

DAY HIKER PREPAREDNESS: ASSESSING THE ROLES OF PAST EXPERIENCE,
SAFETY MESSAGES & KNOWLEDGE OF SAFETY PRACTICES

BY

JARROD SCHEUNEMANN

THESIS

Submitted in partial fulfillment of the requirements
for the degree of Master of Science in Recreation, Sport and Tourism
in the Graduate College of the
University of Illinois at Urbana-Champaign, 2011

Urbana, Illinois

Master's Committee:

Associate Professor Cary McDonald, Chair
Professor William Stewart

ABSTRACT

The purpose of this thesis is to take into consideration the factors that lead to safety preparedness behaviors of day hikers in the Grand Canyon National Park. In addition to that purpose, this study sought to integrate the theory of planned behavior and self-perception theory in order to better understand day hiker safety preparedness behaviors. Secondary data from a study on day hikers in the Grand Canyon National Park was used for this investigation. An interview process was employed as the method of data collection. The interview responses were analyzed and the results suggested that past experience, safety messages and knowledge about safety practices influenced safety preparedness behaviors. This study also found that safety preparedness behavior influenced day hiker posterior attitudes about safety preparedness. The resulting attitudes will help to influence future safety preparedness behaviors in a cyclical manner through the conceptual framework. Search and rescue situations might be avoided in the future by debriefing day hikers after they have completed their hike. These debriefing sessions would serve as safety messages that may help hikers identify their attitudes. In doing so, the safety message would reaffirm their positive attitudes about how they behaved correctly to face the hike's physical challenges or the safety messages can explain what steps the day hiker may need to take if they have negative attitudes about their safety preparedness behaviors.

ACKNOWLEDGEMENTS

Writing a thesis has been no small task for me. Like the mighty Colorado flowing through the ancient canyon, Dr. Cary McDonald has helped carve and shape my thoughts and research. I am thankful for his thoughtfulness and availability amidst his busy schedule. Without his help I would not be where I am today.

I would also like to thank Dr. Bill Stewart for encouraging me to begin this hike and for his faithfulness to see me through to the end. His insight and willingness to help made this thesis possible.

Dr. Laura Payne, Jonathan Hicks, LK Paden, Jeremy Robinett and Brenda Brown were my canteens full of water in an arid land. Thanks for believing in me even when I did not believe in myself.

Thank you to Robin Hall for being my binoculars. Through your lens I can see what parks and recreation are all about. I appreciate your continued efforts to mold my vision into passion not unlike your own.

Jill Gurke, Teri De Haro, and Angela Ronk were like my search and rescue team. Always there to help with anything at a moment's notice and more concerned about my needs than their own. Thank you!

This process has been grueling at times just like many hikes I have been on in the past. I have been blessed with friends and family that helped me soar like the majestic California condor. You are as rare and as special as they are. Yung Kuei, you were my most trusted guide through the rapids of this thesis. Thank you for sharing your time and knowledge about this process. Many thanks to Anna Simeth and Dave Shepherd for helping me start on this journey and for lifting me up along the way. Leslie Ostrander,

Mom Rieder, Dad Repovsch, the Tophams, the Woods, the Martins, the Nelsons, the Orellanas, Kim Cowling and Ashley Ai walked this path with me at times and took interest in where I was going. You cared and that meant everything to me. Mom Rieder, Emily Tira, my sister Sara, the Beatty's, the Barnes', Katie Martin and the Jewell's helped make this possible by loving my little hiker enough to make time for my work and my love. For each of you and everything you did, I am grateful.

Thank you to my Mom and Dad for always sacrificing for my education. I appreciate you both more than you know.

My sister Sara has been my unofficial guide. Your freely given wise council continues to make me successful. May our paths never meander far from the Grand Canyons of the world.

Thank you to my daughter, Cadence, for you are like light dancing in the canyon uncovering new wonders every day. I need not travel far to see the marvels of this world for you are my very own crown jewel.

Last but not least, thank you to my bride, Jessie. My bright angel, we have made it out of the canyon once again and because of you we can do anything together.

To Him through Whom all things are possible.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION.....	1
The Purpose of This Study	3
The Significance of This Study.....	5
CHAPTER 2: LITERATURE REVIEW	7
Introduction.....	7
Attitudes and Behavior Interdependence	7
Safety Preparedness Behavior.....	8
Self-Perception Theory and Theory of Planned Behavior Framework	9
Safety Preparedness Behavior Model	13
CHAPTER 3: METHODS	21
Introduction.....	21
Background and Population.....	21
Procedure	22
Analysis.....	27
CHAPTER 4: RESULTS.....	28
Introduction.....	28
Day Hiker Respondent Socio-Demographic Characteristics.....	28
Key Variable Descriptives	31
Bivariate Relationships and Correlations.....	38
Regression Analysis.....	41
CHAPTER 5: DISCUSSION.....	44
Summary of Findings.....	44
Limitations	54
Conclusions.....	57
REFERENCES	59
APPENDIX A: INTERVIEW INSTRUMENT.....	65

CHAPTER 1: INTRODUCTION

The topography of South Eastern Wisconsin is a landscape where deep depressions sink below the shadow of the rolling hills. Culturally this region is known in glacial terms as the Kettle Moraine. These words give meaning to the evidence of ancient rivers of ice long gone. Their death left one final gift of land, which was stolen from Ontario to the north. This soil left behind broke easily behind the plow as fertile farmland for my German ancestors. Generation begat generation and my grandparents became stewards of the family farm.

Having grandparents that were employed as farmers meant some of my time was occupied by weekly chores in my youth. Farm work; though it could be difficult and grueling at times never really seemed like work to me. Going to the farm meant escape from the city and time spent in communion with nature. That small farm and I created each other and depended on one another. I can distinctly remember the smell of fresh cut alfalfa as I walked the fence lines. The distant woods possessed great adventures surrounded by ancient oak trees and a swampland sliced in two by a cool creek; perfect for lazy afternoons of fishing with a bamboo pole. The barn bank held countless precious gems for an amateur rock hound and made for a good sledding hill. At night, we'd draw our own constellations in a sky that came to life with stars, which were otherwise lost in an artificial glow.

This rolling countryside made for endless encounters with nature. Red-tailed hawks, raccoons, foxes, sand hill cranes, white-tailed deer, barn swallows, woodpeckers, nuthatches and turkeys were my daily companions. It was on those 80 acres that my grandfather and father gave me one of their greatest gifts, a value of land. They showed

me that we were not masters of the land but mere members of the community (Leopold, 1989). Those days on the farm were living illustrations of nature and man living as a community.

As my time on the farm came to a close, I subconsciously looked to fill the void left from what was plentiful on the back forty with the flora and fauna of the national parks. I joined the one-week migration pattern with millions of other Americans to experience our National Parks and began to walk in the footsteps of my forefathers who used the parks to escape the industrial age. In a similar but different fashion, I abandoned the hyper connectivity and technology of our information age for scenic vistas.

Cars took me to these national parks and originally my recreation was found behind the windshield. I filled my eyes full with scenic vistas as I became transformed into a “viewer of views” (Berry, 1979). The roads remained choked with tourists; trophy hunting natural wonders, shooting them with a digital click, and then deserting their carcasses like our forefathers had done without any pride in themselves or their past (Runte, 1979). Worse still was the fact that I was one of them. I look back on this transition with a somber attitude, but I take solace in the fact that in order to appreciate these cultural icons I needed to experience them.

A necessity had developed in me, and maybe in all of us, on how to balance the tame city lifestyle with its wild, natural counterpart. This necessity had been taught in my experiences as a youth living an urban life with weekly escapes to my grandfather’s farm. Just being in wilderness in some capacity had pushed me to step out of the car and it was at that point that the road met its end and the trail began. The deeper I walked into the wilderness and the farther I left the machines behind, the more people I met that were

likeminded. “Thousands of tired, nerve-shaken, over civilized people that were beginning to find out that going to the mountains was going home, that wilderness was a necessity and that mountain parks and reservations were useful, not only as mountains of timber and irrigating rivers but as fountains of life (Muir, 1991).”

Upon meeting these wilderness travelers, I had found in them a kindred spirit that imparted wisdom and friendship. Those that had been there before passed along bits of information on flora and fauna, trail knowledge and etiquette. Others shared their thoughts on life, identity and love. The young spurred us forward with their youthful vigor to reach scenic wonders and then made us remember what it was like to see some of the same things for the first time. It was in these “sanctuaries of reorientation” that life was reduced to the bare essentials of food, water, physical fitness, proper gear, trail knowledge and community (Nash, 1982).

The Purpose of This Study

National park attendance and day hiker numbers, though difficult to measure, continue on an upward trend (Monz, Cole, Leung & Marion, 2010; Papenfuse, Roggenbuck, & Hall, 2000). Many studies, even in large wilderness areas show that most hiking occurs as day-use visitation (Krumpe & Lucas, 1986; Papenfuse et al, 2000; Roggenbuck, Marion, & Manning, 1994). A 1987 study by Roggenbuck and Lucas showed that an overwhelming number of people that were embarking on a hike only walk out into the wilderness for the day. This comprised over half of visitor use in many wilderness areas. The terms wilderness or backcountry are defined by the Grand Canyon National Park Backcountry Office as one step on a trail below the canyon rim or one step out of a developed section of the park (Grand Canyon Backcountry Management Plan,

1988). Therefore, when referring to wilderness or backcountry, this study will be adhering to the Grand Canyon Backcountry Management Office's definitions of these terms.

The same first step that pulled me from the parking lot into the backcountry is pulling many others into the wild. Many national park visitors are becoming day hikers in an effort to find their voice, chase adventure, seek solitude, exercise, encounter nature and reduce life to the bare essentials for a time (Roggenbuck et al., 1994).

In order to accomplish these goals as a day hiker, it is essential for one to be prepared upon entering the wilderness. Prepared day hiking in the backcountry is defined as having the skills and abilities to gather the necessary tools and information in order to foster a safe encounter with the wilderness (Heggie & Amundson, 2009).

Unfortunately, the lack of safety preparedness of day hikers has put increased stress on the wilderness community. The national park staff alone endures physical hardship, possible injury, death and enormous financial pressure in order to rescue sick, lost or injured day hikers (Heggie & Amundson, 2009; Heggie & Heggie 2009; Heggie, Heggie, & Kliwer, 2008).

These safety issues have led to the underlying research question, which is: What are the causes behind day hikers entering the backcountry unprepared to face the physical challenges ahead? Specifically, the purpose of this study will look to identify the factors that lead to safety preparedness for day hiking in the Grand Canyon National Park. A combination of the theory of planned behavior (TPB) (Ajzen, 1991, 2002; Fishbein & Ajzen, 1980) and self-perception theory (SPT) (Bem, 1967; Bem & McConnell, 1970)

will be applied in hopes that they will provide insight into how current and future efforts to reach the day hiker population may be formulated.

The Significance of This Study

First, to my knowledge this will be the first study exploring the relationship between safety preparedness and the conceptual frameworks of the theory of planned behavior (Ajzen, 1991, 2002; Fishbein & Ajzen, 1980) and self-perception theory (Bem, 1967; Bem & McConnell, 1970). Next, this study is also significant because previous literature states that the often-neglected day user needs to be better understood, assessed, considered and managed as an important member of the backcountry hiking community (Cole, 2001). Most, if not all day hiker studies discuss the limited amount of research that has been collected on the day hiker and have appealed for future research to focus on this population (Heggie & Amundson, 2009; Papenfuse et al, 2000; Stewart, Cole, Manning, Valliere, Taylor, & Lee, 1999). Lastly, the identification of the significant variables that lead to safety preparedness behaviors and what affect those behaviors have on resulting attitudes should provide practical implications for park managers.

The main implications should be relevant to the need for day hiker safety preparedness. It is very likely that day hikers in the national parks have various levels of abilities to safely prepare for backcountry excursions and some may not realize how expensive the SAR operations really are (Heggie & Amundson, 2009). Nor do they miss the additional benefits they could be receiving if the money used for SAR incidents would be applied to other budgetary shortfalls (Heggie & Amundson, 2009). This study provides an opportunity to better comprehend the issue of day hiker safety preparedness behavior in hopes of lowering day hiker and national park service personnel injuries,

SAR costs, and budgetary shortfalls. The following objectives pose questions that will look to meet the aforementioned needs:

Objective 1: To understand day hiker safety preparedness by integrating the theory of planned behavior and self-perception theory.

Objective 2: To assess the influence of past experience, safety messages and knowledge of safety practices on day hiker safety preparedness behaviors in the Grand Canyon National Park.

Objective 3: To identify strategies to reduce the number of search and rescue situations and increase day hiker safety at the Grand Canyon National Park.

In order to better understand the concepts involved in targeting day hiking safety preparedness behavior, the literature review will provide a background on previous day hiker studies and what safety preparedness behavior should look like in the GCNP environment. The literature review will also seek to understand the application and integration of the conceptual frameworks of the self-perception theory (Bem, 1967; Bem & McConnell, 1970) and the theory of planned behavior (Ajzen, 1991, 2002) as they relate to safety preparedness behaviors in day hiking.

CHAPTER 2: LITERATURE REVIEW

Introduction

In 2004, I had the good fortune of embarking on a ranger led hike through the seldom-traveled fiery furnace section of Arches National Park. Halfway through the hike, a fellow day hiker fainted from heat exhaustion. Search and rescue personnel had to carry him out on a stretcher through treacherous landscape. They estimated that if the journey went well and if they received additional help from other hikers it would take them four hours to move the man to safety. It was clear to me then and it became evident during later hikes that not all day hikers understand how to prepare for a safe hike in difficult wilderness settings. The literature that was reviewed supports the notion that safety preparedness is an issue for the day hiking community, specifically in the GCNP. This section will begin by discussing the theoretical relationship of attitudes and behavior. Next, the literature review will define safety preparedness behavior and its importance in day hiking at the GCNP. Then, this chapter will continue by outlining the self perception theory (Bem, 1967; Bem & McConnell, 1970) and the theory of planned behavior (Ajzen, 1991; 2002) conceptual frameworks for the study. The TPB will also be applied to understand what effect it may have on day hiker safety preparedness in the context of the GCNP. Furthermore, the literature review will provide evidence that identifies a model and factors that lead to the safety preparedness of day hikers through the conceptual framework.

Attitudes and Behavior Interdependence

Human attitudes and behavior are often best deduced in the light of social psychology. Still, there has been considerable debate in the social psychology

community about whether or not attitudes influence behavior or if behavior influences attitudes. The theory of planned behavior (TPB) has shown that antecedent attitudes lead to behavior and the self-perception theory (SPT) has shown that behavior leads to posterior attitudes.

While day hikers certainly may hold antecedent attitudes before they depart for their hike, the secondary data that will be used for this study did not question day hikers prior to embarking on their hike. Posterior attitudes about safety preparedness behaviors were assessed utilizing the preparedness module of the interview. This study will adapt TPB and SPT frameworks to explain safety preparedness behaviors and attitudes. The model suggests a feedback loop that forms antecedent attitudes that influence safety preparedness behaviors in a cyclical nature. The framework for the TPB is also important in providing insight toward additional factors that lead to day hiker safety preparedness behavior in the GCNP. This literature review will seek to integrate these theories in order to better understand the big picture of the cyclical relationship between the preparedness attitudes and safety preparedness behavior of day hikers at the GCNP.

Safety Preparedness Behavior

The concept that is commonly shared by both the SPT and the TPB is behavior. Behavior has been defined as an individual's observable response in a given situation with respect to a given goal to be reached (Ajzen, 1992, 2002; Bem, 1967; Fishbein & Ajzen, 1980). This study will focus on reported behaviors that led to safety related incidents in the context of preparedness. The most glaring issue caused by day hikers is safety related incidents (Heggie & Heggie, 2009; Marion & Reid, 2007; Schwartz et al, 2009; Stewart et al, 1999).

Heggie and Heggie (2009) reported multiple factors behind SAR deployment for lost or injured day hikers in the national park backcountry setting. Incident reports included the following reasons behind deployment: errors in judgment, fatigue and physical conditioning, insufficient equipment, inadequate clothing, poor training, weather conditions, equipment failure and darkness.

The GCNP is no stranger to these same factors as cause for safety concern. Extreme temperatures create desert like conditions that require early hike start times. Starting one's hike earlier is necessary to avoid the midday sun that may cause heat exhaustion or heat stroke (Schwartz et al, 2009; Stewart et al, 1999). The heat also can cause dehydration and the GNCP staff suggests that day hikers carry and drink at least a gallon of water per hiker per day (Grand Canyon National Park website, 2011). Water intake needs to be at least one quart per hour so that a person does not get dehydrated (Grand Canyon National Park website, 2011). Other safety issues that day hikers need to be aware of involve food intake, gear, and map use (Grand Canyon National Park website, 2011; Stewart et al, 1999).

Self-Perception Theory and Theory of Planned Behavior Framework

In order to understand the big picture surrounding safety preparedness behavior of day hikers in GCNP, it is important to integrate and apply the conceptual frameworks from the TPB and the SPT to this study. Figure 1 below highlights the adapted conceptual model for the TPB in light of the SPT. The reader will be provided a background on these theories and their concepts prior to the introduction of the safety preparedness model and its related concepts that will be used to understand safety preparedness in this study.

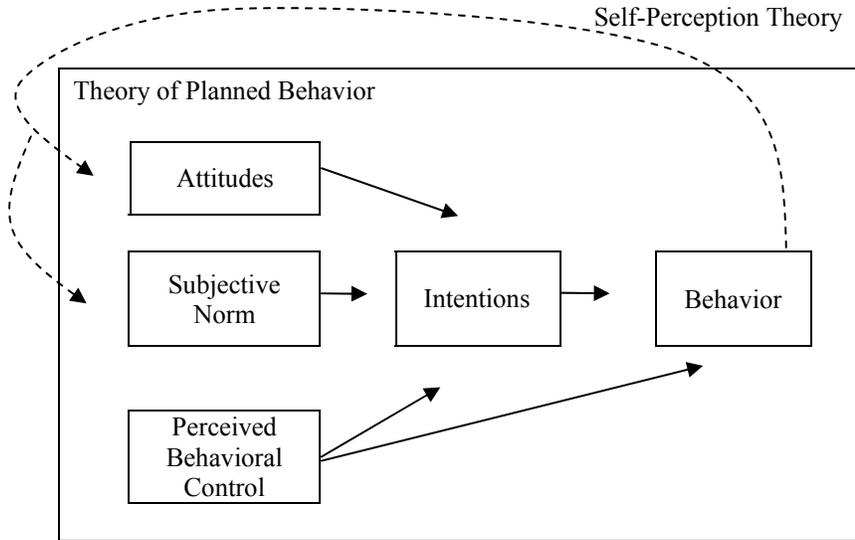


Figure 1. Understanding day hiker preparedness through the theory of planned behavior and self-perception theory.

Attitudes

The SPT states that posterior preparedness attitudes would be inferred from observing one’s own safety preparedness behaviors after day hiking in the context of the GCNP (Bem, 1967; Robak, 2001). In the past, many observer-participant studies produced results that have shown that attitudes are formed when observing one’s own behavior (Bem, 1967; Bem & McConnell, 1970; Beauvois & Joule, 1982). An individual’s capacity to learn is found through observation. Children learn by observing others and the world around them. One also learns and forms attitudes by observing their own behaviors. When a day hiker in the Grand Canyon National Park steps off the trail after completing a hike; that individual is armed with multiple observations of their hiking experience and their own behaviors during that experience. They reflect on what they saw and how they fared on the day hike. The day hiker observes that they took enough water and did not get dehydrated or that they carried a map, which came in handy

when they thought they were lost. These observations influence the day hiker's posterior attitudes about feeling prepared for the hike they just completed. Those posterior attitudes will then cause the day hiker to decide that they will carry the same items in their pack on the next GCNP hike because they made them feel prepared to face the physical challenges they would face. Behavior shapes attitude in light of this theory and its integration is useful in showing how safety preparedness behaviors shape preparedness attitudes. This shaping of the posterior attitudes will then be integral in forming future antecedent preparedness attitudes, which in turn will shape safety preparedness behaviors through the TPB framework in a cyclical fashion.

The TPB places antecedent preparedness attitudes as causal to safety preparedness behaviors. One's attitudes about safety preparedness behaviors when placed in conjunction with the concepts of subjective norm and perceived behavioral control lead to behavioral intention, which is the readiness of a person that is willing to perform a behavior (Ajzen, 2002; Fishbein & Ajzen, 1980; Martin & McCurdy, 2009). Behavioral intention then precedes behavior. These concepts are integral to one another in the formation of behavior and provide a good map as to how certain factors will work together to formulate safety preparedness.

Subjective Norm

The second construct of the TPB, labeled subjective norm is formed by beliefs of what significant others and authority figures want a person to do weighted against one's motivation to comply (Bright & Fishbein, 1993; Fishbein & Ajzen, 1980). An individual decides how they should or should not behave based on the judgment of significant others or authority figures. Significant others or authority figures can be described as parents,

siblings, friends, teachers, coaches, police officers, government officials and in the case of this study, park rangers. Motivation to comply is defined as how compelled one feels to do what other's desire (Gotch & Hall, 2004). Social expectations are shaped by interactions with significant others and authority figures and individuals desire to conform to these expectations.

Perceived Behavioral Control

The TPB is an extension of the theory of reasoned action (TRA). Natural resource and social science studies have applied the TRA in order to understand the relationship between attitude, subjective norm, intention and behavior through hunting practices (Rossi & Armstrong, 1999), nature related behaviors of children (Gotch & Hall, 2004), and wild land fire management (Vogt et al, 2005).

One criticism of the theory of reasoned action (TRA) had been that it did not account for behaviors that were spontaneous or impulsive because they might not be voluntary actions (Ajzen, 2002). These criticisms led Ajzen (1991, 2002) to expand upon the theory of reasoned action by incorporating a construct involving perceived self-efficacy (Bandura, 1991, 1997). Perceived self-efficacies are people's beliefs about their capabilities to organize and execute the courses of action required to produce given levels of attainment. The self-efficacy component of the construct deals more with the internal factors, whereas the controllability deals with the external factors (Ajzen, 2002). The construct of self-efficacy that included an element of controllability was restated as perceived behavioral control (PBC) and the TRA became the theory of planned behavior (Ajzen, 1991).

Safety Preparedness Behavior Model

The conceptual frameworks previously described are useful in creating a map for the factors that lead to safety preparedness for day hikers in GCNP. To my knowledge, SPT has not been used in the context of nature related recreation and safety preparedness behaviors. The TPB however, has been successfully used to understand nature related recreation behaviors, including the hiking experience (Martin & McCurdy, 2009; Reigner & Lawson, 2009). Therefore past research will be outlined in order to determine its applicability to day hiker safety preparedness in the GCNP. This section will begin by providing the research model listed below in Figure 2. Then it will describe the concepts and how they factor into safety preparedness behavior.

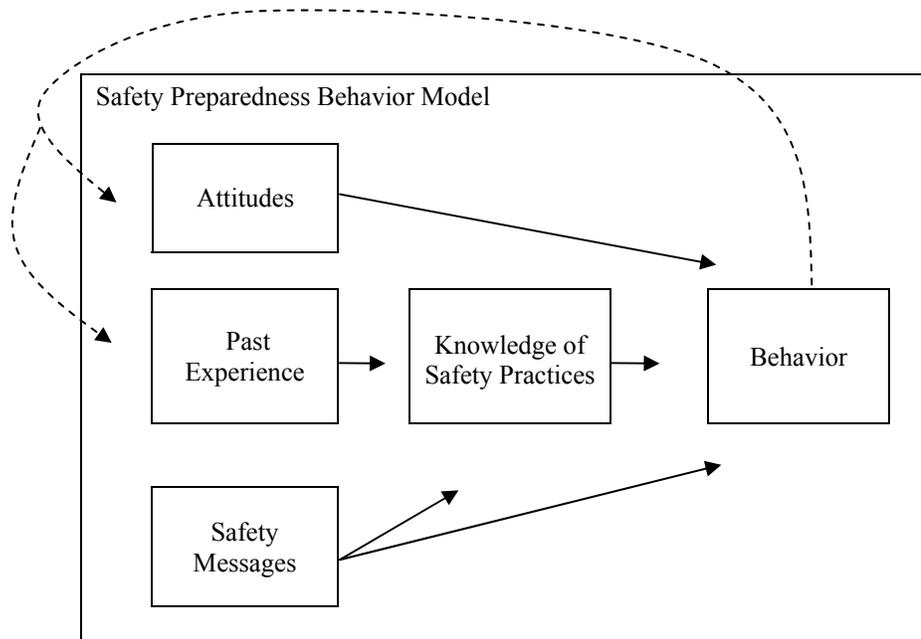


Figure 2. Understanding day hiker preparedness through the safety preparedness behavior model.

Past Experience Concept

The first concept, experience, has been used with two different implications in past research. One meaning of experience can be described with the phrases “to experience something” or “to have an experience,” which are a person’s psychological interpretation of the corresponding events (Schreyer, Lime, & Williams, 1984). The other implication of experience refers to the amount, extent and types of events and individual has participated in (Schreyer et al, 1984). This type of experience has been labeled in the natural resource and recreation field as experience use history (Backlund, Hammitt, & Bixler, 2006a; Schreyer et al, 1984), past on-site experience (Hammitt & McDonald, 1983), past experience (Acharya, Paudel, & Hatch 2009; Kuentzel & McDonald, 1992; McFarlane et al, 1998; Watson et al, 1991) and as a component of recreation specialization theory (Bryan, 1977). For purposes of this study, this concept will be referred to as past experience since most social science recreation research has arrived at Schreyer et al’s (1984) second definition of experience despite the difference in terminology.

Previous investigations of past experience should be significant to this Grand Canyon day hiker study in a number of ways. First, each of these studies investigated participants across the spectrum of past experience use in backcountry settings such as wilderness hiking (McFarlane et al, 1998; Watson & Niccolucci, 1992; Watson & Roggenbuck, 1991) and river recreation (Backlund et al, 2006a; Hammitt & McDonald, 1983; Kuentzel & McDonald, 1992; Schreyer et al, 1984). Their foundational work in understanding how to build variables from the past experience constructs in relation to

the wilderness user should be useful in understanding how to operationalize the past experience variable for the GCNP backcountry day hiker.

Second, past experience's relationship with the safety message concept and the knowledge of safety practices concept have been evident in past literature. Watson & Roggenbuck (1991) noted the relationship between the knowledge of safety and minimal impact practices and past experience in the process of development theory, stating that knowledge is gained through experience and that the internalization of knowledge allows a person to make sense of external situations differently. Studies have shown that past experience reflects the amount and type of information available to a wilderness user when making choices and may reflect cognitive development (McFarlane et al, 1998). This cognitive development helps day hikers make choices in the wilderness environment. Errors in judgment was one of the major reasons cited in the SAR incident reports for why day hikers get into trouble in the backcountry (Heggie & Amundson, 2009). One's knowledge about safety practices may be another factor that is interrelated with past experience in the process of being fully prepared to safely day hike in the GCNP.

Additionally, the experienced user has accumulated more information about the resource and has elaborate mental organization of the executed experience (Kuentzel & McDonald, 1992). Day wilderness users with a higher level of experience allows them to make finer distinctions among settings and activities causing them to need more detailed information. This directly affects the safety messages one encounters, which is another concept in the safety preparedness model (Watson & Roggenbuck, 1991).

McFarlane et al (1998) also found that social influence (i.e. social norm) is correlated with past experience in wilderness user choice behavior. McFarlane et al's (1998) application of the TPB shows that past experience is a concept that influences attitude, subjective norm, perceived behavioral control and ultimately behavior. In turn, past experience may lead to safety preparedness behavior in this study.

Safety Messages Concept

The next concept formulated from the examination of literature will be safety messages. A past focus of management in the national parks has been to impart information to guide day hiker behavior related to safety issues (Hughes, Ham, & Brown, 2009; Park, Manning, Marion, Lawson, & Jacobi, 2008). Safety messages are forms of communication disseminated to visitors of the national parks via posters, brochures, books, websites and videos. These campaigns are called indirect management practices and they work to positively affect visitor behavior without regulating actions (Newman et al, 2003). Communication style in this practice of management is necessarily persuasive in manner in order to influence attitudes and negative behavior without encroaching on the freedoms of the visitor (Bullock & Lawson, 2008; Hocket & Hall, 2007). Indirect management safety messaging campaigns that have applied the theory of planned behavior have been effective in building visitor knowledge on food storage in Yosemite National Park (Lackey & Ham, 2004) and influencing unsafe off trail hiking behavior in Haelakala National Park (Reigner & Lawson, 2009). Indirect management safety messaging campaigns have also been found to provide a deeper and more lasting behavioral change in visitors at a recreation or wilderness setting (Petty et al, 1992; Reigner & Lawson, 2009). However, relying on passive communication media, such as

signs and brochures may not be enough (Cole, Hammond, & McCool, 1997), which leads us to the direct style of management safety messaging.

The direct management style of safety messaging relies on the source of the message rather than the message itself (Cacioppo & Petty, 1984; Marion & Reid, 2007; Petty et al, 1992). In the case of the national parks, the source of the message is most often a park ranger or volunteers (Marion & Reid, 2007). In the GCNP, preventative search and rescue rangers are employed to make hikers aware of safety issues (Grand Canyon National Park website, 2011; Stewart et al, 1999). These preventative search and rescue safety messages also represent the beliefs of the authority figure (the national park service and its rangers) that pressure the day hiker to align with the idea of performing a desirable preparedness behavior or to forgo the performance of a negative preparedness behavior in order to have a safe hike. Safety messaging in this regard then should apply to the subjective norm construct of the theory of planned behavior model and may influence safety preparedness behavior in this study's model.

This study will also argue that indirect management safety messaging conducted by the national park service in the Grand Canyon is perceived as the subjective norm for day hikers as well because safety messages are disseminated by the authority figure, the national park service (Reigner & Lawson, 2009). National park visitors would then be subject to pressures in many forms from the national park service to act in a certain manner. This would allow for the safety-messaging concept to fit well in the framework of the TPB (Ajzen, 1991; Fishbein & Ajzen, 1980; Reigner & Lawson, 2009).

Safety messaging research has determined that face-to-face contact (Marion & Reid, 2007); source credibility (Lackey & Ham, 2004), personal contact from agency

representatives (Fazio, 1979), or a combination of both brochure messaging and personal contact (Marion & Reid, 2007) have influenced behavior. Additional studies have analyzed behavior before and after the application of safety messaging treatments in the case of littering (Brown, Ham, & Hughes, 2010), off trail hiking (Bullock & Lawson, 2008), wildlife feeding (Hughes et al, 2009), unleashed dog walking (Hughes et al, 2009) and food storage (Martin & McCurdy, 2009). Safety messaging may be interrelated to the other concepts of safety preparedness behavior, knowledge of safety practices, and past experience because it may enlarge a participant's knowledge base or awareness of impacts, provide social context, and ultimately influence behavior (Brown et al, 2010; Cole et al, 1997; Marion & Reid, 2007; Park et al, 2008; Teel et al, 2006).

Safety messages are also important to the GCNP day hiker study because TPB communications are effective in influencing misguided or uninformed behaviors (Hrubes et al, 2001; Hughes et al, 2009). Previous research of GCNP day hikers found glaring issues related to water consumption and hike departure time (Stewart et al, 1999). GCNP day hikers still face the same extremely hot hiking conditions, lack of services in the backcountry, and physically strenuous conditions that make water consumption and hike departure times critical to one's safety. Seventy four percent of hikers surveyed in this study were completing their first hike (Backlund et al, 2006b). Safety messaging may have been the only way to influence their misguided or misinformed safety preparedness behaviors in the GCNP.

Knowledge of Safety Practices Concept

The final concept that is important to day hiker preparedness in the GCNP is their knowledge of safety practices. When referring to the knowledge of day hikers in the

GCNP, this study is characterizing the concept as the awareness of safety practices that would prevent injury and possibly even death (Heggie & Amundson, 2009; Newman et al, 2003; Stewart et al, 1999). The managerial implications of a previous day hiker investigation at the GCNP found problem issues that need to be targeted. The target problems were visitor capacity to carry the recommended quantity of water and hike departure time (Stewart, 1999).

Previous investigations have shown that one's knowledge of safety practices is correlated with the safety-messaging concept. Researchers have analyzed knowledge's connection with safety messages via signage relating to campsite and campfire impacts (Reid & Marion, 2005), trailside bulletin influence on wilderness travelers (Cole et al, 1997), Grand Canyon hiker safety promotional campaign information retention (Stewart et al, 1999), and human-black bear conflicts (Lackey & Ham, 2004).

The knowledge of safety practices concept might be related to the past experience concept through development theory. Development theory explains that knowledge is gained through past experience (Watson & Roggenbuck, 1991). The internalization of that knowledge then allows a person to cognitively develop, interpret and make sense of external situations in a wilderness setting (McFarlane et al, 1998; Watson & Roggenbuck, 1991). If knowledge is important in interpreting the situations we encounter then it may be an influence on behavior in our safety preparedness model.

Past research indicates that knowledge of safety and minimal impact practices is a valuable element of the theory of planned behavior. Studies on littering in wilderness settings, (Brown et al, 2010) wildlife feeding and unleashed dog walking (Hughes et al, 2009) have shown that the theory of planned behavior can be applied to influence

problematic behaviors by adding to the knowledge base that helps eliminate misguided or uninformed actions (Brown et al, 2010; Marion & Reid, 2007). Knowledge retention has also been cited as an important factor in communication efforts that have influenced visitor judgment, preparation and experience (Heggie & Heggie, 2009).

These concepts and their relationships will be analyzed in the context of secondary data obtained from a report published in 2006 on day hiking in the GCNP (Backlund et al, 2006a). The following chapter will outline how the variable data was recorded, how it will be analyzed to understand its influence of safety preparedness behavior and if any interrelationships exist among these variables in the safety preparedness model.

CHAPTER 3: METHODS

Introduction

This study examines the factors that lead to safety preparedness behaviors of day hikers in the GCNP. Specifically, the research looks to answer the following objectives:

Objective 1: To understand day hiker safety preparedness by integrating the theory of planned behavior and self-perception theory.

Objective 2: To assess the influence of past experience, safety messages and knowledge of safety practices on day hiker safety preparedness behaviors in the Grand Canyon National Park.

Objective 3: To identify strategies to reduce the number of search and rescue situations and increase day hiker safety at the Grand Canyon National Park.

Background and Population

In the summer and fall of 2004, a team of researchers did an extensive study on backcountry day hikers for the GCNP. Previous studies of hikers in wilderness settings had used onsite interviews with a mail back questionnaire (Manning et al, 1999; Newman et al, 2003). This method was often employed because participants were able answer more questions at a greater depth using a mail back survey that was not constrained by time like the onsite interview. These questionnaires had largely focused on domestic users. The GCNP has many international visitors that would be less likely to respond to a survey. To more fully represent the day hiker population and provide an opportunity to generalize the data acquired, the researchers utilized a multi-site interview only technique.

Procedure

Interview Variables & Instrument

In order to get the full picture of day hiker attitudes and actions when hiking in the Grand Canyon, a long interview process might be necessary. In light of this issue and out of respect for those out enjoying their hike, four thematic modules were developed and presented to a systematic random sample of day hikers. A nucleus of questions that did not alter was consistently presented to each group or individual relating to group size, age, length of hike, length of stay, previous hiking experience, and socio-demographic characteristics.

The four thematic modules were designed to garner responses that helped answer their study objectives. The first module related to hiker attitudes toward preparedness, safety and management actions. The second module assessed hiker's knowledge of minimal impact practices, safety and their attitudes about protecting resources. The next module evaluated hiker's satisfaction with trail attributes, impact perception and if they were satisfied overall. The final module on motivation looked at day hiker preferences for different types of recreational experience. For purposes of this study, the preparedness and knowledge module responses will be utilized. A full copy of the interview instrument can be found in Appendix A.

A purposive sample of trails was then identified for where the study would be conducted in the GCNP. The selected trails included South Rim corridor trails (Bright Angel and South Kaibab), South rim threshold trails (Hermit and Grandview) and North rim trails (North Kaibab, Widforss and Ken Patrick). The sampling frame consisted of day hikers on these trails that were interviewed during the months of May through

October in 2004. The interview schedule pulled representative portions from time periods ranging from 6 a.m. to 8 p.m. and included weekday and weekend days across the spectrum of selected trails. A systematic random sample was used to identify day hikers that were hiking uphill. The sample interval of n was used and each g^{th} hiker that appeared to be over the age of 18 was propositioned to take part in the interview. If the selected hiker was inclined to participate or yielded to another person in their party then the interview was conducted. After completing the interview, the person conducting the interviews began counting individuals until the next g^{th} number of day hiker was reached.

The results from this study should generalize well to backcountry day hikers in the GCNP. A systematic random selection process was used to select participants and the drop out rate was extremely low. This study also included a very large number of respondents with understanding that a larger sample will help provide a better picture of what day hikers in the Grand Canyon look like. Safety issues specific to the trails of the GCNP such as heat conditions, lack of potable water and hike decent followed by ascent might not make resulting implications as generalizable to other national park hiker populations. However, the results should be a good indicator of backcountry day hiking in the GCNP and should help to show how past experience, one's knowledge of safety practices and safety messaging influence day hiker safety preparedness behavior, regardless of the differing safety issues at other parks.

Measurements

The secondary data that will be used for this study was split into four interview modules (Backlund et al, 2006b). All four modules contained core questions that provided information on respondent's socio-demographics, past experience, length of

visit and perceived physical fitness. Each module contained questions that were specific only to that module (Backlund et al, 2006b). The knowledge interview module contained questions that focused more on factors that lead to safety preparedness behavior. The preparedness module interview focused on day hiker posterior attitudes about safety preparedness behaviors. The two modules share the questions that will shape safety preparedness behavior but theory integration is necessary in order to explain the factors that lead to safety preparedness behavior.

In this study, day hiker safety preparedness behavior will serve as both the dependent variable and an independent variable. The GCNP conducts promotional campaigns called “Hike Smart” that outlines ten items that experts have identified as necessary to complete a safe hike (Grand Canyon National Park website, 2011). Day hikers were asked if they carried each of these items. Water is clearly the most important item necessary for survival on a day hike (Grand Canyon National Park website, 2011; Stewart et al, 1999). Therefore, it is important to question if the amount of water day hikers carried was sufficient in addition to the other ten items suggested for a safe hike. Question 13 in the interview instrument, which can be found in Appendix A, asked respondents if they were carried the ten items deemed necessary by the GCNP and if they had sufficient water. The safety preparedness behavior concept will be operationalized into variable form according to the sum of a composite score given to the answers of each of these questions.

An interval scale was created in which weights were provided for each “yes” answer. Water and food were intuitively deemed the most important items required for a safe hike in the GCNP and will be weighted the highest on the scale. The remaining

items were weighted according to how they were listed in order of importance on the GCNP Hike Smart webpage (Grand Canyon National Park website, 2011). The scores for each item carried were then added together to equal the total score for safety preparedness behavior. A list of the interval scale for safety preparedness behaviors can be found in Table 1.

Table 1.
Safety Preparedness Behavior Weighted Scores

Item Taken on Hike	Score
Water	11
Was the amount of water sufficient?	11
Food	11
First Aid	8
Map	7
Flash Light	6
Hat	5
Sunscreen	4
Signal Mirror	3
Jacket	2
Electrolyte	1

In the preparedness module interview, day hikers were asked their level of agreement with the statement, “I was well prepared for my hike.” Safety preparedness attitudes will act as the dependent variable in order to show that safety preparedness behavior has influence on antecedent preparedness attitudes. Question 17.D. in the interview instrument, which can be found in Appendix A was used to solicit responses to the statement “I was well prepared for my hike” and will be used to operationalize the preparedness attitude concept into variable form.

Second, the past experience concept will be operationalized through question 9 in the interview instrument, which can be found in Appendix A. This question determined how many total day hikes (including their current hike) the respondent had taken at the GCNP.

The next concept, safety messaging, is founded in question 11.B in the interview instrument, which can also be located in Appendix A. This question asked the day hiker about whether or not they received any information about hiking the Grand Canyon prior to departure on their hike. If they responded yes, then they were prompted to circle all forms of communication from which they received that information. Since the concept of safety messaging relates to the construct of subjective norm in the conceptual framework, this study will operationalize safety messaging as whether or not day hikers received information from the authority figure, which in this case is a park ranger.

A series of eleven true/false statements were presented to participants of the knowledge module interview. The statements related to one's knowledge of safety and minimal impact practices while day hiking in the GCNP. These statements were posed to respondents through question 18 in the interview instrument, located in Appendix A.

Correct answers provided by each interview participant to the previous true/false statements will be compiled into a composite variable. Therefore, the day hikers that answer all eleven questions correctly will have the highest score in the knowledge test and demonstrate that they are the most knowledgeable day hikers. Not all of the statements pertain specifically to safety preparedness behavior. By including knowledge statements that relate to minimal impact behavior, this scale shows a depth of backcountry knowledge making the assumption that one's knowledge base is much

broader in scope and therefore they will be more prepared when entering the backcountry of the GCNP.

Analysis

A complete copy of the interview questionnaire can be found in Appendix A. The responses to the interview were entered in SPSS upon completion. The three research questions dealt with differing aspects of safety preparedness behavior, which called for a variety of analytical methods to be employed. Statistical analysis will be conducted through SPSS software to determine variable correlations and regression analysis of the safety preparedness model.

CHAPTER 4: RESULTS

Introduction

The results section will be comprised of four sections that will discuss the findings of this research. First, in order to present a broad picture of the characteristics that day hikers of the Grand Canyon National Park possess, a brief synopsis of participant socio-demographics will be presented. The second section will provide descriptive information on the key variables in the study. The next section will discuss the bivariate relationships of the key variables through statistical analysis. The last section will explain the regression analysis of the key variables in the testing of the day hiker safety preparedness model.

Day Hiker Respondent Socio-Demographic Characteristics

One thousand nine hundred and eighty-one people chose to take part in answering parts of the day hiker interview questionnaire. In an effort to reduce the lengthy interview process that interrupts the day hikers from enjoying their time in nature, the interview was segmented into two parts. All respondents were asked a series of twenty-three questions on topics ranging from hiking experience to socio-demographics. Two additional questions were asked of the groups in separate module format. The knowledge module had four hundred and ninety-eight respondents. Four hundred and eighty-three people participated in the motivations module. The preparedness module had four hundred and ninety-one respondents and the satisfaction module had four hundred and eighty-eight respondents.

This study will analyze key variables from the knowledge module and preparedness module. Despite treating these modules as separate datasets, demographics

were very similar as noted in Table 2. Of the 498 respondents that participated in the knowledge module interview, majorities were male (59%), Caucasian (93%), and had received a college education of four or more years (72%). In the preparedness module, sixty-one percent (61%) of the respondents were male, ninety-three percent (93%) were Caucasian and seventy-three percent (73%) had received a college education of four or more years.

Knowledge module respondent's ages were fairly even across ten-year age groupings ranging from nineteen percent (19%) in the age group 20-29, twenty three percent (23%) in the age group 30-39, twenty seven percent (27%) in the age range of 40-49 and nineteen percent (19%) in the age group of 50-59. Whereas, the preparedness module had nineteen percent (19%) in the age group 20-29, twenty-one percent (21%) in the age group 30-39, twenty-six percent (26%) in the age range of 40-49 and twenty one percent (21%) in the age group of 50-59.

Roughly eighty-five percent (85%) of all respondents in both modules had a total household income of \$35,000 or higher. Approximately thirty-six percent (36%) of respondents in both data sets recorded that their total household income exceeded \$95,000.

Table 2.
Respondent Socio-Demographics

Variable	Percentage	
	Knowledge Module Respondents (N=498)	Preparedness Module Respondents (N=491)
Race/Ethnicity		
American Indian	0.2	0.7
Asian	5.3	4.6
African-American/Black	0.2	0.4
Caucasian	93.1	93.2
Pacific Islander	0.3	0.2
Did not wish to answer	0.9	0.9
Age by Group		
8-19	3.1	4.6
20-29	18.5	18.6
30-39	23.4	21.1
40-49	27.2	25.7
50-59	18.7	21.2
60+	9.1	8.8
Total Years of Education		
High School Diploma	9.9	8.3
Some Post High School	16.7	18.1
Bachelors Degree	35.6	35.5
Some Post Bachelors Degree	2.5	2.3
Graduate Degree and Above	34.4	34.7
Total Household Income		
Under \$10,000	5.7	4.5
\$10,000 -\$19,000	1.7	4.8
\$20,000 -\$34,999	7.1	6.5
\$35,000 -\$49,999	13.5	9.0
\$50,000 -\$64,999	13.8	16.0
\$65,000 -\$79,999	12.8	11.0
\$80,000 -\$94,999	9.1	11.8
\$95,000 +	36.2	36.3

Key Variable Descriptives

For the purpose of review, the five key concepts in the study are past experience, safety messages, knowledge of safety practices, safety preparedness attitudes and safety preparedness behavior. This section will describe how each of the concepts were operationalized into variable form so that the reader will be able to comprehend what the variables look like in relation to the Grand Canyon day hiker. The knowledge module data set will be used for the past experience, safety messaging and knowledge of safety practices concepts. The safety preparedness behavior concept will be comparatively operationalized from both the knowledge and preparedness data set. The preparedness attitude concept will be operationalized from the preparedness module data set.

Past Experience

Past experience in this study is operationalized by the total frequency of hikes completed in the Grand Canyon. When posed with the question of how many day hikes the interviewee participated at the Grand Canyon including the hike they were currently on, the participants in the knowledge data set responded that fifty nine percent (59%) were on their first hike ever in the GCNP. Sixteen percent (16%) of hikers were on their second total hike and the remaining twenty seven percent (25%) stated that this hike was greater than or equal to their third hike in the GCNP. Table 3 listed below highlights the previously mentioned findings.

Table 3.

Past Experience of Knowledge Module Respondents

Variable	Percentage
Total Day Hikes at Grand Canyon (Including Current Hike)*	
1	59.3
2	16.0
3+	24.7

Note. *(N=498)

Safety Messages

The next concept, safety messages, is operationalized by whether or not respondents received information about hiking the Grand Canyon prior to their hike from a park ranger. Table 4 shows that in the knowledge module interview, approximately seventy nine percent (79%) of all respondents received information about hiking the Grand Canyon prior to their hike. Of the seventy nine percent of respondents that received information prior to their hike, roughly seventeen percent (17%) of those respondents received that information from a park ranger. Since the safety message variable was categorical in nature, the data was coded as a dummy variable (Kerlinger, & Pedhazur, 1973). The “no” answer was coded as zero and a “yes” answer was coded as a one in order to present the data in a manner that shows a presence and absence of information received from a park ranger (Kerlinger, & Pedhazur, 1973).

Table 4.

Safety Messages Received By Knowledge Module Respondents

Variable	Percentage		N
	Yes	No	
Information received about hiking the Grand Canyon prior to hike	79.2	20.8	498
Information received from a park ranger	17.0	83.0	395

Knowledge of Safety Practices

The knowledge of safety practices concept was the next to be operationalized in the study of GCNP day hikers. In the knowledge module, 498 respondents were tested with eleven true or false questions on their knowledge of low impact and safety preparedness techniques they might practice while hiking in the GCNP. Statements ranged from describing the quarts of water recommended by park rangers that each person carry to disposal of toilet paper. A full list of the questions can be found in Appendix A. Two of the most incorrectly answered knowledge statements were related to air temperature at the bottom of the canyon (25%) and toilet paper disposal (58%). Thirty four percent (34%) of respondents answered two or more questions incorrectly. A similar percentage of respondents answered one question incorrectly at (38%) and the remaining twenty eight percent (28%) answered all questions correctly. Full detail on respondent's answers to the knowledge test can be found in Table 5.

Table 5.

Knowledge Test Responses (N=498)

Statement	Percentage	
	True	False
Hikers are not allowed to collect rocks and plants along the trails at Grand Canyon	98.4*	1.6
The air temperature at the bottom of the Grand Canyon is usually 5 degrees Fahrenheit warmer than the air temperature at the rim	25.2	74.8*
Most of the trails going down into the Grand Canyon have water sources along the way	17.7	82.3*
Food scraps should be scattered widely to avoid attracting and concentrating wild animals	7.1	92.9*
Park rangers discourage visitors from hiking rim to river to rim in one day	98.0*	2.0
When hiking at Grand Canyon during the summer, park rangers recommend that visitors take one quart of water per person per day of hiking	16.4	83.6*
All day hikers should be prepared to carry out their trash and litter	98.8*	0.2
Off-trail hiking to make a short cut is appropriate at Grand Canyon	2.9	97.1*
Hunting wild animals is not allowed in Grand Canyon	99.4*	0.6
Park rangers recommend that you drink water regularly, even before you become thirsty	99.8*	0.2
When disposing of human wastes in places where toilets are not available, park rangers recommend that visitors bury their toilet paper	58.2	41.8*

*Note. *Correct Answer*

The number of correct answers for each respondent on the knowledge test will be summed. The resulting composite score will be used in the analysis to represent the knowledge variable. The sum of correct answer test results can be found in Table 6 below.

Table 6.
Percentage and Mean Responses to the Knowledge Test (N=498)

	Number of correct answers							Mean	Sd
	5	6	7	8	9	10	11		
Percentage of Respondents	0.4	1.5	4.7	7.8	20.3	37.7	27.7	9.7	1.21

Safety Preparedness Behavior

The next concept that will be operationalized and described in the results section is safety preparedness behavior. Safety preparedness behavior will be operationalized through a list of ten safety related items that the day hiker may carry to help them be prepared for their hike. The day hikers were also posed the question if the amount of water they carried was sufficient, which will be included as the eleventh item.

Safety preparedness behavior will be comparatively described by both data sets. First, ten items were identified as items that would be carried by a prepared hiker in the GCNP. Items carried most by respondents in the knowledge module were food (81%), hats (85%) and water (97%). Ninety four percent (94%) of all respondents said that the water amount they carried on the hike was sufficient. The least carried items were signal mirrors (7%), flashlights (19%) and electrolytes (24%).

The preparedness interview data set had a similar frequency of items carried per person. Items carried most by respondents in the knowledge module were food (76%), hats (86%) and water (94%). Approximately ninety two percent (92%) of all respondents said that the water amount they carried on the hike was sufficient. The least carried items

were signal mirrors (8%), electrolytes (22%). Table 7 outlines the similarities among respondent's safety preparedness behaviors between the knowledge and preparedness modules.

Table 7.

Safety Preparedness Behavior of Respondents

Variable	Percentage	
	Knowledge Module Yes Response (N=498)	Preparedness Module Yes Response (N=491)
Which of the following items did someone in your group take on your hike today?		
Water	96.7	94.3
Was the amount of water sufficient?	94.0	92.2
Hat	84.8	86.3
Food	80.6	76.2
Sunscreen	56.2	56.8
Jacket	39.0	44.9
First Aid Kit	36.7	34.0
Trail Map	35.3	31.1
Electrolyte	23.6	22.7
Flashlight	19.4	18.4
Signal Mirror	7.1	8.2

Each item was then assigned a weight according to its importance in having a safe hiking experience at the GCNP as determined by the GCNP Hike Smart campaign. Water, sufficient water and food were cited as the most important items needed with a score of eleven and electrolytes, which were listed as a subcategory on the GCNP Hike Smart webpage was determined to be the least important with a score of one (Grand Canyon National Park website, 2011). Scores for items taken by each day hiking group were then added together to create a composite safety preparedness score. Table 8 listed below provides the means and standard deviations for the composite safety preparedness scores across the two modules.

Table 8.

<i>Composite Safety Preparedness Behavior Score Mean & Sd</i>		
<i>Variable</i>	<i>Mean</i>	<i>Sd</i>
Knowledge module sum of scores for total number of safety related items taken on day hike. (N=498)	44.23	12.36
Preparedness module sum of scores for total number of safety related items taken on day hike. (N=491)	43.0	13.38

Preparedness Attitudes

The final variable of preparedness attitudes was determined by whether or not the respondent felt well prepared on their hike. In the preparedness module, One percent (1%) of respondents strongly disagreed and four percent (4%) disagreed with the statement that they felt well prepared on their day hike. Table 9 highlights respondent's level of agreement on whether or not they felt well prepared for their day hike.

Table 9.

Preparedness Attitudes of Respondents (N=491)

Statement Item	Strongly Disagree				Strongly Agree		Mean	Sd
	1	2	3	4	5			
I was well prepared for my hike	1.4	4.3	9.4	49.0	35.9	4.14	0.86	

Bivariate Relationships and Correlations

SPSS software was employed to perform a correlation analysis between the total number of day hikes in the GCNP, whether or not information was received from a park ranger, safety knowledge test scores, safety preparedness behavior composite scores and to what level of agreement a respondent felt well prepared on their day hike. Analysis of the conceptual model utilizing the knowledge module dataset utilizes the safety preparedness behavior score as the dependent variable. The independent variables were the total number of day hikes (including current hike) at the GCNP; information received from a park ranger and total knowledge test score. Results can be found in Table 10 listed below.

Table 10.

Correlations between variables (knowledge module)

Measure	Safety preparedness behavior score	Total day hikes at the GCNP	Park ranger information source	Knowledge test scores
Total day hikes at the GCNP	.01*			
Park ranger information source	-.12*	0.03		
Knowledge test scores	.01*	.13**	0.08	

*Note. * Pearson correlation significant at p<.05. ** Pearson correlation significant at p<.01.*

The self-perception theory shows that observation of one’s own behavior formulates attitudes about that behavior. This theory helps us to understand that safety preparedness behavior scores influence respondent’s attitudes about being well prepared, which makes it necessary to test if there is a correlation between those variables. Total number of day hikes in the GCNP and information received from a park ranger were included to further analyze their role in safety preparedness. Knowledge test score data was only available in the knowledge module data set and was therefore excluded from the second step of the model correlation analysis. Results can be found in Table 11 listed below.

Table 11.
Correlations between variables (preparedness module)

Measure	Safety preparedness behavior score	Total day hikes at the GCNP	Park ranger information source	I was well prepared for my hike.
Total day hikes at the GCNP	.09*			
Park ranger information source	-.16**	-0.07		
I was well prepared for my hike	.24**	.01*	.12*	

*Note. * Pearson correlation significant at p<.05. ** Pearson correlation significant at p<.01.*

The most significant correlation found was between safety preparedness behavior scores and preparedness attitudes. A significant correlation exists between preparedness attitudes and safety preparedness behavior score ($r=.24$, $p<.01$) in Table 11. The composite score for safety preparedness behavior was formulated by providing weighted scores for the eleven safety items recommended that a day hiker carry by the Hike Smart campaign. This score created from the sum of number of items carried and their

importance shows that it has a significant relationship with whether or not the respondent felt well prepared on their day hike.

Other variables held weak but still statistically significant relationships. In both datasets, there was a negative correlation between reception of information from a park ranger source and the safety preparedness score in Table 10 ($r=-.12$, $p<.05$) and Table 11 ($r=-.16$, $p<.01$). This negative correlation may show that the more prepared a respondent is the less likely they are to seek out information about hiking the canyon from a park ranger. In essence, the park rangers may be targeting the right individuals to help them better prepare for their day hike or day hikers that are less prepared are seeking out advice from park rangers. Also, by coding the “no” answer as zero and a “yes” answer as a one in order to present the data in a manner that shows a presence and absence of information received from a park ranger, the correlation results may have been altered.

Total number of day hikes in the GCNP and safety preparedness behavior scores showed a positive relationship in both Table 10 ($r=.01$, $p<.05$) and Table 11 ($r=.09$, $p<.05$). These results show that there is a relationship between how many day hikes a respondent has completed in the GCNP and what they carry with them on their hike.

Specifically in the knowledge module, knowledge test scores showed a significant but weak positive correlation with safety preparedness scores ($r=.01$, $p<.05$) and total day hikes in the GCNP ($r=.13$, $p<.01$). Therefore, respondent’s knowledge of safety and minimal impact practices shows a relationship with the total number of day hikes completed in the GCNP and what items a respondent carried with them.

The preparedness module also showed significant positive correlations between preparedness attitudes and total day hikes in the GCNP ($r=.01$, $p<.05$) and preparedness

attitudes and reception of information from a park ranger source ($r=.12$, $p<.05$). These correlations show that there is a relationship between how prepared one felt on their day hike and how many hikes the respondent had completed at the GCNP and whether or not a respondent had received information about day hiking in the GCNP from a park ranger.

Although total day hikes in the GCNP and information received from a park ranger did not show a significant correlation between each other, this study retained those variables because they showed relationships to the dependent variables in both datasets.

Correlations were found to be significant between the independent variables in the knowledge and preparedness modules and the dependant variables of safety preparedness behavior score and preparedness attitudes. Further investigation of the relationships between safety preparedness behavior score, level of agreement with the statement “I was well prepared for my day hike,” and the independent variables were conducted through linear regression analysis.

Regression Analysis

SPSS software was utilized to conduct a simple linear regression analysis. Regression analysis is a way to analyze the collective and separate contributions of two or more independent variables to the variation of the dependent variable (Kerlinger & Pedhazur, 1973). In this study, safety preparedness behavior will be analyzed in light of the total number of day hikes in the GCNP, whether or not information was received from a park ranger and an overall score received from a knowledge test. The model will also look at the influence of safety preparedness behaviors on the level of agreement that a day hiker had about feeling well prepared for a hike. Table 12 provides the regression analysis results for safety preparedness behaviors as the dependent variable.

Table 12.
Summary of Regression Analysis for Predicting Safety Preparedness Behaviors (Knowledge Module)

Variable	B	SEB	β
Knowledge Test Score	0.67	0.56	1.2
Total number of day hikes at the GCNP	0.2	0.12	0.01
Park ranger information source	4.02	1.81	0.12*

Note. $R^2 = .03$ ($ps < .05$). * $p < .05$

The linear regression analysis outlined in Table 12 shows that the independent variables predict safety preparedness behavior at a low but significant percentage ($R^2 = .03$, $p < .05$). Therefore, the safety preparedness behavior model is useful in understanding what variables are influencing day hiker preparedness behaviors. In examining the standardized betas, it was possible to determine which variable had a greater effect. This analysis showed that information received from a park ranger was the only variable that showed a significant influence of safety preparedness behaviors ($\beta = 0.12$, $p < .05$). The most significant variable that influenced what safety items a day hiker carried was their contact with a park ranger that had provided information on day hiking in the GCNP.

Table 13 provides the regression analysis results for preparedness attitudes as the dependent variable and safety preparedness behavior scores as the independent variable.

Table 13.

Summary of Regression Analysis for Predicting Safety Preparedness Attitudes (Preparedness Module)

Variable	B	SEB	β
Safety Preparedness Behavior Score	0.02	0.03	0.24*

*Note. $R^2 = .06$ ($ps < .01$). * $p < .01$*

This analysis in Table 13 shows that the independent variable of safety preparedness behavior predicts preparedness attitudes at a low but significant percentage as well ($R^2=.06$, $p<.05$). In examining the standardized beta, it was possible to determine that safety preparedness behaviors significantly influenced day hiker preparedness attitudes ($\beta=0.24$, $p<.01$). Therefore, number and importance of safety items carried by respondents influenced how they felt about being prepared for their day hike in the GCNP.

While the independent variables identified in this study had a small predictive impact on safety preparedness behaviors and preparedness attitudes, they were still significant. If one couples these findings with the understanding of past research, theoretical context and the conceptual framework it is now a possibility to move forward toward a discussion that synthesizes the research goals.

CHAPTER 5: DISCUSSION

Summary of Findings

The purpose of this study was to identify the factors that lead to safety preparedness behaviors when day hiking in the Grand Canyon National Park. This was achieved through the results attained upon review of past research and statistical analysis of secondary data collected from day hikers in the GCNP. Three major findings emerged from this study that addressed the objectives of this study. The findings will be highlighted and then expounded upon in relation to each of the objectives.

First, the integration of self-perception theory and the theory of planned behavior proved useful in understanding the safety preparedness behaviors of day hikers in the GCNP. Second, the factors of past experience, safety messages and knowledge of safety practices were found to influence safety preparedness behaviors of respondents through the safety preparedness behaviors model. Safety messages specifically showed the strongest relationship with safety items that respondents carried with them on their day hike. Safety preparedness behaviors were also found to influence respondent attitudes on how well prepared they felt on their day hike. Lastly, the Hike Smart campaign has been successful in influencing day hiker preparedness. The campaign needs to be sustained and augmented to continue to reach future day hikers in the GCNP.

Objective 1: To understand day hiker safety preparedness by integrating the theory of planned behavior and self-perception theory.

The literature review and study results were supportive of the notion that the TPB and the SPT could be integrated in order to help understand day hiker safety preparedness behavior in the context of the GCNP.

The TPB was a useful foundation for the safety preparedness behavior conceptual model. When applied to wilderness situations, factors such as antecedent attitudes, subjective norm, perceived behavioral control and intention help to understand behavior (Ajzen, 1991; Ajzen, 2002). Consequently, this shows that there are multiple factors that lead to behavior, which led to the investigation of the factors that lead to day hiker safety preparedness behaviors in the GCNP. The integration of Self-perception theory in the theoretical framework was useful in showing that observed behaviors help to understand one's posterior attitudes (Bem, 1967). Safety preparedness behaviors of day hikers at the GCNP then become a factor that helps to understand posterior preparedness attitudes. The integration of these theories display the fluidity of attitudes and behaviors and how in a feedback loop manner, day hikers continue to learn from factors that lead to safety preparedness behaviors and from observing safety preparedness behaviors once they are completed.

Multiple concepts were identified past research as possible factors that would be useful in understanding safety preparedness behaviors. The following paragraphs will discuss those concepts.

The TPB was useful in suggesting that subjective norms are correlated with wilderness choice behavior (McFarlane et al 1998). This meant that social pressures from peers and authority figures had influenced choices made by wilderness users. The results from this study indicate that GCNP respondents that obtained information from the park ranger authority figure showed a relationship with the sum of the total number of safety related items taken with on a day hike. Authority figures in the GCNP are influencing what unprepared day hikers are taking with them on a day hike.

McFarlane et al's (1998) application of the TPB proved useful in this study by showing that past experience is a concept that helps to understand attitudes, subjective norm, perceived behavioral control and also behavior.

The concepts of safety messages and knowledge of safety practices have been applied using the TPB to understand littering behavior (Brown, Ham, & Hughes, 2010), off trail hiking (Bullock & Lawson, 2008), wildlife feeding (Hughes et al, 2009), unleashed dog walking (Hughes et al, 2009) and food storage (Martin & McCurdy, 2009) in past research.

The TPB was also useful in this study when applied to safety messaging that serves to influence misguided or uninformed behaviors (Hrubes et al, 2001; Hughes et al, 2009). Studies on littering in wilderness settings (Brown et al, 2010), wildlife feeding and unleashed dog walking (Hughes et al, 2009), food storage in Yosemite National Park (Lackey & Ham, 2004) and unsafe off trail hiking behavior in Haelakala National Park (Reigner & Lawson, 2009) have shown that the theory of planned behavior can be applied to understand problematic behaviors resulting from misguided or uninformed actions (Brown et al, 2010; Marion & Reid, 2007). The concepts and the framework for the TPB should then help to understand the misguided and uninformed safety preparedness behaviors of day hikers in the GCNP.

Objective 2: To assess the influence of past experience, safety messages and knowledge of safety practices on day hiker safety preparedness behaviors in the Grand Canyon National Park.

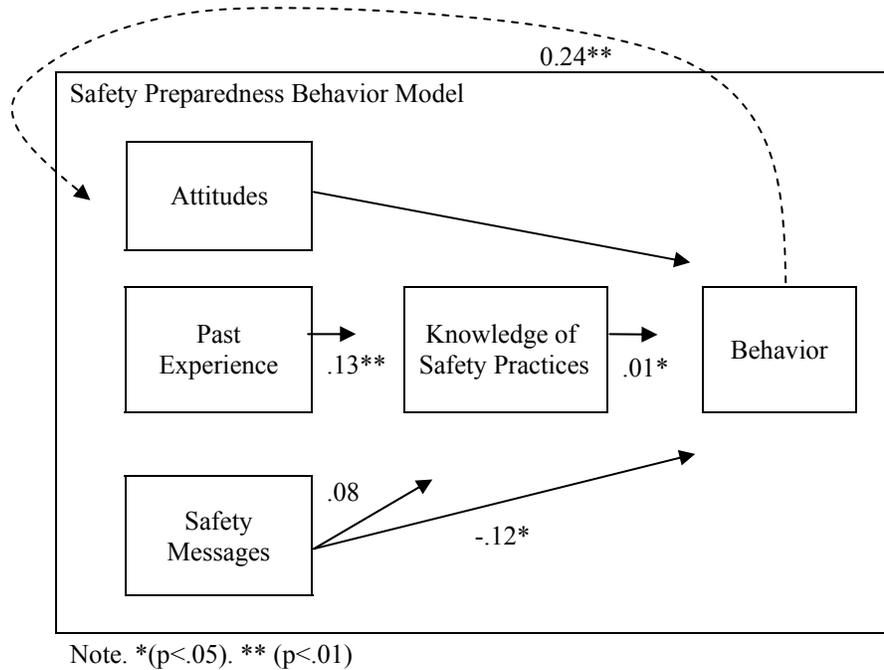


Figure 3. Path Analysis for the Day Hiker Safety Preparedness Behavior Model.

At the end of this study the research found that there were two key relationships in the safety preparedness behavior model; the relationship between safety preparedness behavior and attitudes and the relationship between safety messages and behavior.

While the influence of antecedent attitudes on safety preparedness behaviors was not measured in this dataset, the influence of safety preparedness behavior on preparedness posterior attitudes was measured. The results support the notion that by integrating SPT in the safety preparedness model, safety preparedness behavior leads to preparedness attitudes, which may influence future antecedent attitudes in a cyclical

manner. The results, listed in Figure 3, show that the number and importance of safety related items one carried on a day hike influenced how prepared one felt after completing a day hike in the GCNP. Future research of day hikers may then look at how these new attitudes gained from observing one's behavior has an influence on future safety preparedness behaviors. Since roughly fifty nine percent (59%) of all day hikers in the 2004 study were on their first day hike in the GCNP, it would be useful to see if their newly formed antecedent attitudes influenced them to act upon more or similar safety preparedness behaviors when embarking on future day hikes.

The results in Figure 3 also support the notion that safety messages are a factor that leads to safety preparedness behaviors. Safety messages received from the park ranger authority figure showed a significant relationship with the number and importance of safety related items taken along on a day hike in the GCNP. Safety messages did not show a relationship with knowledge of safety practices. This may be due to the fact that the safety messages variable was a "yes" or "no" response question and was coded as a dummy variable. Also, past research has found that communication channel types are important in the gaining of knowledge of safety practices (Teel et al, 2006). Respondents may have taken the proper safety items with them because they were told to do so by an authority figure. They may not have retained the knowledge behind why or what they were supposed to do in order to have a safe hike in the GCNP because the communication channel type was not a method by which the respondent retained knowledge.

Past experience and knowledge of safety practices also showed a significant relationship with safety preparedness behaviors. The model itself then shows all factors are useful in explaining safety preparedness behaviors.

Future Safety Preparedness Behavior Research Design

The first way that a future study on the factors leading to safety preparedness behaviors can be improved upon is by interviewing day hikers before and after they complete a hike in the GCNP. This would help measure how well prepared a day hiker feels and why they feel prepared or unprepared prior to and after completing a day hike. If a respondent felt prepared upon entering the wilderness and exited with a feeling of not being prepared, it would allow the researcher to probe why they felt this way. This may possibly lead to additional factors that influence safety preparedness behaviors.

The second way this study could be improved in the future is by looking at the findings of Heggie and Amundson in 2009. Heggie and Amundson's (2009) research observed reports on SAR incidents in the National parks over a number of years. They cited errors in judgment, fatigue and physical conditioning, insufficient equipment, inadequate clothing, poor training, weather conditions, equipment failure and darkness as reasons for safety issues in the backcountry (Heggie & Amundson, 2009). While the concepts and secondary dataset in this study explained a few of the factors leading to the safety preparedness behaviors of day hikers in the GCNP, future research should include questions that address the additional factors mentioned by Heggie & Amundson (2009), which may also improve the conceptual model.

The first way the model can be improved in light of this research is through the knowledge of safety practices concept. The knowledge of safety practices concept from

the literature review was identified as a concept that may improve one's errors in judgment. The knowledge test for this study did not include statements that related to errors in judgment. In future research, it may be useful to include specific true/false statements in the knowledge test that find out what decision making capabilities a day hiker possesses in challenging backcountry situations. The current knowledge test conducted in the 2004 GCNP study only had five statements that related to safety preparedness behaviors. This test could also be altered to include more specific safety related true/false statements that might show a higher influence of safety preparedness behaviors as well.

The second way the model could be augmented is through studying respondent fatigue and physical conditioning. Fatigue, physical conditioning and poor training were three reasons that led to day hikers having to be rescued from the backcountry. In the 2004 study of GCNP day hikers, ninety four percent (94%) of day hikers rated themselves between somewhat fit and extremely fit and eighty percent (80%) said they exercised for 20 continuous minutes at least every other day. It would be interesting to conduct actual physical stress tests on subjects to find out what day hiker fitness levels really are in the GCNP. Such a test would provide actual data about the fitness level of day hikers who face the physical challenges of the canyon. This is especially important considering fifty six percent (56%) of day hikers are over the age of forty and may be more susceptible to the stresses of hiking the Grand Canyon.

Another useful concept to operationalize and measure would be day hiker perceived behavioral control. The addition of a scale that measures the participant's confidence level in their ability to complete the hike they are about to take would be an

important way to operationalize this variable. If a day hiker is less confident that they can complete the day hike, then they may not take greater risks or they may make efforts to be more prepared. Someone that is more confident in their abilities to hike in the GCNP may take less safety precautions and may take greater risks that could lead to injury.

Finally, an important part of TPB application is to elicit participant's beliefs in a pilot questionnaire before conducting an actual interview or survey. The pilot questionnaire should produce salient beliefs that then can be specifically targeted to better understand the behaviors the researchers are looking to understand. Belief strength testing for the safety messages variable could have helped determine what safety messages respondents felt were those that most influenced their safety preparedness behaviors.

Objective 3: To identify strategies to reduce the number of SAR situations and increase day hiker safety at the Grand Canyon National Park.

Sustaining and Augmenting the Hike Smart Campaign

This study shows that the GCNP's Hike Smart campaign is a successful strategy in its effectiveness of reaching day hikers. The results display the need for this promotional campaign to be maintained and improved upon.

The park service needs to sustain several parts of their campaign that they are currently doing very well. The first way this is possible is through their current information dissemination. A majority of respondents received information about hiking the GCNP prior to their hike. The results also showed that respondents that carried the

highest frequency and most important safety related items did not seek out information from a park ranger. Those that did receive information from a park ranger were the less prepared respondents. This means that park rangers are targeting the correct day hikers that are in need of assistance and that less prepared day hikers know that they need to talk to a ranger in order to find out what they need to take with them. The less prepared respondent's scores may have also been lower because the park ranger might have focused on the imperative safety items of water and food instead of inundating the day hiker with a lot of safety information at once. Exposure to safety messages over time might increase day hiker safety preparedness since respondents that were more experienced hikers in the GCNP carried more safety related items

The Hike Smart campaign also needs to continue to promote the eleven items listed on their website that they have determined are necessary for a safe hike. This study found that more prepared someone felt on their hike, the more important or higher quantity of safety preparedness items were taken along on the hike. Therefore, the safety items that the Hike Smart campaign has determined as necessary to completing a safe hike caused respondents to feel more well prepared about their hike. These eleven safety items cause a day hiker to be better prepared to face the physical challenges of the GCNP.

Improving the Hike Smart Campaign

Over forty percent (40%) of day hikers were on their second hike ever and roughly 64% of day hikers had stayed at the GCNP for two or more days. There is great potential for first time and even second time hikers to take another hike in the GCNP and

safety preparedness attitudes formed from observing their safety preparedness behaviors will influence what safety items they take on their next hike.

It would be beneficial for park rangers to debrief hikers after they exit the trail and find out what they selected to take with them and how they felt about being prepared. This interaction might solidify one's attitude about making the right choices on their safe hike or it might provide an opportunity for the park rangers to show someone why they were not prepared and influence their attitude for the next hike. The foot in the door technique understood through the SPT may be useful in relation to day hiker attitudes (Beauvois & Joule, 1982). Day hikers could be shown that they complied with simple preparedness behaviors, like carrying water. In light of observing their behavior and having a positive attitude about what they did right, then park rangers or volunteers could then ask them to carry more items that would increase the possibility of influencing them to be even more prepared the next time. The conceptual model cycle would be continued when positive posterior attitudes about safety preparedness behaviors would formulate positive antecedent attitudes that would influence safety preparedness behaviors for the next hike.

As an alternative idea, day hikers may benefit from the park service making the Hike Smart campaign safety related items available at the trailheads with the highest proportion of unprepared hikers. This would provide one last opportunity for day hikers to receive the items they need for their hike or for a volunteer or ranger to influence what they carry. The items that are not replaceable could be provided for a deposit and if they were returned, the day hiker would receive a patch or pin (specific to the year of issue) that would say they were well prepared for their hike and "ask me why". This way they

could spread the information by word of mouth and influence their peer's attitudes. Day hikers desiring to collect the commemorative item would necessarily carry the items they needed to be prepared.

Despite the valiant effort by the park service through the Hike Smart campaign, there are still day hikers that feel unprepared (6%). Though it may seem like this is a small portion of the day hiker population, these are the people that will most likely be in need of assistance from the SAR team. Day hikers that felt unprepared carried only half the amount of water compared to those that felt prepared (Backlund et al., 2006b). Items that were cited as necessary for a safe hiking experience were carried by low numbers of respondents, such as trail maps (35%) and electrolytes (23%). These items may not be as vital as water or food but they do go a long way in helping keep one from getting lost or hydrated more quickly.

In reference to the knowledge test, there were a few specific safety and minimum impact issues that need attention. Fifty eight percent (58%) of day hikers incorrectly answered that they should bury their toilet paper in the backcountry. Nearly seventeen percent (17%) of hikers were confused about whether or not there was potable water available on the trails. Thirty-five (35%) of respondents answered two or more questions incorrectly on the knowledge test. It would be useful to focus some of the Hike Smart campaign energy on helping day hikers resolve these problem areas.

Limitations

The findings of this study are limited in a number of ways. First, due to the nature of the hiking environment in the GCNP, the results may not be generalizable to the entire day hiking population in the national parks. Extreme temperatures, high exposure

to the sun and decent followed by accent are not typical hiking conditions met by day hikers in most other National parks (Schwartz, 2009; Stewart et al, 1999). Therefore, GCNP day hikers may have slightly different safety preparedness behaviors compared to the day hikers in the other National parks.

Second, this study utilized a secondary data set in order to answer the research questions. While the dataset proved to be useful in providing answers for this study's research objectives, there were several objectives connected to this study including understanding day hiker safety preparedness behaviors. The results showed that safety preparedness behaviors are influenced by factors such as past experience; safety messaging and knowledge of safety practices, however there are additional factors that need to be fleshed out in future research. Primary data specifically tailored to understand the possible factors that influence the safety preparedness behavior of day hikers in the GCNP, might prove useful.

The study results may have been limited through the past experience measure. Hall et al (2010) found that when wilderness campers have created routines, they largely ignore any national park communication efforts and tend to habituate. Habituation may account for a few of the weak relationships in which more experienced day hikers ignore safety messages and are not concerned with knowledge of safety practices or safety preparedness behaviors because their routines have been successful in the past (Hall et al, 2010). Day hiker feelings of being well prepared may have been less significant because day hikers that display habitual behaviors do not need to engage in self-analysis when undertaking routine tasks. Therefore new attitudes will not develop that may affect safety preparedness behavior on future day hikes.

Next, since day hiker behavior is measured through self-reports, not through direct observation, self-reports might not be as accurate as actual behavior. Because of the face-to-face contact format, respondents may have felt pressure to provide socially acceptable responses regardless of their actual behavior or attitudes. Respondents were first questioned about whether or not they took the eleven items determined necessary by the Hike Smart campaign. The respondents were then questioned on how prepared they felt on their day hike. This order of questioning may have caused the respondent to change their attitude about how prepared they were as they reflected on how many items they carried on their day hike.

Another limitation may have been with the safety preparedness score. Each individual is different in his or her needs and abilities. To create an interval scale in which some items are more important than other items is arbitrary according to the determination of the Hike Smart campaign. It is true that everyone needs water and protection from the sun but items like a hat or sunscreen may be more important to someone that is more susceptible to the effects of the sun, or another individual may not handle food intake well while exercising. These factors make it difficult to place weights on the importance of the items that one needs to have a safe hike in the GCNP.

As a final observation, the time scale of the study may have been a limitation. The secondary data that was utilized in this study was completed in 2004 and published in 2006. While SAR operations continue in the GCNP for lost or injured day hikers, the day hiker continues to be an understudied population. There is little knowledge about trends in day hiking (Cole, 2001), so it is quite possible that in the last five to seven years, the day hiker has changed enough that this dataset is not relevant in some areas.

Social media is forever changing how one receives information, so it is quite possible that Facebook or cell phone applications may now be important variables in which the GCNP could reach the day hiker population.

Conclusions

The purpose of this study looked to identify the factors that led to safety preparedness behaviors of day hikers in the Grand Canyon National Park. This study found that the safety preparedness behaviors of day hikers had a moderately significant influence on day hiker attitudes about whether or not they felt well prepared for their hike. These results showed that safety preparedness behaviors influence preparedness attitudes through the integrated and adapted model of the TPB and SPT. In a cyclical manner, these posterior attitudes may help formulate antecedent attitudes that would influence safety preparedness behaviors before a future day hike.

Furthermore, this research found that the total day hikes in the GCNP, knowledge test scores and reception of information from a park ranger had significant influence on safety preparedness behavior scores in day hiking at the GCNP ($R^2=.03$, $F=3.17$, $p<.05$). Even though this study only contributed to a slight proportion of the variance it still lays the groundwork for future research in understanding the factors that influence day hiker safety preparedness. It also provides much needed insight into who the day hiker is through a significantly positive Pearson correlation between total day hikes in the GCNP, knowledge test scores, information reception from park ranger contact and safety preparedness behaviors score.

This study also found a negative correlation between reception of information from a ranger and safety preparedness behaviors. This negative correlation may show

that the more prepared a day hiker is the less likely they are to seek out information about hiking the canyon from a park ranger. In essence, the park rangers may be targeting the right individuals to help them better prepare for their day hike or day hikers that are less prepared are seeking out advice from park rangers.

In conclusion, this study has demonstrated that the relationship between the factors that lead one to safety preparedness behaviors when day hiking in the GCNP and safety preparedness behaviors are complex in nature. Past experience, safety messages and knowledge of safety practices do influence safety preparedness behaviors despite their role only being a small piece of the puzzle. The importance of this study is that the dialogue has continued on how to reach the day hiker population, the foundation has been laid for the use of a conceptual framework in understanding day hiker safety preparedness behaviors and the body of knowledge about day hiker characteristics has been augmented. People will continue to need these vast backcountry spaces to improve their quality of life. I hope that this study will help improve day hiker's quality of life by providing insight into what will prepare them to meet the physical challenges they will face on a day hikes in the Grand Canyon National Park.

REFERENCES

- Acharya, R., Paudel, K., & Hatch, L. (2009). Impact of nostalgia and past experience on recreational demand for wilderness. *Applied Economics Letters*, 16(5), 449-453.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, 32(4), 665-683.
- Ajzen, I., & Driver, B. (1992). Application of the theory of planned behavior to leisure choice. *Journal of Leisure Research*, 24(3), 207-224.
- Backlund, E., Hammitt, W., & Bixler, R. (2006a). Experience Use History and Relationship to the Importance of Substitute Stream Attributes. *Human Dimensions of Wildlife*, 11(6), 411-422.
- Backlund, E., Stewart, W., Schwartz, Z., & McDonald, C. (2006b). Backcountry day hikers at Grand Canyon National Park. Report submitted to Grand Canyon National Park.
- Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, 50, 248-287.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.
- Beauvois, J., & Joule, R. (1982). Dissonance versus self-perception theories: A radical conception of Festinger's theory. *Journal of Social Psychology*, 117(1), 99.
- Bem, D. J. (1967). Self-Perception: The Dependent Variable of Human Performance. *Organizational Behavior & Human Performance*, 2(2), 105-121.
- Bem, D. & McConnell, H. (1970). Testing the self-perception explanation of dissonance phenomena: On the salience of premanipulation attitudes. *Journal of Personality and Social Psychology*, 14, 23-31.
- Berry, W. (1977). *The unsettling of america: culture & agriculture*. San Francisco: Sierra Club Press.
- Bright, A., & Fishbein, M. (1993). Application of the theory of reasoned action to the National Park Service's controlled burn policy. *Journal of Leisure Research*, 25(3), 263.

- Brown, T., Ham, S., & Hughes, M. (2010). Picking up litter: an application of theory-based communication to influence tourist behaviour in protected areas. *Journal of Sustainable Tourism*, 18(7), 879-900.
- Bryan, H. (1977). Leisure value systems and recreational specialization: The case of trout fishermen. *Journal of Leisure Research*, 9, 174-187.
- Bullock, S., & Lawson, S. (2008). Managing the "Commons" on Cadillac Mountain: A stated choice analysis of Acadia National Park visitors' preferences. *Leisure Sciences*, 30(1), 71-86.
- Cacioppo, J., & Petty, R. (1984). The elaboration likelihood model of persuasion. *Advances in Consumer Research*, 11(1), 673-675.
- Christensen, H. & Cole, D. (2000). Leave no trace practices: Behaviors and preferences of wilderness visitors regarding use of cook stoves and camping away from lakes. In S.F. McCool, W.T. Borrie, J. O'Loughlin (eds) *Proceedings – Wilderness Science in a Time of Change Conference* (pp. 77-85). RMRS-P-15-VOL-4. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.
- Cole, D. (1998). Written appeals for attention to low-impact messages on wilderness trailside bulletin boards: Experimental evaluations of effectiveness. *Journal of Park and Recreation Administration*. 16 (1), 65-79.
- Cole, D., Hammond, T., & McCool, S. (1997). Information quantity and communication effectiveness: Low-impact messages on wilderness trailside bulletin boards. *Leisure Sciences*, 19(1), 59-72.
- Cole, D. (2001). Day users in wilderness: How different are they? *Research Paper RMRS-RP-31*. Rocky Mountain Field Station. United States Forest Service.
- Fazio, J. (1979). Communication with the wilderness user. Bulletin Number 28. Moscow, ID: University of Idaho, College of Forestry, Wildlife and Range Experiment Station.
- Fishbein, M., & Ajzen, I. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice Hall Inc
- Gotch, C., & Hall, T. (2004). Understanding nature-related behaviors among children through a theory of reasoned action approach. *Environmental Education Research*, 10(2), 157-177.
- Grand Canyon National Park. *Hike smart*. Retrieved February 18, 2011, from <http://www.nps.gov/grca/planyourvisit/hike-tips.htm>

- Hall, T. E., Ham, S. H., & Lackey, B. K. (2010). Comparative evaluation of the attention capture and holding power of novel signs aimed at Park visitors. *Journal of Interpretation Research*, 15(1), 15-36.
- Ham, S. (2007). Can interpretation really make a difference? Answers to Four Questions from Cognitive and Behavioral Psychology. Interpreting World Heritage Conference.
- Hammitt, W., & McDonald, C. (1983). Past on-site experience and its relationship to managing river recreation resources. *Forest Science*, 29(2), 262-266.
- Heggie, T., Heggie, T., & Kliwer, C. (2008). Recreational travel fatalities in US National Parks. *Journal of Travel Medicine*, 15(6), 404-411.
- Heggie, T., & Heggie, T. (2009). Search and rescue trends associated with recreational travel in US National Parks. *Journal of Travel Medicine*, 16(1), 23-27.
- Heggie, T. & Amundson, M. (2009). Dead men walking: search and rescue in U.S. National Parks. *Wilderness and Environmental Medicine* 20(3): 244-249.
- Hendon, W. C. (1991). The wilderness as a source of recreation and renewal: Who uses it? What are their characteristics? Their other interests? Their preferences? *American Journal of Economics & Sociology*, 50(1), 105-112
- Hockett, K., & Hall, T. (2007). The effect of moral and rear appeals on Park visitors' beliefs about feeding wildlife. *Journal of Interpretation Research*, 12(1), 5-27.
- Howe, S. (2002). Five who survived: after near-fatal mishaps in the backcountry, these long overdue backpackers lived to hike another day. Heed their advice, and you will, too. *Backpacker*, 30(7), 54-60; 62;112-114.
- Hrubes, D., Ajzen, I., & Daigle, J. (2001). Predicting hunting intentions and behavior: An Application of the Theory of Planned Behavior. *Leisure Sciences*, 23(3), 165-178.
- Hughes, M., Ham, S., & Brown, T. (2009). Influencing Park visitor behavior: A belief-based approach. *Journal of Park & Recreation Administration*, 27(4), 38-53.
- Kerlinger, F. & Pedhazur, E. (1973). *Multiple regression in behavioral research*. New York, NY: Holt, Rinehart and Winston, Inc.
- Krumpe, E. & Lucas, R. 1986. Research on recreation trails and trail users. A Research Review and Synthesis for the President's Commission on Americans Outdoors, Washington, DC Government Printing Office.

- Kuentzel, W., & McDonald, C. (1992). Differential effects of past experience, commitment, and lifestyle dimensions on river use specialization. *Journal of Leisure Research*, 24(3), 269-287.
- Lackey, B., & Ham, S. (2004). Assessment of communication focused on human-black bear conflict at Yosemite National Park. *Journal of Interpretation Research*, 8(1), 25-40.
- Leave No Trace Center for Outdoor Ethics. *Minimal impact practices*. Retrieved February 18, 2011, from <http://www.lnt.org/programs/principles.php>
- Leopold, A. (1989). *A Sand County almanac; with essays on conservation from Round River*. New York: Oxford University Press.
- Manning, R., Bacon, J., Graefe, A., Kyle, G., Lee, R., & Burns, R. (2001). I never hike alone. Security on the Appalachian Trail. *Parks & Recreation*, 36(7), 50.
- Marion, J., & Reid, S. (2007). Minimising visitor impacts to protected areas: The efficacy of low impact education programmes. *Journal of Sustainable Tourism*, 15(1), 5-27.
- Martin S., & Mccurdy, K. (2009). Wilderness food storage in Yosemite: Using the theory of planned behavior to understand backpacker canister use. *Human Dimensions of Wildlife*, 14(3), 206-218.
- McFarlane, B., Boxall, P., & Watson, D. (1998). Past experience and behavioral choice among wilderness users. *Journal of Leisure Research*, 30(2), 195
- Monz, C., Cole, D., Leung, Y., & Marion, J. (2010). Sustaining visitor use in protected areas: Future opportunities in recreation ecology research based on the USA experience. *Environmental Management*, 45, 3. p.551(12).
- Muir, J. (1991). *Our National Parks*. San Francisco: Sierra Club Press.
- Nash, R. (1982). *Wilderness and the American mind*. New Haven, CT: Yale University Press.
- Newman, P., Manning, R., Bacon, J., Graffe, A., & Kyle, G. (2003). An evaluation of Appalachian Trail hikers' knowledge of minimum impact skills and practices. *International Journal of Wilderness*, 9(2).
- Park, L. O., Manning, R. E., Marion, J. L., Lawson, S. R., & Jacobi, C. (2008). Managing visitor impacts in Parks: A multi-method study of the effectiveness of alternative management practices. *Journal of Park & Recreation Administration*, 26(1), 97-121.

- Papenfuse, M., Roggenbuck, J., & Hall, T., (2000). The rise of the day visitor in wilderness: Should managers be concerned? RMRS-P-15, Vol. 4: Wilderness science in a time of change conference-Volume 4: Wilderness visitors, experiences, and visitor management; Missoula, MT.
- Petty, R., McMichael, S., & Brannon, L., (1992). The elaboration likelihood model of persuasion: Applications in recreation and tourism. In M.J. Manfredo (Ed.), *Influencing human behavior: Theory and applications in recreation and tourism and natural resources management* (pp. 77-101). Champaign, IL: Sagamore Publishing.
- Reid, S., & Marion, J. (2005). A comparison of campfire impacts and policies in seven protected areas. *Environmental Management*, 36(1), 48-58.
- Reigner, N., & Lawson, S. (2009). Improving the efficacy of visitor education in Haleakalā National Park using the theory of planned behavior. *Journal of Interpretation Research*, 14(2), 21-45.
- Roggenbuck, J., Lucas, R. (1987). Wilderness use and user characteristics: a state-of-knowledge review. Proceedings, National Wilderness Research Conference: issues, state-of-knowledge, future directions. Ogden, UT: USDA Forest Service General Technical Report INT-202: 204-245.
- Roggenbuck, J., Marion, J., Manning, R. (1994). Day user of the backcountry: The neglected National Park visitor. *Trends*, 19-24.
- Rossi, A. & Armstrong, J. (1999). Theory of reasoned action vs. theory of planned behavior: Testing the suitability and sufficiency of a popular behavior model using hunting intentions. *Human Dimensions of Wildlife: An International Journal*, 4(3), 40-56.
- Robak, R. (2001). Self-Definition in Psychotherapy: Is it time to revisit self-perception theory?. *North American Journal of Psychology*, 3(3), 529.
- Runte, A. (1979). *National Parks: the American experience*. Lincoln, NE: University of Nebraska Press.
- Schreyer, R., Lime, D., & Williams, D. (1984). Characterizing the influence of past experience on recreation behavior. *Journal of Leisure Research*, 16(1), 34-50.
- Schwartz, Z., Stewart, W., Backlund, E. (2009). Monitoring visitor flows in destinations: The case of multiple-use hiking trails in Grand Canyon National Park. *Tourism Analysis*, 14(6), 749-763.

- Stewart, W., Cole, D., Manning, R., Valliere, W., Taylor, J., Lee, M. (1999). Preparing for a Day Hike in the Grand Canyon: What Information is Useful? *Wilderness science in a time of change conference—Volume 4: Wilderness visitors, experiences, and visitor management*; USDA Forest Service, General Technical Report. pp. 221-225.
- Swearingen, T., & Johnson, D. (1995). Visitors' responses to uniformed park employees. *Journal of Park & Recreation Administration*, 13(1), 73-85.
- Teel, T., Bright, A., Manfredo, M., & Brooks, J. (2006). Evidence of biased processing of natural resource-related information: A study of attitudes toward drilling for oil in the Arctic National Wildlife Refuge. *Society & Natural Resources*, 19(5), 447-463.
- Vogt, C., Winter, G., & Fried, J. (2005). Predicting homeowners' approval of fuel management at the Wildland–Urban interface using the theory of reasoned action. *Society & Natural Resources*, 18(4), 337-354.
- Watson, A., & Niccolucci, M. (1992). Defining past-experience dimensions for wilderness recreation. *Leisure Sciences*, 14(2), 89-103
- Watson, A., & Roggenbuck, J. (1991). The influence of past experience on wilderness choice. *The Journal of Leisure Research*, 23(1), 21-36.

<p>5. Did your trip take:</p> <p><input type="checkbox"/> More time than you expected</p> <p><input type="checkbox"/> Less time than expected</p> <p><input type="checkbox"/> About what you expected</p>						
<p>6. When did you decide to take a hike on this trail?</p> <p><input type="checkbox"/> Before arriving at Grand Canyon</p> <p><input type="checkbox"/> After arriving at Grand Canyon but before today</p> <p><input type="checkbox"/> Today</p>						
<p>7. Are you staying:</p> <table border="0"> <tr> <td><input type="checkbox"/> Inside the park?</td> <td>Are you camping?</td> </tr> <tr> <td><input type="checkbox"/> Outside the park?</td> <td><input type="checkbox"/> Yes</td> </tr> <tr> <td><input type="checkbox"/> Just visiting for the day?</td> <td><input type="checkbox"/> No</td> </tr> </table>	<input type="checkbox"/> Inside the park?	Are you camping?	<input type="checkbox"/> Outside the park?	<input type="checkbox"/> Yes	<input type="checkbox"/> Just visiting for the day?	<input type="checkbox"/> No
<input type="checkbox"/> Inside the park?	Are you camping?					
<input type="checkbox"/> Outside the park?	<input type="checkbox"/> Yes					
<input type="checkbox"/> Just visiting for the day?	<input type="checkbox"/> No					
<p>8. On this trip to Grand Canyon:</p> <p>How many days have you been at Grand Canyon including today?</p> <p>_____Days</p> <p>How many additional days will you spend at Grand Canyon total? _____Days</p>						
<p>9. Hiking Experience: Including this <i>day</i> hike, how many <i>day</i> hikes have you taken:</p> <p>a) At Grand Canyon in the last 12 months?</p> <p>_____</p> <p>b) Total at Grand Canyon?</p> <p>_____</p> <p>c) At other parks or wilderness areas in the last 12 months?</p> <p>_____</p>						
<p>10. How many visits have you made to Grand Canyon prior to this trip?</p> <p>_____</p>						

11. a) Did you receive any information about hiking Grand Canyon prior to your hike?
 Yes No (Skip to q. 12)

b) Where did you get your information about hikes at Grand Canyon? (Check all that apply)

<input type="checkbox"/> Park Ranger	<input type="checkbox"/> Poster on Hiking Safety
<input type="checkbox"/> Backcountry Info Center - South Rim	<input type="checkbox"/> Ranger Program
<input type="checkbox"/> Canyon View Information Plaza	<input type="checkbox"/> North Rim Visitor Center
<input type="checkbox"/> Book or Magazine	<input type="checkbox"/> Desert View Information Center
<input type="checkbox"/> Grand Canyon Website	<input type="checkbox"/> Friends/ Word of Mouth
<input type="checkbox"/> Backcountry Info. Center - North Rim	<input type="checkbox"/> Other Website _____
<input type="checkbox"/> Store or Lodge employee	<input type="checkbox"/> Other _____

c) Did the information include safe hiking tips?
 Yes No Don't Know

d) Did the information include low impact hiking techniques?
 Yes No Don't Know

e) Did the information you receive influence you to change plans? Yes No (Skip to 12)

If yes, how were your plans changed? (Check all that apply)

<input type="checkbox"/> Started earlier	<input type="checkbox"/> Shortened hike
<input type="checkbox"/> Wore different clothes	<input type="checkbox"/> Started later
<input type="checkbox"/> Carried more water	<input type="checkbox"/> Hiked without children/child
<input type="checkbox"/> Changed route	<input type="checkbox"/> Brought electrolytes
<input type="checkbox"/> Hiked without unfit adult	<input type="checkbox"/> Lengthened hike
<input type="checkbox"/> Brought more food	<input type="checkbox"/> Other: _____

12. a) How much water did you and the rest of your group carry today?
_____ Quarts/Liters/Gallons

b) Was this amount sufficient? Yes No

13. Which of the following items did someone in your group take with you on your hike today?
(Check all that apply)

<input type="checkbox"/> Water	<input type="checkbox"/> Topographic map	<input type="checkbox"/> Signal mirror
<input type="checkbox"/> Flashlight	<input type="checkbox"/> Electrolyte replacement	<input type="checkbox"/> Sunscreen
<input type="checkbox"/> Food	<input type="checkbox"/> Toilet paper	<input type="checkbox"/> First aid kit
<input type="checkbox"/> Jacket	<input type="checkbox"/> Trail map	<input type="checkbox"/> Hat
<input type="checkbox"/> GPS	<input type="checkbox"/> Cellular phone	<input type="checkbox"/> Sunglasses
<input type="checkbox"/> Other: _____		

14. a. Did anyone in your group become: Sick Injured Lost
(If not, skip to q. 15)

b. Who was responsible for someone in your group being sick, injured, or lost? Please rate your belief on the following scale:

Entirely my/our responsibility				Both equally responsible			Entirely park's responsibility
1	2	3	4	5	6	7	

15. How physically fit do you consider yourself to be?

Not at all Fit		Somewhat Fit		Extremely Fit
1	2	3	4	5

16. Over the past year, how frequently did you get at least 20 minutes of continuous physical exercise?

Nearly every day About once every 2 weeks
 About every other day About once a month
 About once a week Less than once a month

Knowledge Interview Form

17. For each statement I read, please indicate your level of agreement from Strongly Disagree to Strongly Agree with the following statements.
SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly Agree

	Level of Agreement				
	SD	D	N	A	SA
a. Ranger patrols are necessary and appropriate.	<input type="checkbox"/>				
b. I was well informed about appropriate behavior to protect park resources.	<input type="checkbox"/>				
c. I would change my behavior to avoid damaging park resources.	<input type="checkbox"/>				
d. I want to learn more about low-impact hiking to avoid damaging park resources.	<input type="checkbox"/>				
e. It is important for day hikers to minimize their impact on the resource.	<input type="checkbox"/>				
f. A single hiker cannot damage park resources because he or she is just one of many hikers.	<input type="checkbox"/>				

18. Please indicate whether you believe the following statements to be true or false.

	True	False
a. Hikers are not allowed to collect plants and rocks along the trails at Grand Canyon.	T	F
b. The air temperature at the bottom of Grand Canyon is usually about 5 degrees Fahrenheit warmer than the air temperature at the rim.	T	F
c. Most of the trails going down into the Grand Canyon have water sources along the way.	T	F
d. Food scraps (from snacks and lunches) should be scattered widely to avoid attracting and concentrating wild animals.	T	F
e. Park rangers discourage visitors from hiking rim-to-river-to-rim in one day.	T	F
f. When hiking at Grand Canyon during the summer, park rangers recommend that visitors take one quart of water per person per day of hiking.	T	F
g. All day hikers should be prepared to carry out their own trash and litter.	T	F
h. Off-trail hiking to make a short-cut is appropriate at Grand Canyon.	T	F
i. Hunting wild animals is not allowed in Grand Canyon.	T	F
j. Park rangers recommend that you drink water regularly, even before you become thirsty.	T	F
k. When disposing of human wastes in places where toilets are not available, park rangers recommend that visitors bury their toilet paper.	T	F

Preparedness Interview Form

17. For each statement I read, please indicate your level of agreement from Strongly Disagree to Strongly Agree with the following statements.

SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly Agree

	Level of Agreement				
	SD	D	N	A	SA
a. Ranger patrols are necessary and appropriate.	<input type="checkbox"/>				
b. Park rangers exaggerate the dangers of hiking.	<input type="checkbox"/>				
c. Park rangers will rescue me if I get into trouble.	<input type="checkbox"/>				
d. I was well prepared for my hike.	<input type="checkbox"/>				
e. Day hiking at Grand Canyon requires special physical conditioning	<input type="checkbox"/>				
f. Park rangers will help me back to safety if I have problems hiking.	<input type="checkbox"/>				
g. Park rangers depict Grand Canyon hiking as being more dangerous than it really is	<input type="checkbox"/>				
h. Most of the risk visitors face in Grand Canyon are beyond the control of the National Park Service.	<input type="checkbox"/>				

Now, we would like to ask you some questions about yourself so that we can make comparisons among different groups of people that day hike at Grand Canyon.

19. Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female	22. Do you consider yourself Spanish, Hispanic, or Latino? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't wish to answer								
20. Zip Code or Country of origin: _____ _____	What race do you consider yourself to be? (Check all that apply)								
21. What year were you born? _____	<input type="checkbox"/> American Indian <input type="checkbox"/> Native Hawaiian <input type="checkbox"/> Asian <input type="checkbox"/> White <input type="checkbox"/> Black or African American <input type="checkbox"/> Don't wish to answer								
23. What is the highest level of education you have completed so far? <table style="width:100%; text-align:center;"> <tr> <td>Junior High</td> <td>High School</td> <td>College</td> <td>Graduate Study</td> </tr> <tr> <td>5 6 7 8</td> <td>9 10 11 12</td> <td>13 14 15 16</td> <td>17 18 19 20+</td> </tr> </table>		Junior High	High School	College	Graduate Study	5 6 7 8	9 10 11 12	13 14 15 16	17 18 19 20+
Junior High	High School	College	Graduate Study						
5 6 7 8	9 10 11 12	13 14 15 16	17 18 19 20+						
24. Which Category best represents your total household income before taxes? <table style="width:100%; text-align:center;"> <tr> <td><input type="checkbox"/> <10,000</td> <td><input type="checkbox"/> \$20,000 - \$34,999</td> <td><input type="checkbox"/> \$50,000 - \$64,999</td> <td><input type="checkbox"/> \$80,000- \$94,999</td> </tr> <tr> <td><input type="checkbox"/> \$10,000 - \$19,999</td> <td><input type="checkbox"/> \$35,000 - \$49,999</td> <td><input type="checkbox"/> \$65,000 - \$79,999</td> <td><input type="checkbox"/> \$95,000+</td> </tr> </table>		<input type="checkbox"/> <10,000	<input type="checkbox"/> \$20,000 - \$34,999	<input type="checkbox"/> \$50,000 - \$64,999	<input type="checkbox"/> \$80,000- \$94,999	<input type="checkbox"/> \$10,000 - \$19,999	<input type="checkbox"/> \$35,000 - \$49,999	<input type="checkbox"/> \$65,000 - \$79,999	<input type="checkbox"/> \$95,000+
<input type="checkbox"/> <10,000	<input type="checkbox"/> \$20,000 - \$34,999	<input type="checkbox"/> \$50,000 - \$64,999	<input type="checkbox"/> \$80,000- \$94,999						
<input type="checkbox"/> \$10,000 - \$19,999	<input type="checkbox"/> \$35,000 - \$49,999	<input type="checkbox"/> \$65,000 - \$79,999	<input type="checkbox"/> \$95,000+						
25. How can the Park Service improve your day hiking experience in the future or do you have any comments to bring to the attention of the National Park Service regarding your day hiking experience. <hr/> <hr/> <hr/> <hr/>									