analysis, mode

CHAPTER IV

RESULTS

A survey was administered among adult women using community trails to gain a greater understanding of the influences of trail use and physical activity. This study was conducted during the spring of 2008 in St. George, Utah on the Virgin River community trail. The student researcher through SPSS 16.0 analyzed the data from the surveys. This chapter will discuss the results of the four research questions presented in chapters one and three.

Research Question Number One

How do ecological influences of physical activity influence trail use? To answer this question, three individual regression analyses were conducted for each of the three ecological influences of physical activity in relation to community trail use. These influences are intrapersonal, sociocultural, and physical-environment variables.

Research Question 1a

Are the intrapersonal factors, age, time and race/ethnicity significantly associated with community trail usage among women? To answer this question, a linear regression analysis was conducted to measure how well the intrapersonal variables predicted community trail use. Age and time were the predictor or independent variables and trail use was the criterion or dependent variable. Although race/ethnicity is one of the predictor variables, it was not included in the analysis because all but three participants who

responded to this item reported being white. Therefore it was unnecessary and not valuable to include race/ethnicity in the analyses.

Item 42 inquired about age and was measured continuously. Item 28 inquired about the extent to which time was a barrier to participating in physical activity and was measured on a categorical likert type scale. The trail use composite score was determined by a combination of frequency and duration of trail use. The information for these scores came from items three and four of the survey. Trail use was scored as an interval variable with possible scores ranging between 1-15; one indicating the least amount of trail use and 15 indicating the most. The actual range from the survey sample was between one and 14.

The results from the regression analysis are shown below in Table 14. Neither age nor time were statistically significant predictors of trail use ($R^2 = .05, f^2 = .05$). Age and time accounted for only five percent of the variance in trail use indicating a small effect size ($p = .07, p = .27$, respectively; Xue Xin & Myers, 2004).

Research Question 1b

Are the sociocultural factors, income, education, and social support significantly associated with community trail use among women? To answer this question, a multiple

Table 14
Coefficients with Time and Age as Predictor Variables of Trail Use

Variable	B	SE	Beta	t	p value
Age	.061	.033	.235	1.841	.071
Time as a barrier	.491	.441	.142	1.113	.270

Note. Adjusted $R^2 = .05, f^2 = .05$

linear regression analysis was performed to measure the extent to which these sociocultural factors predicted community trail use. The sociocultural factors, income, education, and social support were the independent or predictor variables and community trail use was the dependent or criterion variable.

Income and education were both scored as categorical variables. The social support composite score was scored continuously. The income score corresponded with item 45 on the survey and education corresponded with item 43. The social support composite was comprised of items 29-34 and 38-41. The results from the regression model are shown below in Table 15.

The sociocultural variables, social support ($p = .108$), education ($p = .810$) and household income ($p = .097$) did not emerge as statistically significant predictors of trail use ($R^2 = .05, f^2 = .05$). As a whole, the sociocultural variables only accounted for 5% of the variance of trail use indicating a small effect size (Xue Xin & Myers, 2004). These results suggest that trail use is not influenced by social support, educational attainment or household income.

Table 15
Coefficients with Social Support, Education and Household Income as Predictor Variables of Trail Use

Variable	<i>B</i>	<i>SE</i>	<i>Beta</i>	<i>t</i>	<i>p</i> value
Social support	.080	.049	.208	1.63	.108
Education	.176	.726	.031	.242	.810
Household income	.849	.502	.213	1.689	.097

Note. Adjusted $R^2 = .05, f^2 = .05$

Research Question 1c

Are the physical-environmental factors, cost, convenience and safety significantly associated with community trail usage among women? To answer this question, a multiple linear regression model was performed to measure the extent to which the physical-environment factors predicted community trail use. Cost, convenience and safety were the predictor or independent variables. Trail use was the dependent or criterion variable and was scored on an interval scale.

Cost and convenience were scored categorically and safety was made up of a composite score, scored continuously. An additional perceived safety score was included in the analysis, and was scored categorically. The cost related score corresponded to item 22 on the survey, convenience corresponded with item 21, the safety composite score comprised of items 16-20 and 23-26, the perceived safety score corresponded to item 27. The results from the regression model are shown below in Table 16. In this regression model, convenience statistically significantly ($B = .1.350, SE = .596, t = 2.266, p < .05$)

Table 16
Coefficients with Cost, Convenience and Safety as Predictor Variables

Variable	B	SE	Beta	<i>t</i>	<i>p</i> value
Cost	-.309	.446	-.098	-.693	.491
Convenience	1.350	.596	.333	2.266	.028 *
Safety composite	-.009	.063	-.022	-.145	.885
General safety	-.276	.833	-.044	-.331	.742

Note. Adjusted $R^2 = .029$; $f^2 = .03$; * $p < 0.05$

predicted trail use among this sample of women trail users. The remaining variables, cost ($p = .49$), safety ($p = .89$) and general safety ($p = .74$) did not significantly predict trail use. The overall effect size for environmental influences was considered small ($R^2 = .029, f^2 = .03$) (Xue Xin & Myers, 2004) and as a whole the variables only accounted for 3% of the variance in trail use.

To further measure perceived convenience of community trails, a Pearson product-moment correlation coefficient was conducted to measure the strength of the association between the distance participants reported traveling to arrive at the trail and how convenient they perceived the trail. Items six and seven from the survey were used to conduct this analysis.

The results are shown below in Table 17. Nearly 70% of participants reported traveling less than 10 minutes to the trail and nearly 70% of participants also reported the trail being somewhat to very convenient. The correlation coefficient indicated that the relationship between the variables is negative and had a large effect size ($r = -.394, p < 0.01$) (Green & Salkind, 2005). This finding suggests that the greater distance a participant traveled to arrive at the trail, the less convenient they perceived the trail and vice versa. The shorter distance one traveled to the trail, the more convenient they perceived the trail.

Table 17
Coefficients for Trail Convenience

Variable	<i>N</i>	<i>r</i>	<i>p value</i>
Distance traveled to trail and perceived trail convenience	66	-.394	0.01 **

** $p < 0.01$.

Research Question Two

How do sociocultural, intrapersonal, and physical-environment factors interact to predict community trail usage among women? To answer this question, an additional multiple linear regression model was planned to further investigate the relationships of the ecological variables that emerged in the first regression models as predictors of trail use. However, because the ecological variable, convenience was the only variable that emerged as a statistically significant predictor of trail use, this research question became obsolete. This question cannot be answered because convenience was the only variable that could be included in this analysis. The answer of this question is left to future research.

Research Question Three

Is there an association between trail use and participation in physical activity? To answer this question, Pearson correlation coefficients were computed between the trail use and physical activity scores. The composite scores for each variable were used to measure these relationships. The results of the analysis are reported below in Table 18.

The overall correlation coefficient performed was between general physical activity and community trail use. The physical activity composite score included items 9-12 of the survey. The trail use composite score comprised of items three and four. A statistically significant two-tailed correlation coefficient ($N = 67$, $r = .244$, $p < 0.05$) was obtained from the analysis indicating a medium effect size (Green & Salkind, 2005). These results suggest that the more physical activity the survey participants reported, the more they would also use trails.

A Pearson product moment correlation was also performed between the type of activity trails users participated in on community trails and the type of physical activity in general. In regard to the type of activity participated in on community trails, walking, jog/run, skating, bicycling, and other were the answer options provided. Thirty-five percent reported walking, another 35% reported jog/running, and 25% reported bicycling as their primary activity on community trails. The answer options offered for type of physical activity included, walking, jog/run, swimming, bicycling, and other. Twenty-four percent reported walking, 45% reported jog/running, 13% reported bicycling, 1.5% reported swimming, and 4.5% ($n = 3$) marked 'other' as the most common type of general physical activity. The 'other' responses were racquetball, Curves and elliptical. The correlation coefficient produced a positive, statistically significant, medium sized relationship (Green & Salkind, 2005) between the two variables ($r = .318, p = .019$, see Table 18). These results suggest that whatever the type of activity participated in most often on trails was also more likely to be the most common type of activity they participated in general.

Two more Pearson correlations were performed between physical activity and trail use variables. The first was performed to measure the strength of the relationship between overall trail use (composite score of items 3 and 4) and if the amount of physical activity they participated in since they began using trails had increased (item 5). The analysis indicated a statistically significant, positive relationship between the two variables ($N = 65, r = .364, p < 0.01$) with a medium effect size (Green & Salkind, 2005). These results

Table 18
Coefficients for Overall Trail Use and Overall Physical Activity

Variables	<i>N</i>	<i>r</i>	<i>p value</i>
Overall trail use and overall physical activity	67	.244	.047 *
Most common type of trail activity and physical activity	58	.308	.019 *
Physical activity since began using trails and physical activity	65	.261	.035 *
Physical activity since began using trails and trail use	65	.364	.003 **

* $p < 0.05$, ** $p < 0.01$

suggest that after the survey participants began using community trails, the amount of physical activity they participated in had significantly increased ($p < 0.01$).

The second analysis measured the extent to which participation in physical activity was associated with the increased amount of physical activity they participated in since they began using trails. The physical activity score measure for this analysis was the composite score of physical activity comprised of items 9-12. Item five measured the increase in physical activity upon using community trails. Although not as strong of a relationship, this second correlation also produced a statistically significant, positive correlation coefficient between the two variables ($N = 65$, $r = .261$, $p < 0.05$) with a small to medium effect (Green & Salkind, 2005). These results suggest that the greater increase in physical activity after the onset of trail use, the more likely they were to also report participating in greater amounts of physical activity.

Research Question Four

What is the perceived motivation among women to participate in physical activity and use community trails? For each of the qualitative items from the survey (46 and 47), the Stage Model of qualitative content analysis was followed (Berg, 2004) to analyze the responses. The responses to item 46 regarding motivation to participate in general physical activity produced six grounded categories and 10 additional subcategories to chunk the data (see Table 19). The responses from item 47 regarding motivation to use community trails were categorized into seven grounded categories and four subcategories (see Table 20). Upon completion of the data sorting and chunking process, descriptive statistics were conducted. The categories and the descriptive statistics performed are presented below.

Motivation to Participate in Physical Activity

Most of the responses to item 46 indicated that some aspect of health motivated them to participate in physical activity. Three of the six grounded categories cover some aspect of health. These grounded categories were general health, appearance and well-being. Within these categories were nine total subcategories. Because there are many aspects of health, these categories were not retained into one category, but separated to provide a clearer picture of the motivators of physical activity.

A lot of overlap was found across sub-categories, due to the limited information gathered from the item responses, the categorization was limited largely to the vocabulary used in the responses (see Table 19). For example, In-shape is a subcategory linked with Appearance. However, In-shape may also have similar reference to physical fitness. But,

Table 19
Qualitative Summation of Motivation to Participate in Physical Activity (N = 62)

Grounded Category	Sub-category	Responses	<i>n</i>	%
General health			33	53.23
	Health	Health, general, good health Healthy, to be, want, get, stay healthy feeling myself-I want to be healthy as long as I live! keep blood pressure under control	19	30.65
	Aging	Health for my senior years, retired, staying young	3	4.84
	Physical fitness	Fitness, physical fitness, feeling strong, have energy, physical just to keep active, to tone up, stamina	11	17.74
Appearance			30	48.39
	In shape	Shape, stay in, being in, keep in shape	9	14.52
	Body	My body, looks, look better, physical results, physical results	6	9.68
	Weight management	Weight control, weight, weight loss, lose weight, lose weight after having kids, lose baby weight, fit in my clothes, maintaining my perfect weight, stay trim	15	24.19

(table continues)

Grounded Category	Sub-category	Responses	<i>n</i>	%
Well-being			28	45.16
	Mental health	Mental, the high, endorphins, self-esteem, focused	5	8.06
	Stress management	Stress relief, stress reduction, stress release	3	4.84
	Feeling good	Feel good, feel good about myself, feel good about life, to feel better, I love the way I feel when & after exercising, feeling of well being	13	20.97
	Enjoyment	Fun, love to exercise, like to exercise, like to try new things, get involved	7	11.29
Location		Like to be outside, being outside, love outdoors-always been active, weather, facility, outdoor trails	6	9.68
Social support		My family, my son, friends	3	4.84
Competition		Competition, I also run for a cross country team so I train as much as possible.	2	3.23

because the word shape appeared on 15% ($n = 9$) of the surveys, it was categorized by itself. This is one limitation of the qualitative items on this survey. First, the answers were open ended and second the participants were not available for further clarification of their responses or the vocabulary they used.

Twenty-nine percent ($n = 18$) of the surveys simply contained the word health or in a sentence expressing a desire to be healthy, get healthy, stay healthy, healthy feeling, good health, etc. One woman expressing her enthusiasm for health with an exclamation point at

the end of her statement, said, “I want to be healthy as long as I live!” In contrast to the general health responses, one woman was very specific in her expression of health as a motivator to participating in physical activity. She stated, to “keep blood pressure under control” motivated her to participate in physical activity.

In addition to health, five percent ($n = 3$) of participants indicated aging factors as motivators to participating in physical activity and another 18% ($n = 11$) indicated factors related to physical fitness as motivating them to participate in physical activity. The physical fitness responses included responses related to building strength, stamina and energy.

Under the grounded category, Appearance, 15% ($n = 9$) indicated some aspect of being in shape, 24% ($n = 15$) fell under weight management and 10% ($n = 6$) reported an aspect of body as their motivation to participate in physical activity. Under appearance, weight management contained the largest number of responses. While some of the responses more vaguely stated “stay trim” and “fit in my clothes.” Thirteen responses specifically contained the word weight in the context of maintaining or losing weight.

Well-being was the third grounded category related to health. While the previous categories were more related to aspects of physical health, the responses related to well-being appeared to be more related to mental and emotional health. Eight percent ($n = 5$) of the responses fell under mental health and varied from “self-esteem” to “the high” to “focused.” Responses under stress management were very specific to managing stress and enjoyment contained responses mostly stating that they like or love to exercise.

Feeling good was the most common category under well-being and one of the most common overall responses (21%, $n = 13$). While seven surveys contained “feel good” others more specifically stated that they felt better about themselves, about the world and felt better in general. This expression of *feeling good* can be specific to mental, physical, or emotional health, but appeared from the responses on the surveys to be a general feeling that may have encompassed mental, emotional as well as physical well-being. Because the assessment of the responses was left to only what each participant wrote and did not have access to the participants for further clarification, it is unknown what specifically these participants meant by these responses.

In addition to the health related responses, location, social support and competition, were other grounded categories that described the responses from the surveys. Although the number of responses under each of these categories is small, because of the uniqueness of the responses, grounded categories were created for them. Location was related to physical environmental influences of physical activity and consisted of 10% ($n = 6$) of the responses. Most of these responses referred to being outside to exercise. The last two categories, social support ($n = 3$) and competition ($n = 2$) were largely related to sociocultural influences of physical activity.

Motivation to Use Community Trails

The results of the qualitative responses for motivation to use community trails is shown in Table 20. Seven grounded categories and three sub-categories were established to represent the responses from the surveys. The grounded categories were outdoors, aesthetics, physical activity, enjoyment, cost, convenience and safety. Under outdoors,

Table 20
Qualitative Summation of Motivation to Use Community Trails (N = 59)

Grouped Category	Sub-category	Responses	<i>n</i>	%
Outdoors			23	38.98
	Weather	Weather, great weather thru most of the year sunshine, fresh air	4	6.78
	Terrain	Good terrain, paved road, good route to take, good trails, well taken care of	7	11.86
	Outdoors	Love outdoors, to be in the outdoors, the outdoors, kids like to be outdoors, get in to nature view nature	12	20.34
Aesthetics		Beauty, beautiful, beautiful area, scenery, scenic, Pretty, lovely, they are beautiful, beauty of our city, St. George is beautiful, prettier than going to gym	18	30.51
Physical Activity		Running, run, good exercise, exercise	4	6.79
Enjoyment		Friendly, fun, kids on walks	3	5.08
Cost		Free, no fee	2	3.39
Convenience		Convenient, convenience, location, close, ease, easy access, accessible, close to home, I live 20 miles from St. G. so I don't really use community trails	20	33.90
Safety		Safer than on roads, no traffic/vehicles, Safe, safety, I use them because I feel safe	12	20.33

three sub-categories were created to further separate and clarify responses. They were, weather, terrain, and outdoors. The responses about motivation to use community trails are discussed below. Five of the grounded categories represent physical-environmental, ecological variables. Of these, outdoors, aesthetics, and convenience were the most commonly reported motivators to use community trails. Safety was the fourth physical-environment category and Cost was the last. Outdoors (39%, $n = 23$) was the most common reported motivator to using community trails with three subcategories including, weather, terrain and outdoors.

Convenience was the second most commonly reported (34%, $n = 20$) motivator to use community trails. Convenience is a physical environment factor related to physical activity and in this study was found in the quantitative analysis to significantly predict community trail use. Of the responses which fell under convenience, 11 specifically said convenience was what motivated them to use community trails. Other related responses included location, accessibility and ease. One comment from one of the surveys contained a comment that explained how lack of convenience deterred her from using trails. She said, "I live 20 miles from St. [George] so I don't really use community trails." This statement was directly opposite from those who stated that they were motivated to use trails with adjectives such as, "close," "ease," "accessible," "location," and so forth.

Aesthetics was another common motivator for using community trails. Thirty percent ($n = 18$) wrote that aesthetics or the beauty of the environment motivated them to use community trails. Most responses contained a form of the word *beauty* or *scenic*. Other responses were more specific, including one survey which read, "beauty of our city" or,

“St. George is beautiful.” Another woman said that she was motivated to use community trails because they were “prettier than going to the gym.” While aesthetics emerged in nearly one third of the surveys, and is a physical environment factor, this study failed to quantitatively examine if and how it might predict community trail use.

The two remaining physical-environment related categories that emerged as motivators to using community trails were safety (20%, $n = 12$) and cost (3%, $n = 2$). The two responses regarding cost both indicated that because trails were “free” or “no fee” they were motivated to use them. Safety had a bit more variability in the responses from the surveys. Nearly half the responses simply contained the word safe or safety, the other half of the responses dealt with safety related to traffic. Some of the statements were “safer than roads” and “no traffic.”

Safety and cost were both measured under physical environment variables in the quantitative portion of this study to determine the extent to which they might predict trail use. Neither of these variables emerged as significant predictors of trail use. The lack of the relationship between cost and trail use may be reflected by the fact that only two surveys reported that cost motivated them to use community trails. On the other hand, while safety did not emerge as a significant predictor of trail use in the quantitative analysis, 20% reported that safety did in fact motivate them to use community trails. This may be worth consideration in future research.

In addition to the physical environment related categories, physical activity and enjoyment were two additional categories that emerged which could both fall under intrapersonal influences. It is also likely that these variables might also be influenced by

sociocultural influences. Seven percent ($n = 4$) stated that running or exercise in general motivated them to use community trails. Due to the statistically significant relationship between community trails and participation in physical activity, it was surprising to see that only four women reported physical activity as a motivator to using community trails.

Enjoyment was a category that also emerged under motivators to use community trails. The comments categorized under enjoyment were “fun,” “friendly,” and “I take the kids on walks.” The last comment may be an indication of social support playing a role in motivation to use community trails. However, the quantitative portion of this study failed to determine that social support was a significant predictor of trail use. In addition, the survey failed to inquire if women used trails with others and what influence that might have on their motivation to use them. Lastly, because only one comment from item 47 made a slight inclination toward social support, it is unlikely that social support was a motivator of trail use.

The responses for motivation to use trails from item 47 on the survey may be a reflection of the various ecological variables measured quantitatively in this study. Convenience was the second most common reported motivator for using community trails and also emerged as the only statistically significant predictor of trail use in this study. Quality of the outdoors and aesthetics were two other common motivators for using community trails, however these variables were not specifically studied in the quantitative portion of this study, therefore it is not known if these variables predict community trail use.

Physical activity, cost and safety each emerged as motivators to use community trails. Physical activity was significantly correlated with trail use in the quantitative analysis; however cost and safety did not emerge as significant predictors of trail use. The last category, enjoyment was not a very common response on item 47 and was not measured quantitatively. Due to the limited response, it does not appear to be critical that the variable was not measured in the quantitative portion of this study.

Summary

This chapter presented the results of the analyses of the four research questions from the physical activity and trail survey. The survey was conducted among adult women in St. George, Utah during the spring of 2008. The following chapter will further discuss the results of the study.

CHAPTER V

DISCUSSION

This chapter will discuss the results of the study presented in chapter IV. While physical activity and its influences have been explored for several years, very little research about the influences of community trail use exists. Therefore, this study was designed to measure the ecological influences already established to influence physical activity to determine if and how they might influence community trail use among women. Table 21 presents each of the research questions from this study including the corresponding results from the data analyses and relevant literature.

Research Question 1a

Are the intrapersonal factors, age, time, and race/ethnicity significantly associated with community trail use among women?

Intrapersonal influences include the many biological, psychological, cognitive, emotional and behavioral factors which are unique to each individual (Sallis & Owen, 2002). This research question sought to measure most specifically those influences of physical activity including age, time and race/ethnicity to determine the extent to which they might predict community trail use. Due to the homogeneity of the sample regarding race/ethnicity, this factor was eliminated from the analysis. Age and time remained as the two intrapersonal variables analyzed in this study.

Table 21
Analysis of Data and Conclusions

Research question	Data analysis results	Relevant literature
1a. Are the intrapersonal factors, age, time and race/ethnicity significantly associated with community trail usage among women?	Analyses failed to determine that age and time are statistically significant predictors of trail use. Regardless of age and time, most participants used trails regularly. Race/ethnicity was not included in the analysis.	Agreeing: Huston et al., 2003; Kruger et al., 2005; NCHS, 2006 Dissenting: Eyler & Vest, 2002; Nies et al., 1998
1b. Are the sociocultural factors, income, education, and social support significantly associated with community trail usage among women?	The analyses failed to determine that income, education and social support were statistically significant predictors of trail use.	Agreeing: NCHS, 2006; Librett et al., 2006 Dissenting: Huston et al., 2003; Litt et al., 2002; Siegel et al., 1995; Young & Stewart, 2006
1c. Are the physical-environmental factors, cost, convenience and safety significantly associated with community trail usage among women?	The analyses failed to determine that cost and safety were statistically significant predictors of trail use. Convenience did emerge as the only ecological variable to statistically significantly predict trail use. A statistically significant correlation appeared between perceived trail convenience and distance traveled to the trail.	Agreeing: Eyler & Vest, 2002; Huston et al., 2003; Richter et al., 2002; Sanderson et al., 2002; Thompson et al., 2002; Dissenting: Eyler et al., 2002c; Richter et al., 2002; Wilbur et al., 2002; Young et al., 2002

(table continues)

Research question	Data analysis results	Relevant literature
2. How do sociocultural, intrapersonal, and physical-environment factors interact with one another in regard to community trail usage among women?	Due to the results from research question one, the analysis for research question two could not be conducted. Therefore, there are no results for this research question.	
3. Is there an association between trail use and participation in physical activity?	There is a statistically significant correlation between trail use and general physical activity. A statistically significant relationship also appeared between trail use, physical activity and increase in physical activity at onset of trail use.	Agreeing: Gordon et al., 2004; Librett et al., 2006 Dissenting: Huston et al., 2003
4. What is the perceived motivation among women to participate in physical activity and use community trails?	General health was the most commonly reported motivator to participating in physical activity. Quality of the outdoors, convenience, and aesthetics, were the most commonly reported motivators of trail use.	Agreeing: Nies et al., 1998; Richter et al., 2002; Sanderson et al., 2002; Thompson et al., 2002; Young et al., 2002

Age

While a large body of research supports the relationship between age and general physical activity, no studies were found in the literature review for this study that measured the relationship between age and community trail use. Therefore, this study sought to explore how age impacts community trail use. Previous research findings support a strong negative correlation between age and regular physical activity, meaning that as age

increases, participating in physical activity generally declines (Kruger et al., 2005; National Center of Health Statistics, 2006). Despite this decline in physical activity, additional studies have found an increase in regular physical activity among adults between the ages of 60 and 70 (Huston et al., 2003).

The age of this sample was positively skewed with most of the sample between the ages 18-30 ($n = 22$) and the number of trail users declining in every age group as age increased, with the exception of the age group 60-69 which had a 5% increase. This pattern of the age of trail users is similar to previous findings regarding age and regular physical activity (Huston et al., 2003, United States Department of Health and Human Services, 2000). One possible explanation for this increase in the number of trail users within the age group 60-69 comes from a qualitative response from the survey regarding motivation to use trails. One woman stated that being “retired” motivated her to be physically active. Another woman wrote that her motivation to participate in physical activity was “health in my senior years.”

Although the number of trail users across age was largely representative of the general population, age did not emerge as a significant predictor of trail use. It is important to point out that this study found that trail users are statistically significantly likely to participate in regular physical activity; second, trail use did not statistically significantly vary by age which is contrary to data regarding general physical activity trends (National Center for Health Statistics, 2006; United States Department of Health and Human Services, 2000). In other words, this sample largely represents the proportion of women in

the population who participate in regular physical activity. Due to the lack of variability in the age and activity level of the sample, few conclusions were made.

In order to really understand how the age factor influences trail use, it will be necessary to study not only trail users, but the general population in regard to attitudes toward and use of community trails.

Time

Past research among women regarding physical activity has suggested that lack of time is a significant barrier to participating in physical activity (Eyler & Vest, 2002; Nies et al., 1998; Thompson et al., 2002; Young et al., 2002). Qualitative research findings also suggest that time when managed well, may be a significant enabler and/or barrier to participating in physical activity (Nies et al., 1998). This study sought to explore how time might be a barrier to using community trails as no research was found that explored this relationship.

In this study, time as a barrier weakly accounted for only five percent of the variance in trail use. On the other hand, nearly half of the women reported that time was in fact a barrier to participating in physical activity. Despite this, the sample was statistically significantly likely to participate in regular physical activity as well as use trails regularly. These findings suggest that despite time being a barrier for participating in physical activity, time does not significantly influence trail use.

These findings may suggest that this sample of women who regularly used community trails and participated in regular physical activity more likely possess successful time management skills than those who do not participate in regular physical

activity and use trails regularly. This may be further supported by the significant role of convenience in influencing trail use. Convenience is related to time and may also be associated with successful time management.

Future research should examine first, the relationship between successful time management and time as a barrier to trail use. It is possible that while time as a barrier does not influence trail use, successful time management may be a significant predictor of trail use. In addition, future research should not only examine how time influences trail users, but also how it influences the general population to use trails.

Race/Ethnicity

The predictor variable race/ethnicity was excluded from the analysis due to the largely homogenous sample of White participants. While it remains unknown how race and ethnicity may influence trail use, past research and county demographics may provide some conclusions about the largely homogenous sample.

First, the race/ethnic results from this survey are similar to the most recent U.S. Census data for Washington County, Utah with the exception of the Hispanic/Latino and Native American populations (United States Census Bureau, 2000). Second, the rates of general physical activity across race/ethnicities may provide some insight as to why the sample was mostly White. U.S. government reports in the past have demonstrated how White populations are typically more physically active and minority groups like Black/African American and Hispanic people have higher rates of inactivity (National Center for Health Statistics, 2006). This may explain why the sample was largely white.

Research Question 1b

Are the sociocultural factors, income, education, and social support significantly associated with community trail use among women?

Past research, both qualitative and quantitative have found that the sociocultural factors of income, education and social support play significant roles in influencing general physical activity. This study explored if and how these variables might influence community trail use.

Income

Income and employment status have been significantly and positively associated with participating in general physical activity (Estabrooks, Lee, & Gyuresik, 2003; Huston et al., 2003; National Center for Health Statistics, 2006; Siegel et al., 1995). These findings are further supported by qualitative research, which have suggested that the expense of an activity or a facility for participating in physical activity is a barrier for many women (Eyler et al., 2002b). Despite the trend in general physical activity by income, some research among trail users have found very little change in trail use and physical activity as income increases (Librett et al., 2006). Based upon the findings of previous research, this study sought to further explore how trail use might be influenced by income.

The income demographics of this sample showed that over half of the sample (58%) reported an annual household income of \$50,000 or more and less than eight percent reported an annual household income less than \$25,000. Therefore this sample appears to be biased in favor of individuals of higher income. This finding is similar to past research among trail users that found the majority of trail users reported a higher income (Librett et

al., 2006). However, in the regression analysis, income did not emerge as a significant predictor of trail use.

Eighty-five percent of the sample reported participating in regular physical activity, a variable highly correlated with income in previous research findings. It is possible that community trails attract people who are already generally physically active and therefore largely represent people of higher income who participate in physical activity. Another reason why income did not emerge as a predictor of trail use may be because most of the sample was under the age of 40.

Another issue to consider is, due to the large number of trail users in this study who reported higher income, the issue of accessibility might be raised. Huston et al. (2003) and Estabrooks et al. (2003) found that with increasing income, people had greater accessibility to community trails. The question might be further explored, do individuals with a higher income have greater accessibility to community trails? Accessibility to community trails was not directly measured in this study.

Education

Past research findings support the conclusion that there is a positive association between educational attainment and participating in physical activity (National Center for Health Statistics, 2006). Previous findings have also supported the conclusion that individuals with higher education are more likely to use trails and use trails more frequently than those with less education (Librett et al., 2006). Therefore this study sought to explore the relationship between education and trail use.

In the regression analysis, educational attainment did not significantly predict trail use. Two possible reasons for this are that the sample largely represented people with at least some college education as well as those who participated in regular physical activity. Because there was limited variability in this sample of trail users in regard to education and physical activity, it may be suggested that income does not play a significant role in determining how often trail users actually use trails. Considering that there is little variability and a restriction of the range of the sample's educational attainment, the sample may not accurately represent the trail use among people of various levels of educational attainment.

Because this study failed to study non-trail users as well as trail users, it is unknown if educational attainment would significantly influence women to decide to use or not use community trails. It may be of value to investigate in future research if educational attainment predicts whether an individual in the general population uses or does not use community trails.

Social Support

The literature base regarding the significance of social support in influencing physical activity among women is very strong. Both quantitative and qualitative research has supported the importance of social support in promoting physical activity (Eyler & Vest, 2002; Huston et al., 2003; Litt et al., 2002; Siegel et al., 1995; Young & Stewart, 2006). In regard to trail use, no research was found for this study that explored the relationship between social support and community trail use among women. Therefore,

this study analyzed this relationship through the use of a survey developed for measuring the influence of social support on participation in physical activity.

The regression analysis found that social support did not emerge as a significant predictor of trail use among this sample of women. In the qualitative portion of the study, three (4.48 %) responses regarding motivation to use community trails were related to social support. The small number of social support related responses from the qualitative portion appears to be a reflection of the quantitative analysis, that social support has little influence on trail use.

It is interesting that because first, social support is significantly related to general physical activity and second most of this sample participates in regular physical activity that social support did not influence community trail use. One approach that could have been made to further study the influence of social support on trail use would have been to inquire in the survey if they used trails with others, and if so, how many others, and who they used trail with (e.g. family, friend). This may have shed more light upon how the role of social support differs between general physical activity and trail use. Also, by studying the general population instead of strictly trail users, this comparison could have been made more accurately. These considerations should be made in future research.

Research Question 1c

Are the physical environment factors, cost, safety and convenience significantly associated with community trail usage among women?

Environmental correlates of trail use are most closely related to trails because community trails, a physical-environmental structure, provide an opportunity for physical

activity and recreation. Cost, convenience and safety have been supported in qualitative studies as both enablers and barriers to participating in general physical activity. The influence they may have on community trail use is largely unknown. Therefore, this study explored if and how these variables might influence community trail use.

Cost

Previous qualitative research has found that cost is a significant barrier people face to participating in physical activity (Eyler et al., 2002c; Richter et al., 2002; Wilbur et al., 2002; Young et al., 2002). Because cost is often a barrier for physical activity, this study hypothesized that because community trails are often free to use, they might overcome this cost barrier to participating in physical activity. Therefore this study explored the perceived importance and influence of cost to trail users.

In this study, half of the survey participants did however report that cost often influenced the location where they chose to participate in physical activity. Only 3.6% reported participating in physical activity at home, whereas 62% reported outdoors and 35% reported a gym as the primary location for physical activity. In the regression analysis, the perceived importance of cost related to physical activity did not predict trail usage among this sample.

One possible reason why cost was not found to predict trail use may be due to the fact that community trails are free to use and therefore trail users were not required to carefully consider the cost of using them. It may be of value to study the general population regarding the influence of cost in determining a location for physical activity in reference

to community trails. It may also be of value to specifically measure if participants chose to use community trails because they were free to use.

Safety

The role of one's safety when participating in physical activity has been reported to be an important influence and often a major barrier to participating in physical activity (Eyler et al., 2002b, 2002c; Sanderson et al., 2002; Wilbur et al., 2002). Previous findings have also suggested that the characteristics of a safe environment were better in locations where higher education and income existed (Huston et al., 2003). Although qualitative research has suggested the significance of safety for participating in physical activity, little research has explored the influence of safety on using community trails. Therefore, this study sought to explore how safety might influence community trail use.

In this study, nearly half of the survey participants reported that they were rarely to never influenced by stray dogs/animals, crime, or police patrol when determining a location to participate in physical activity. Ninety-five percent reported that they generally felt safe when they participated in physical activity. This is supported by previous research that reported that the safer people felt in their neighborhood; the more likely they were to participate in the recommended amount of physical activity (Huston et al., 2003). This is important considering that 85% of this survey sample participated in regular physical activity. This may be an indication of the safety of the community in which these trails were built.

In the multiple regression analysis, safety did not emerge as a significant predictor of trail use. This may be because 95% of the sample felt trails were safe; therefore there

was no need among trail users to consider the importance of finding a safe location to participate in physical activity perhaps because these trails were built in a safe community.

It may be assumed that women would not use community trails if they felt trails were unsafe. Therefore this study was unable to capture the variability of perceptions of the safety of community trails and how that might influence use of trails. Again, studying the general population regarding their attitudes, and behavior regarding community trail use, specifically in consideration to safety would help paint a more complete picture.

Convenience

In this study convenience was the only statistically significant variable that emerged as a predictor of trail use. This finding is supported by previous research which has found that when all other demographic variables are controlled for, convenience still emerges as a significant predictor of trail use (Huston et al., 2003).

In addition to the regression analysis, a Pearson correlation between perceived convenience of the trail and distance traveled to the trail showed a significant negative correlation ($r = -.394, p = 0.001, N = 66$). This finding seems to indicate that one's perception of the convenience of the trail increases as the distance traveled to arrive at the trail decreased. This is supported by previous findings which suggest that individuals who report having access to community trails for physical activity are more likely to use them (Huston et al., 2003).

Past research has also demonstrated the importance of convenience in using community trails and participating in physical activity (Eyler & Vest, 2002; Owen, Humpel, Leslie, Bauman, & Sallis, 2004, Richter et al., 2002; Sanderson et al., 2002;

Thompson et al., 2002; Wilbur et al., 2002, Young et al., 2002). In qualitative research, lack of convenient places for physical activity is often reported as major barriers to participating in physical activity (Owen et al.; Thompson et al.). In addition, having convenient locations for physical activity are often reported as being significant enablers to participating in physical activity (Eyler & Vest, 2002; Richter et al., 2002; Sanderson et al., 2002; Thompson et al., 2002; Wilbur et al., 2002; Young et al., 2002).

In addition to the quantitative assessment of convenience in this study, the last item on the survey, an open-ended question regarding motivation to use community trails, found convenience as a highly reported motivator to using community trails. Thirty-seven percent ($n = 25$) of participants wrote convenience or location as a primary motivator to using community trails.

From this study, convenience appears to be a strong predictor of trail use and supports previous findings which also support the importance of convenience of community trails in regard to using them. It may be concluded that the more convenient a trail is perceived to be, the more likely women will be to use them.

Research Question Two

How do sociocultural, intrapersonal, and physical-environment factors interact with one another in regard to community trail usage among women?

Upon completion of the individual multiple regression analyses for each of the ecological influences, an additional regression model was planned to include each of the significant predictor variables that emerged. However, because convenience was the only significant predictor variable that emerged in the regression analysis, it became

meaningless to conduct an additional model because there were no other predictor variables to be included in the analysis.

Research Question Three

Is there an association between trail use and participation in physical activity?

Previous research conducted among trail users has supported a positive relationship between trail use and physical activity (Gordon et al., 2004). However, the research regarding community trails is limited and therefore there is little confidence in the relationship between trail use and physical activity. This study attempted to gain a better understanding of the characteristics of both trail use and general physical activity and how they may be related. A Pearson bivariate correlation was performed to measure the strength of the association between trail use and physical activity. Additional Pearson correlations and frequencies were performed to measure the relationship between additional characteristics of trail use and physical activity.

A significant positive relationship emerged in the statistical analyses between trail use and physical activity. These results indicated that participants who were more likely to report participating in regular physical activity were also more likely to report using community trails regularly. This finding was consistent with the results of an additional item on the survey that indicated that 85% of survey participants reported that the primary reason they used trails was for physical activity. This finding has been supported by another previous study among trail users (Librett et al., 2006), which found that most trail users participate in regular physical activity.

Additional support for promoting community trail use comes from the finding in this study that 75% of trail users reported that they had increased the amount of physical activity they participated in since they began using the trail. In addition, the item inquiring if the amount of physical activity one participated in had increased since they began using trails was significantly correlated with both overall trail use and overall physical activity. These findings are supported by previous research, which also found that people, who previous to using community trails were not physically active, significantly increased the amount of physical activity they participated in when they began using community trails (Gordon et al., 2004).

Based on previous physical activity research, trail use has not been a commonly reported location for physical activity. One study in particular reported that over half exercised outdoors, but less than 3% specifically reported using walking/jogging/biking trails (Huston et al., 2003). Although this study is specific to trail users, the survey did inquire about the primary location where they participated in physical activity. As expected, the primary location was outdoors, similar to Huston and colleagues research findings. Further research with an expanded sample to include the general population may provide more information about the percentage of people who exercise outdoors and further, who uses community trails for physical activity.

Although further research is necessary to strengthen these findings, it may be confidently concluded that those who began using trails increased participation in physical activity. It may also be confidently assumed that most women who use community trails participate in regular physical activity.

Research Question Four

What is the perceived motivation among women to use community trails and participate in physical activity?

Motivation has been defined as the “direction and intensity of effort” (Weinberg & Gould, 2007) and is attributed to the “factors influencing individuals to attend to and act upon information and knowledge” (Finnegan & Viswanath, 2002, p. 370). Therefore, each of the ecological variables studied in this study are potential motivators to using community trails. Previous findings have supported the significance of motivation for participating in physical activity and its significance as both an enabler and a barrier to participating in physical activity (Nies et al., 1998; Richter et al., 2002; Sanderson et al., 2002; Thompson et al., 2002; Young et al., 2002). Therefore, this study attempted to explore how the ecological influences or motivators of physical activity might also act as motivators of community trail use.

In addition to quantitatively measuring the ecological influences of trail use, this study included two open-ended questions at the end of the survey to inquire what each individual felt motivated them to participate in general physical activity and to use community trails.

Physical Activity

The majority of the sample gathered for this study reported participating in regular physical activity (85%). Therefore, it should be noted that the responses about motivators for participating in physical activity might be those that are most effective in promoting physical activity. Caution should be made though in generalizing these responses to additional populations who may not use trails or who may not participate in physical

activity. Motivation is an intrapersonal variable and therefore is unique to each individual and influences people differently.

Most of the women who participated in this survey indicated that various aspects of health motivated them to participate in physical activity including, aging, fitness, weight management, mental health, stress management, enjoyment and a general good feeling produced by participating in physical activity. Additional motivators for participating in physical activity included the location, social support and competition.

These physical activity motivators are similar to what has been found in previous qualitative studies regarding physical activity (Nies et al., 1998; Richter et al., 2002; Sanderson et al., 2002; Thompson et al., 2002; Young et al., 2002). Therefore, it is possible that the motivators that influence physical activity among non-trail users may be similar to those of trail users. The most common motivator to participating in physical activity, “physical health” was not measured as one of the ecological influences of physical activity in this study.

Community Trail Use

Based upon the quantitative analyses from this study, convenience was the only statistically significant predictor variable that emerged to motivate trail use among this sample. Similarly, among the qualitative responses, convenience was one of the most common motivators to using community trails (37%, $n = 25$).

Physical environment related responses were also commonly reported as motivators of community trail use among this sample of women. While most of the responses specifically indicated a desire to be in the outdoors or nature, other responses

related to the environment that motivated women were pleasant weather, terrain and quality of the trails. Women were motivated by the desirable routes of the trails, the fact that the trails were paved and also that they were well taken care of. This study failed to quantitatively study how various aspects of the outdoors might influence community trail use. Further investigation might provide a clearer understanding of the influence of these factors.

Further, aesthetics was reported by 38% ($n = 26$) of women as a motivator of community trail use. Due to the large percentage of women who specifically commented on the beauty and scenery of community trails, it is possible that aesthetics, a physical-environment influence may be significantly related to community trails. However, this study failed to quantitatively study the relationship between aesthetics and community trail use. Further investigation might provide further clarification of this relationship.

Considering safety, 21% ($n = 14$) of participants stated that safety motivated them to use community trails. Responses from the qualitative portion of the survey indicated that trails were safe, they were away from vehicles and traffic and they were safer than roads. Although safety did not emerge as a significant predictor of trail use in the quantitative analyses, because 20% of the sample indicated that some aspect of safety motivated them to use community trails, this variable will require further investigation. There are many aspects of safety to be considered which may influence trail use differently such as crime, terrain, unleashed and potentially harmful animals, and personal safety.

It is possible that the quantitative section of the survey did not accurately measure the influence of safety in using community trails and therefore does not accurately measure the association between trail use and safety. Further research about the influence of safety and its many facets may provide a clearer understanding of the relationship between safety and community trails. Due to the many facets of safety, it is recommended to future researchers to develop a reliable and valid instrument to measure perceived safety of the outdoor environment in relation to a location where people participate in physical activity. An entire instrument is needed to fully explore and understand the complexity of safety in influencing physical activity in general.

Implications for Health Education

The benefits of physical activity are clearly established as a powerful intervention to decrease risk of disease, improve the side effects of prevalent illness and disability, promote healthy body weight, and improve overall quality of life. Therefore promotional efforts to improve physical activity are being made on many fronts including within the field of health education. The results from this study may be valuable to health educators in their efforts to promote physical activity by providing insights for effectively implementing environmental approaches.

First, the findings of this study should encourage health educators to become aware of where trails presently exist in their area and to gain an understanding of the demographics of local trail users. In this study, the participants had a higher income, more education, and were mostly White/Caucasian. As a consequence, health educators should

make specific efforts to promote trail use among groups with less education, income and people of other race/ethnicities.

Second, in response to the positive relationship observed between trail use and physical activity in this study, health educators may choose to make greater efforts to promote trail use in areas where community trails are already present. Although not established as a causal relationship, it seems reasonable that as people begin to use trails, they will also likely increase their participation in physical activity.

Third, health educators can become involved in areas of rapid growth and construction where trails are being built in abundance. Due to the significant influence of convenience regarding trail use, health educators should advocate for the development of community trails in locations where people can conveniently access them from their homes, businesses, and shopping areas.

Recommendations for Future Research

The most important recommendation for future research is in regard to the study sample. Additional recommendations are for studying more specifically time, social support and cost, as well as the additional qualitative variables that emerged including, aesthetics and the outdoor environment.

First, the women sampled for this study, were women who were already using community trails. Therefore, due to the narrowness of this sample, this study was not able to determine if any of the ecological factors in this study predict if one will choose to use or not use community trails. This study only measured how the ecological factors might

predict how much women use community trails. The results from this study regarding age, time, income, education, social support, cost, and safety were therefore limited in relationship and understanding.

It is suggested for further research of community trails to expand the sample from only community trail users to the general population. A similar survey should be administered to a stratified-random sample within the same or similar community where community trails exist. Three possible sampling procedures come from studies from the literature review of this study. The first study (Huston et al., 2003) conducted a cross-sectional telephone survey of adults living within six counties where a large network of community trails were built. In another study, Evenson and colleagues (2005) also conducted a cross-sectional telephone survey, however this time, the sample consisted of a random sample of adults who lived within two miles of a community trail.

In the third study (Reed et al., 2004), a telephone survey was conducted among a stratified, random sample of adults living in a community with a network of community trails. This time, the sample was determined by the use of geocoding or GIS mapping of households within proximity of the trails. The purpose of this sampling method was to proportionately survey a sample of adults within proximity to trails as well as to accurately represent adults of various demographics. While each of these sampling procedures may effectively broaden the scope of this research, the last may be most effective to measure the ecological, demographic factors that may predict trail use.

In addition to the type of sample, recommendations to further research are made to clarify the influence of some of the ecological variables measured in this study. First, lack

of time was measured as an intrapersonal influence of trail use. The majority of this sample reported that they both used community trails regularly and participated in regular physical activity, however the majority of this sample also stated that time was a barrier to participating in physical activity. Because these two variables contradict one another, further research is recommended to provide further clarification. Based upon previous research, it is recommended to not only measure time as a barrier, but to measure time management skills and success as predictors of community trail use. It is recommended that time management be added to a survey of the ecological influences of community trail use conducted within a broader sample as discussed above.

In addition to time, cost was a physical environment variable that should be further studied as this study failed to effectively measure cost as an influence of community trail use. In past research, women often reported that it was important to have a free or low cost facility for participating in physical activity (Eyler et al., 2002b). Trails are a free facility for physical activity, therefore it was hypothesized that this would influence trail use. Due to this contradiction, it is possible that the survey itself failed to effectively measure cost in relation to community trail use.

One recommendation to overcome this is in a future survey is to specifically inquire how cost influences trail use. For example, a survey item might read, "Are you inclined to use community trails because they are free to use?" In a survey of the general population, a survey item might read, "Are you aware that community trails are free to use?" Further exploration of the relationship between cost and community trails may provide a clearer understanding of its influence on trail use and who that may influence.

The last recommendation for future research is in regard to the findings from the qualitative portion of this study as well as the finding that convenience was the only significant predictor of trail use. It is recommended to further explore what ecological factors may predict trail use. This study only found one significant variable that influences trail use, convenience. Further research should explore the same variables explored in this study as well as additional variables. Additional variables this study failed to examine include those reported in the qualitative portion of the survey reported as motivators of using community trails including the outdoor environment and aesthetics. These variables were the most commonly reported motivators of community trail use and physical activity from this sample. Further study and research should be conducted about the outdoor environment and aesthetics and the influence it might have upon community trail use. These factors should be added to a survey of the ecological influences of trail use among a broader sample of the general population.

By further investigating community trail use among the general population and those ecological factors that might influence whether one uses or does not use community trails will be valuable in understanding the effectiveness of community trails as an environmental approach to promoting physical activity. This information will not only be valuable to researchers, but to health educators, city planners, and women for improving physical activity in their life.

REFERENCES

- Berg, B. L. (2004). *Qualitative research methods* (5th ed). Boston: Pearson.
- Brownson, R. C., Baker, E. A., Housemann, R. A., Brennan, L. K., & Bacak, S. J. (2001). Environmental and policy determinants of physical activity in the United States. *American Journal of Public Health, 91*, 1995-2003.
- Brownson, R. C., Housemann, R. A., Brown, D. R., Jackson-Thompson, J., King, A. C., Malone, B. R., et al. (2000). Promoting physical activity in rural communities: Walking trail access, use, and effects. *American Journal of Preventive Medicine, 18*, 235-241.
- Casperson, C. J., Powell, K. E., & Christensen, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health related research. *Public Health Reports, 100*, 126-131.
- Centers for Disease Control and Prevention. (2005). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, GA: United States Department of Health and Human Services.
- Centers for Disease Control and Prevention. (2006). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, GA: United States Department of Health and Human Services.
- Centers for Disease Control and Prevention. (2007a). *Behavioral Risk Factor Surveillance System (BRFSS): Turning information into health*. Retrieved October 8, 2006, from <http://www.cdc.gov/brfss/>
- Centers for Disease Control and Prevention. (2007b). *National Health Interview Survey*. Retrieved October 8, 2006 from <http://www.cdc.gov/nchs/nhis.htm>
- City of St. George: Parks, Trails, & Facilities. (2005). *St. George City urban trail guide*. Retrieved November 26, 2007, from <http://www.sgcity.org/pdf/trailsmap.pdf>
- Cohen, B. H. (2001). *Explaining psychological statistics* (2nd ed). New York: Wiley.
- Estabrooks, P. A., Lee, R. E., & Gyuresik, N. (2003). Resources for physical activity participation: Does availability and accessibility differ by neighborhood socioeconomic status. *Physical Activity Resources, 25*, 100-104.

- Evenson, K. R., Herring, A. H., & Huston, S. L. (2005). Evaluating change in physical activity with the building of a multi-use trail. *American Journal of Preventive Medicine*, 28, 177-185.
- Ewing, R., Schmid, T., Killingsworth, R., Zlot, A., & Raudenbush, S. (2003). Relationship between urban sprawl and physical activity, obesity, and morbidity. *American Journal of Health Promotion*, 18, 47-57.
- Eyler, A. E., & Vest, J. R. (2002). Environmental and policy factors related to physical activity in rural white women. *Women and Health*, 36, 111-121.
- Eyler, A. E., Vest, J. R., Sanderson, B., Wilbur, J., Matson-Koffman, D., Evenson, K. R., et al. (2002a). Environmental, policy, and cultural factors related to physical activity in a diverse sample of women: The women's cardiovascular health network project-introduction and methodology. *Women and Health*, 36, 1-15.
- Eyler, A. E., Vest, J. R., Sanderson, B., Wilbur, J., Matson-Koffman, D., Evenson, K. R., et al. (2002b). Environmental, policy, and cultural factors related to physical activity in a diverse sample of women: The women's cardiovascular health network project-summary and discussion. *Women and Health*, 36, 123-134.
- Eyler, A. E., Wilcox, S., Matson-Koffman, D., Evenson, K. R., Sanderson, B., Thompson, J., et al. (2002c). Correlates of physical activity among women from diverse racial/ethnic groups. *Journal of Women's Health and Gender-Based Medicine*, 11, 239-252.
- Finnegan, J. R., & Viswanath, K. (2002). Communication theory and health behavior change. In K. Glanz, B.K. Rimer, & F.M. Lewis (Eds.), *Health Behavior and Health Education: Theory, Research, and Practice* (3rd ed., pp. 361-388). San Francisco: Jossey-Bass.
- Gall, M. D., Gall, J. P., & Borg, W. R. (2003). *Educational Research: An introduction* (7th ed). Boston: Allyn & Bacon.
- Glanz, R., Rimer, B. K., & Lewis, F. M. (2002). *Health behavior and health education: theory, research and practice* (3rd ed). San Francisco: Jossey-Bass.
- Gordon, P. M., Zizzi, S. J., & Pauline, J. (2004). Use of community trail among new and habitual exercisers: A preliminary assessment. *Preventing Chronic Disease*, 1, A11.
- Green, S. B., & Salkind, N. J. (2005). *Using SPSS for Windows and Macintosh: Analyzing and understanding data* (4th ed). Upper Saddle River, NJ: Pearson Prentice Hall.

- Ham, S. A., Yore, M. M., Fulton, J. E., Kohl, H. W. Division of Nutrition of Physical Activity, National Center for Chronic Disease Prevention and Health Promotion, et al. (2004). Prevalence of no leisure-time physical activity: 35 states and the District of Columbia, 1988-2002. *Morbidity and Mortality Weekly Report*, 53, 82-86.
- Hughes, E., McCracken, M., Roberts, H., Mokdad, A. H., Valluru, B., Goodson, R., et al. (2006). Surveillance for certain health behaviors among states and selected local areas: Behavioral Risk Factor Surveillance System, United States, 2004. *Morbidity and Mortality Weekly Report*, 55, 1-124.
- Humpel, N., Marshall, L., Leslie, E., Bauman, A., & Owen, N. (2004). Changes in neighborhood walking are related to changes in perceptions of environmental attributes. *Annals of Behavior Medicine*, 27, 60-67.
- Huston, S. L., Evenson, K. R., Bors, P., & Gizlice, Z. (2003). Neighborhood environment, access to places for activity, and leisure-time physical activity in a North Carolina population. *American Journal of Health Promotion*, 18, 58-69.
- Kahn, E. B., Ramsey, L. T., Brownson, R. C., Heath, G. W., Howze, E. H., Powell, K. E., et al. (2002). The effectiveness of interventions to increase physical activity: A systematic review. *American Journal of Preventive Medicine*, 22, 73-102.
- Kruger, J., Ham, S. A., & Kohl, H. W. (2005). Trends in leisure-time physical inactivity by age, sex, and race/ethnicity: United States, 1994-2004. *Morbidity and Mortality Weekly Report*, 54, 991-994.
- Librett, J. J., Yore, M. M., & Schmid, T. L. (2003). Local ordinances that promote physical activity: A survey of municipal policies. *American Journal of Public Health*, 93, 1399-1404.
- Librett, J. J., Yore, M. M., & Schmid, T. L. (2006). Characteristics of physical activity levels among trail users in a U.S. national sample. *American Journal of Preventive Medicine*, 31, 399-405.
- Litt, M. D., Kleppinger A., & Judge, J. O. (2002). Initiation and maintenance of exercise behavior in older women: Predictors from the Social Learning Model. *Journal of Behavioral Medicine*, 25, 83-97.
- Macintyre, S., & Ellaway, A. (2000). Ecological approaches: Rediscovering the role of the physical and social environment. In L.F. Berkman, & I. Kawachi, I. (Ed.), *Social Epidemiology*, 332-345.
- McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly*, 15, 351-377.

- National Center for Health Statistics. (2005). *Health, United States, 2005: With chart book on trends in the health of Americans* (Library of Congress Catalog No. 76-641496). Hyattsville, MD: Government Printing Office.
- National Center for Health Statistics. (2006). *Health, United States, 2006: With chart book on trends in the health of Americans* (Library of Congress Catalog No.). Hyattsville, MD: Government Printing Office.
- Nies, M. A., Vollman, M., & Cook, T. (1998). Facilitators, barriers, and strategies for exercise in European American women in the community. *Public Health Nursing, 15*, 263-272.
- Office of Management and Budget. (1997, October 30). *Federal register notice: Revisions to the standards for the classification of federal data on race and ethnicity*. Retrieved October 8, 2007, from <http://www.whitehouse.gov/omb/fedreg/1997standards.html>
- Orleans, C. T., Kraft, M. K., Marx, J. F. & McGinnis, J. M. (2003). Why are some neighborhoods active and others not: Charting a new course for research on the policy and environmental determinants of physical activity. *Annals of Behavioral Medicine, 25*, 77-79.
- Owen, N., Humpel, N., Leslie, E., Bauman, A., & Sallis, J. F. (2004). Understanding environmental influences on walking. *American Journal of Preventive Medicine, 27*, 67-76.
- Reed, J. A., Ainsworth, B. E., Wilson, D. K., Mixon, G., & Cook, A. (2004). Awareness and use of community walking trails. *American Journal of Preventive Medicine, 39*, 903-908.
- Richter, D. L., Wilcox, S., Greaney, M. L., Henderson, K. A., & Ainsworth, B. E. (2002). Environmental, policy, and cultural factors related to physical activity in African American women. *Women and Health, 36*, 91-109.
- Robinson, W.S. (1950). Ecological correlations and the behavior of individuals. *American Sociological Review, 15*, 351-357.
- Robison, J. I., & Rogers, M. A. (1994). Adherence to exercise programmes: Recommendations. *Sports Medicine, 17*, 39-52.
- Sallis, J. F., Bauman, A., & Pratt, M. (1998). Environmental and policy interventions to promote physical activity. *American Journal of Preventive Medicine, 15*, 379-397.

- Sallis, J. F., Cervero, R. B., Ascher, W., Henderson, K. A., Kraft, M. K., & Kerr, J. (2006). An ecological approach to creating active living communities. *Annual Review of Public Health, 27*, 297-322.
- Sallis, J. F., Grossman, R. M., Pinski, R. B., Patterson, T. L., & Nader, P. R. (1987). The development of scales to measure social support for diet and exercise behaviors. *American Journal of Preventive Medicine, 16*, 825-836.
- Sallis, J. F., & Owen, N. O. (2002). Ecological models of health behavior. In K. Glanz, B. K. Rimer, & F. M. Lewis (Eds.), *Health Behavior and Health Education: Theory, Research, and Practice* (3rd ed., pp. 462-484). San Francisco: Jossey-Bass.
- Sanderson, B., Littleton, M. A., & Pulley, L. V. (2002). Environmental, policy and cultural factors related to physical activity among rural, African American women. *Women and Health, 36*, 75-90.
- Schmid, T. L., Pratt, M., & Howze, E. (1995). Policy as intervention: Environmental and policy approaches to the prevention of cardiovascular disease. *American Journal of Public Health, 85*, 1207-1211.
- Schoenborn, C. A., Barnes, P. M., & Division of Health Interview. (2002). Leisure-time physical activity among adults: United States, 1997-1998. *Advance Data: From Vital and Health Statistics, 325*, 1-24.
- Siegel, P. Z., Brackbill, R. M., & Heath, G. W. (1995). The epidemiology of walking for exercise: Implications for promoting activity among sedentary groups. *American Journal of Public Health, 85*, 706-710.
- St. George Area Chamber of Commerce. (2005). *Demographics: St George/Washington County, UT*. Retrieved July, 2008, from <http://www.stgeorgechamber.com/EcDev/demographic.breakdown.htm>
- Task Force on Community Preventive Services. (2002). Recommendations to increase physical activity in communities. *American Journal of Preventive Medicine, 22*, 67-72.
- Thompson, J. L., Allen, P., Cunningham-Sabo, L., Yazzie, D. A., Curtis, M., & Davis, S. M. (2002). Environmental, policy, and cultural factors related to physical activity in sedentary American Indian women. *Women and Health, 36*, 59-74.
- United States Census Bureau. (2000). *Census 2000 redistricting data (Public Law 94-171) summary file, Matrices PL1 and PL2*. Retrieved 8 August, 2008, from www.factfinder.census.gov

- United States Department of Health and Human Services. (1996). *Physical activity and health: A report of the Surgeon General*. Atlanta, GA: Centers for Disease Control and Prevention.
- United States Department of Health and Human Services. (2000). *Healthy people 2010: Understanding and improving health* (2nd ed). Washington, DC: United States Government Printing Office.
- Wang, G., Macera, C. A., Scudder-Soucie, B., Schmid, T., Pratt, M., & Buchner, D. (2003). Cost effectiveness of a bicycle/pedestrian trail development in health promotion. *American Journal of Preventive Medicine*, 38, 237-242.
- Wang, G., Macera, C., Scudder-Soucie, B., Schmid, T., Pratt, M., Buchner, D. et al. (2004). Cost analysis of the build environment: The case of bike and pedestrian trails in Lincoln, NE. *American Journal of Public Health*, 94, 549-553.
- Weinberg, R. S., & Gould, D. (2007). *Foundations of sport and exercise psychology* (4th ed). Champagne, IL: Human Kinetics.
- Wilbur, J., Chandler, P., Dancy, B., Choi, J., & Plonczynski, D. (2002). Environmental, policy, and cultural factors related to physical activity in urban, African American women. *Women and Health*, 36, 17-28.
- Xue Xin, W. P., & Myers, L. (2004). Computing aspects of power for multiple regression. *Behavior Research Methods, Instruments, and Computers*, 36, 695-701.
- Young, D. R., He, X., Harris, J., & Mabry, I. (2002). Environmental, policy, and cultural factors related to physical activity in well-educated urban African American women. *Women and Health*, 36, 29-41.
- Young, D. R., & Stewart, K. J. (2006). A church-based physical activity intervention for African American women. *Family and Community Health*, 29, 103-117.

APPENDIXES

Appendix A. Invitation to Participate in Study

Invitation to Participate in Study

Hello! I am a graduate student at Utah State University. I am conducting a survey on this trail as part of my thesis research and would like to get your opinions about this trail. Would you be willing to take this short survey?

The survey should only take five to ten minutes to fill out. I will not take any identifying information from you and your answers will be kept confidential. Participation is voluntary and you may refuse to answer any questions.

Following the survey, if you would like more information regarding the results of this study, you may provide an email or mailing address for information to be sent.

Appendix B. Letter of Information



Dept. of P.E. and Recreation
 7000 Old Main Hill
 Logan, UT 84322-7000
 Voice: (435) 797-1495
 Fax: (435) 797-3759

LETTER OF INFORMATION

The ecological influences of community trail use and physical activity among women

Introduction/ Purpose Professor Phillip J. Waite in the Department of Health, Physical Education and Recreation at Utah State University (USU) and Sarah Moulton, a research assistant, are conducting a research study to find out more about the influences of physical activity and trail use among women. You have been asked to take part as you are a trail user during the time and at the location the study is taking place. There will be approximately 70 participants at this site and total for this research.

Procedures If you agree to be in this research study, you will be asked to complete the paper/pencil survey. The survey will be completed at the trailhead where you agree to participate in the study. The survey will take approximately 10 minutes to complete.

Risks There is minimal risk in participating in this study.

Benefits There may not be any direct benefit to you from these procedures. The investigator, however, may learn more about the benefits and barriers associated with community trails as well as the people who use the trails. This information may help future researchers, community leaders, and policy makers to provide improved places for physical activity. If you wish to be informed of the results of this research study or are interested in any information regarding community trails or the benefits of physical activity, please provide your email or mailing address on a separate sheet of paper. Information will then be sent to you.

Voluntary nature of participation and right to withdraw without consequence Participation in research is entirely voluntary. You may refuse to participate or withdraw at any time without consequence or loss of benefits. You may be withdrawn from this study without your consent by the investigator if the survey is incomplete.

Confidentiality Research records will be kept confidential, consistent with federal and state regulations. Only the investigator, Phillip Waite, PhD. and the student researcher, Sarah Moulton will have access to the data. Any identifying information from the study will be kept in a locked file cabinet in Phillip Waite's office, located in the Health, Physical Education & Recreation department on the Utah State University campus. Any identifying information to study participants from this study will be retained for a period of five years at which point the information will be permanently destroyed.

IRB Approval Statement The Institutional Review Board for the protection of human participants at USU has approved this research study. If you have any questions or concerns about your rights, you may contact the IRB at (435) 797-1821.

Phillip Waite, Ph.D., Principal Investigator
 (435) 797-7217

Sarah Moulton, Research Assistant
 (801) 636-5548

Appendix C. Physical Activity and Trail Survey for Women

ID: OFFICIAL USE ONLY

Physical Activity and Trail Survey for Women

Questions 1-7 will inquire about this and other community trails you may use. Please check the answer that most accurately describes you.

<p>1. What is the primary reason you use this and other community trails? (Pick One)</p> <table> <tr> <td><input type="checkbox"/> Physical activity</td> <td><input type="checkbox"/> Walk dog</td> </tr> <tr> <td><input type="checkbox"/> Recreation</td> <td><input type="checkbox"/> Stress reduction</td> </tr> <tr> <td><input type="checkbox"/> Aesthetics</td> <td><input type="checkbox"/> Other: _____</td> </tr> <tr> <td><input type="checkbox"/> Transportation</td> <td></td> </tr> </table>	<input type="checkbox"/> Physical activity	<input type="checkbox"/> Walk dog	<input type="checkbox"/> Recreation	<input type="checkbox"/> Stress reduction	<input type="checkbox"/> Aesthetics	<input type="checkbox"/> Other: _____	<input type="checkbox"/> Transportation	
<input type="checkbox"/> Physical activity	<input type="checkbox"/> Walk dog							
<input type="checkbox"/> Recreation	<input type="checkbox"/> Stress reduction							
<input type="checkbox"/> Aesthetics	<input type="checkbox"/> Other: _____							
<input type="checkbox"/> Transportation								
<p>2. What type of activity do you usually do on this and other community trails? (Pick one)</p> <table> <tr> <td><input type="checkbox"/> Walking</td> <td><input type="checkbox"/> Bicycle</td> </tr> <tr> <td><input type="checkbox"/> Jog/Run</td> <td><input type="checkbox"/> Other: _____</td> </tr> <tr> <td><input type="checkbox"/> Skating</td> <td></td> </tr> </table>	<input type="checkbox"/> Walking	<input type="checkbox"/> Bicycle	<input type="checkbox"/> Jog/Run	<input type="checkbox"/> Other: _____	<input type="checkbox"/> Skating			
<input type="checkbox"/> Walking	<input type="checkbox"/> Bicycle							
<input type="checkbox"/> Jog/Run	<input type="checkbox"/> Other: _____							
<input type="checkbox"/> Skating								
<p>3. How often do you use this or other community trails?</p> <table> <tr> <td><input type="checkbox"/> Hardly ever</td> <td><input type="checkbox"/> 2-4 times per week</td> </tr> <tr> <td><input type="checkbox"/> Couple times a month</td> <td><input type="checkbox"/> Almost daily</td> </tr> <tr> <td><input type="checkbox"/> Once a week</td> <td><input type="checkbox"/> Daily</td> </tr> </table>	<input type="checkbox"/> Hardly ever	<input type="checkbox"/> 2-4 times per week	<input type="checkbox"/> Couple times a month	<input type="checkbox"/> Almost daily	<input type="checkbox"/> Once a week	<input type="checkbox"/> Daily		
<input type="checkbox"/> Hardly ever	<input type="checkbox"/> 2-4 times per week							
<input type="checkbox"/> Couple times a month	<input type="checkbox"/> Almost daily							
<input type="checkbox"/> Once a week	<input type="checkbox"/> Daily							
<p>4. When using this or other community trails, how long do you use the trail?</p> <table> <tr> <td><input type="checkbox"/> Less than 15 minutes</td> <td><input type="checkbox"/> 31-59 minutes</td> </tr> <tr> <td><input type="checkbox"/> 15-30 minutes</td> <td><input type="checkbox"/> 1 hour or more</td> </tr> </table>	<input type="checkbox"/> Less than 15 minutes	<input type="checkbox"/> 31-59 minutes	<input type="checkbox"/> 15-30 minutes	<input type="checkbox"/> 1 hour or more				
<input type="checkbox"/> Less than 15 minutes	<input type="checkbox"/> 31-59 minutes							
<input type="checkbox"/> 15-30 minutes	<input type="checkbox"/> 1 hour or more							
<p>5. Since you began using this or other community trails has the amount of physical activity you participated in increased?</p> <table> <tr> <td><input type="checkbox"/> No change</td> <td><input type="checkbox"/> Somewhat increased</td> </tr> <tr> <td><input type="checkbox"/> Increased very little</td> <td><input type="checkbox"/> Definitely increased</td> </tr> </table>	<input type="checkbox"/> No change	<input type="checkbox"/> Somewhat increased	<input type="checkbox"/> Increased very little	<input type="checkbox"/> Definitely increased				
<input type="checkbox"/> No change	<input type="checkbox"/> Somewhat increased							
<input type="checkbox"/> Increased very little	<input type="checkbox"/> Definitely increased							
<p>6. How far did you travel today to arrive at this trail?</p> <table> <tr> <td><input type="checkbox"/> No distance</td> <td><input type="checkbox"/> 11-20 minutes</td> </tr> <tr> <td><input type="checkbox"/> 1-5 minutes</td> <td><input type="checkbox"/> Longer than 20 minutes</td> </tr> <tr> <td><input type="checkbox"/> 6-10 minutes</td> <td></td> </tr> </table>	<input type="checkbox"/> No distance	<input type="checkbox"/> 11-20 minutes	<input type="checkbox"/> 1-5 minutes	<input type="checkbox"/> Longer than 20 minutes	<input type="checkbox"/> 6-10 minutes			
<input type="checkbox"/> No distance	<input type="checkbox"/> 11-20 minutes							
<input type="checkbox"/> 1-5 minutes	<input type="checkbox"/> Longer than 20 minutes							
<input type="checkbox"/> 6-10 minutes								
<p>7. How convenient do you feel this trail is to you?</p> <table> <tr> <td><input type="checkbox"/> Not at all convenient</td> <td><input type="checkbox"/> Somewhat convenient</td> </tr> <tr> <td><input type="checkbox"/> Somewhat <i>inconvenient</i></td> <td><input type="checkbox"/> Very convenient</td> </tr> </table>	<input type="checkbox"/> Not at all convenient	<input type="checkbox"/> Somewhat convenient	<input type="checkbox"/> Somewhat <i>inconvenient</i>	<input type="checkbox"/> Very convenient				
<input type="checkbox"/> Not at all convenient	<input type="checkbox"/> Somewhat convenient							
<input type="checkbox"/> Somewhat <i>inconvenient</i>	<input type="checkbox"/> Very convenient							

The following questions will ask you about physical activity. Please check the box next to the answer that most accurately describes you.

<p>8. How often do you participate in physical activity other than your regular job?</p> <p><input type="checkbox"/> Hardly ever (if you answered 'Hardly ever,' skip to question #16)</p> <p><input type="checkbox"/> Couple times a month</p> <p><input type="checkbox"/> Once a week</p> <p><input type="checkbox"/> 2-4 times per week</p> <p><input type="checkbox"/> Almost daily</p> <p><input type="checkbox"/> Daily</p>
<p>9. How often do you participate in moderate intensity activity (brisk walk, gardening, vacuuming, etc)?</p> <p><input type="checkbox"/> Hardly ever</p> <p><input type="checkbox"/> Couple times a month</p> <p><input type="checkbox"/> Once a week</p> <p><input type="checkbox"/> 2-4 times per week</p> <p><input type="checkbox"/> Almost daily</p> <p><input type="checkbox"/> Daily</p>
<p>10. What length of time do you typically participate in moderate intensity physical activity?</p> <p><input type="checkbox"/> Less than 15 minutes</p> <p><input type="checkbox"/> 15-30 minutes</p> <p><input type="checkbox"/> 31-59 minutes</p> <p><input type="checkbox"/> 1 hour or more</p>
<p>11. How often do you participate in vigorous intensity activity (running, swimming, bicycling, etc)?</p> <p><input type="checkbox"/> Hardly ever</p> <p><input type="checkbox"/> Couple times a month</p> <p><input type="checkbox"/> Once a week</p> <p><input type="checkbox"/> 2-4 times per week</p> <p><input type="checkbox"/> Almost daily</p> <p><input type="checkbox"/> Daily</p>
<p>12. What length of time do you typically participate in vigorous intensity physical activity?</p> <p><input type="checkbox"/> Less than 15 minutes</p> <p><input type="checkbox"/> 15-30 minutes</p> <p><input type="checkbox"/> 31-59 minutes</p> <p><input type="checkbox"/> 1 hour or more</p>
<p>13. How far do you typically travel to a facility (e.g. gym, park, trail, etc) to participate in physical activity?</p> <p><input type="checkbox"/> No distance</p> <p><input type="checkbox"/> 1-5 minutes</p> <p><input type="checkbox"/> 6-10 minutes</p> <p><input type="checkbox"/> 11-20 minutes</p> <p><input type="checkbox"/> Longer than 20 minutes</p>
<p>14. Where do you most often participate in physical activity?</p> <p><input type="checkbox"/> Home</p> <p><input type="checkbox"/> Outdoors</p> <p><input type="checkbox"/> Gym</p> <p><input type="checkbox"/> Other: _____</p>
<p>15. What type of physical activity do you participate in most often?</p> <p><input type="checkbox"/> Walking</p> <p><input type="checkbox"/> Jog/Run</p> <p><input type="checkbox"/> Swimming</p> <p><input type="checkbox"/> Bicycling</p> <p><input type="checkbox"/> Other: _____</p>

For the following questions, check the box to the right of each question that most accurately describes you.

	Never	Rarely	A few times	Often	Very Often
16. Does crime influence the location where you participate in physical activity?	<input type="checkbox"/>				
17. Does police patrol influence the location where you participate in physical activity?	<input type="checkbox"/>				
18. Does the presence of stray dogs or other animals influence the location where you participate in physical activity?	<input type="checkbox"/>				
19. Does the safety of outdoor terrain influence the location where you participate in physical activity?	<input type="checkbox"/>				
20. Does the presence of outdoor lighting influence the location where you participate in physical activity?	<input type="checkbox"/>				
21. Does the convenience of a location for participating in physical activity influence the location where you participate in physical activity?	<input type="checkbox"/>				
22. Does the cost of participating in physical activity influence the location where you participate in physical activity?	<input type="checkbox"/>				
23. Does police patrol influence the time of day you participate in physical activity?	<input type="checkbox"/>				
24. Does crime influence the time of day you participate in physical activity?	<input type="checkbox"/>				
25. Does the presence of stray dogs or other animals influence the time of day you participate in physical activity?	<input type="checkbox"/>				
26. Does the presence of outdoor lighting influence the time of day when you participate in physical activity?	<input type="checkbox"/>				
27. Do you generally feel safe when you participate in physical activity outside?	<input type="checkbox"/>				
28. Do you find lack of time is a barrier to participating in physical activity?	<input type="checkbox"/>				

During the past three months, my family (or members of my household) or friends:	Never	Rarely	A few times	Often	Very Often
29. Exercised with me	<input type="checkbox"/>				
30. Offered to exercise with me	<input type="checkbox"/>				
31. Gave me helpful reminders to exercise ("Are you going to exercise tonight?")	<input type="checkbox"/>				
32. Gave me encouragement to stick with my exercise program	<input type="checkbox"/>				
33. Changed their schedule so we could exercise together	<input type="checkbox"/>				
34. Discussed exercise with me	<input type="checkbox"/>				
35. Complained about the time I spend exercising	<input type="checkbox"/>				
36. Criticized me or made fun of me for exercising	<input type="checkbox"/>				
37. Gave me rewards for exercising (bought me something or gave me something I like)	<input type="checkbox"/>				
38. Planned for exercise on recreational outings	<input type="checkbox"/>				
39. Helped plan activities around my exercise	<input type="checkbox"/>				
40. Asked me for ideas on how they can get more exercise	<input type="checkbox"/>				
41. Talked about how much they like to exercise	<input type="checkbox"/>				
42. Changed their schedule so we could exercise together	<input type="checkbox"/>				

The following questions will ask you to provide some general demographic information. Remember all information you provide is anonymous and confidential. Please check the box next to the answer that most accurately describes you.

43. As of today, what is your age? _____	
44. What is the highest grade or year in school you have completed?	
<input type="checkbox"/> Never attended school	<input type="checkbox"/> Some college or technical training
<input type="checkbox"/> Some schooling	<input type="checkbox"/> Bachelors degree or equivalent (B.S., B.A., etc)
<input type="checkbox"/> High school graduate or GED equivalent	<input type="checkbox"/> Post secondary degree (M.S., M.A., PhD, etc)
45. Which one of the following would you say is your race/ethnicity (check all that apply):	
<input type="checkbox"/> American Indian or Alaska Native	<input type="checkbox"/> Native Hawaiian or other Pacific Islander
<input type="checkbox"/> Asian	<input type="checkbox"/> White
<input type="checkbox"/> Black/African American	<input type="checkbox"/> Other: _____
<input type="checkbox"/> Hispanic	
46. Which best describes your annual household income? (please consider all sources of income):	
<input type="checkbox"/> Less than 9,999	<input type="checkbox"/> Between 50,000-74,999
<input type="checkbox"/> Between 10,000-24,999	<input type="checkbox"/> 75,000 or more
<input type="checkbox"/> Between 25,000-49,000	<input type="checkbox"/> Retired

Questions 47-48 are open ended questions.

47. What motivates you to participate in physical activity?

48. What motivates you to use community trails?