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Decision Making in the Backcountry While Carrying a Cellular Phone

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ABSTRACT

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The purpose of this study was to gain understanding about the influence of technology, specifically cellular phones, on decision making during potentially risky situations in the backcountry. Previous research in this area is contradictory and some studies indicate technology is influencing people to take more risks while others suggest it is not. Further confounding the relationship is the fact that previous studies have found people may be taking more risk in the presence of technology were based largely on respondent perceptions, not observation data. The current study used a scenario-based decision model to examine the difference in decision making between those who carried a cell phone on a hike and those who did not. A one-way ANCOVA revealed there was no statistical difference ($F=2.18$, $p=.0898$) between the two groups. This indicated people did not take more risks because they carried a cell phone into the backcountry. Risk tolerance and experience hiking long mountain hikes similar to the mountain used in the scenario were the only two variables that influenced decision making in this model. Because cell phones do not adversely influence decision making, it is proposed cell phones and other wireless communication devices be added as a recommended piece of gear to the 10 essentials to help reduce the time it takes for search and rescue to arrive on scene when help is needed.

Keywords: cellular phone, technology, decision making, heuristics, risk taking, risk propensity, backcountry

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As electronic devices become lighter, smaller, more reliable, and more affordable, the number of people relying on them for entertainment, navigation, and emergency communication on outdoor adventures is increasing (Hung & Townes, 2007; Pohl, 2006). Increased use and accessibility may also contribute to increased impacts on the backcountry experience. Cell phones in particular seem to be a standard piece of gear. Undoubtedly, being able to contact emergency responders in case of an emergency can be invaluable, but people may be relying on them too heavily, substituting them for proper skill, preparation, judgment, and experience (Martin & Pope, 2012; Pope & Martin, 2011). It appears people may be using their cell phones to oversimplify decision making in the backcountry. This may influence them to omit other important information key to the decisions they are making and lead them to a false sense of security resulting in riskier decisions than they would otherwise make. Consider the following example.

Nine students and I departed Utah Valley University in Orem, Utah midmorning and took a three-hour drive to Fuller Bottom to hike the San Rafael Gorge. The gorge is a 16.6-mile (26.72 km) hike from Fuller Bottom to the San Rafael Campground through a lush desert canyon with 1,500 ft (457.2 m) of high red rock walls. The trailhead is 19 mi (30.58 km; roughly an hour) from the nearest town, Castle Dale, Utah, on improved and unimproved dirt roads. This town is also the location of the Emery County Search and Rescue headquarters. The nearest emergency room is located in Price, Utah 39 mi (62.76 km; roughly an hour and a half) from Fuller Bottom. The hospital in Price is only an emergency care facility and does not have a trauma rating.

To descend the canyon successfully, one must cross the San Rafael River approximately 20 times as it meanders through the canyon. At the time we embarked on the journey, the river was running at about 7 cfs (cubic feet per second; 0.20 cubic meters per second). At this flow, the water barely reached a maximum depth of knee deep at any of the crossings. Around mile eight, three of my students decided to jump off a 15 ft (4.57 m) bank into the river without considering water depth or the consequences of their jump. Before they were able to jump, I instructed them not to, as this was not an appropriate activity for a class setting. One of the students pleaded, "I will check the water depth!" I told him even if the water were deep enough, I would not let them jump. He proceeded to check the water depth anyway. It reached about waist deep. Immediately one of the other students ran toward the bank and yelled, "You have a satphone!" as he jumped in. Another student immediately followed. The first student assumed that having a satellite phone made the situation safer, when in reality a phone can, at best, only decrease the time it takes to notify emergency responders of needed help. Despite having a phone, an injury would have resulted in intense pain, trip delays, increased costs, and other frustrated students because he made a riskier decision. Although this particular decision did not result in injury, placing this kind of skewed confidence on technology could obviously result in negative consequences.

My experience with those students is not the only example of poor judgment due to an overreliance on technology. Local land management and search and rescue authorities report similar stories of individuals who are making riskier decisions as a result of carrying a cell phone (B. Hill, personal communication, January 5, 2016). Similarly, Martin and Pope (2012) reported a sizable portion of their respondents believed wireless communication devices reduced the dangers present in the backcountry and most of the same people admitted they had made

decisions that increased their exposure to risk because they were carrying one. Therefore, the purpose of this study was to gain understanding about the influence of technology, specifically cellular phones, on backcountry decision making during potentially risky situations in the backcountry and examine the difference in decision making between those who carry a cellular phone and those who do not.

Justification

People are taking technology into backcountry and it is affecting their experiences (Ewert & Shultis, 1999; Pohl, 2006; Shultis, 2012). Growing network coverage and increasing technology is bound to continue to influence the experiences people have in the backcountry with both positive and negative consequences.

The ability to call for assistance from search and rescue is a positive consequence of carrying wireless communication devices into the backcountry. A related negative consequence could be the number of calls for search and rescue and the associated costs. Vigneron (2014) reported an average of 11.2 search and rescue operations per day between 1992 and 2007 performed by the National Park Service (NPS). These operations resulted in cost totaling $58,572,164 funded by the NPS between the same years. The NPS is not the only agency responsible for search and rescue. Other federal, state, county, and local agencies are funding and sending volunteers for search and rescue operations. This is a financial burden to the agencies called upon to perform these searches and rescues (Heggie & Heggie, 2008).

Wireless communication devices appear to be particularly connected to search and rescue operations. These devices appear to be influencing the way people make decisions in the backcountry, causing them to behave in ways they would not otherwise (Holden, 2002; Martin & Pope 2012; Pope & Martin, 2011). Cell phones in particular could be a major contributor to this

problem (Martin & Pope, 2012; Pope & Martin, 2011; Vigneron, 2014). Vigneron reported 32% of calls for search and rescue came via cellular phone. This was the largest category. People asking in person, as opposed to using a wireless communication device, was the second largest category at 26%. Satellite phones were the only other means of calling for help reported by Vigneron. They accounted for only 3% of calls.

It is important for land managers and search and rescue teams to understand what influences people in their backcountry decision making. Understanding personal backcountry behaviors could allow land managers, search and rescue teams, and recreation professionals to encourage and educate backcountry users to make wise and safe decisions. This understanding may also provide insight that could assist in the successful rescue of individuals caught in backcountry emergencies.

Literature Review

This research was conducted to understand if the presence of technology, specifically cellular phones, alters the decisions hikers make in potentially risky situations in the backcountry. The related literature is presented under the following topics: (a) risk in outdoor recreation, (b) decision making, (c) social influences, (d) familiarity, (e) experience, (f) risk propensity, (g) technology and the backcountry, (h) preparedness for outdoor activities, and (i) the role of technology.

Risk in Outdoor Recreation

Risk is built into everything we do (Cater, 2006). It is a part of life and recreational pursuits. The British Medical Association (1990) stated, “Nobody sincerely believes that all recreational activities can be made free of risk. Indeed, some degree of risk is manifestly one of

the attractions of many kinds of recreation…" (p. 146). Although there is a desirable level of risk in outdoor recreation (Ewert & Hollenhorst, 1989), not all risk is desirable (Cater, 2006).

Many recreationists are not seeking actual risk, but rather the fear and thrills associated with risk. Cater (2006) stated, "The most successful adventure tourism operators are those that have reduced their actual risk levels whilst effectively commodifying the thrills within" (p. 317). Cater mentioned bungee jumping as an example. Bungee jumping involves relatively low risk, but bungee jumping operations are successful because they provide adequate equipment and they have performed the necessary calculations for height and bungee length for a safe jump. They are controlling the actual risk, but preserving the associated thrills of falling. Likewise, the decisions a recreationist makes while on outdoor pursuits can either decrease or increase the risk to which he or she exposes him or herself. Understanding how people perceive risk and then make decisions is integral to understanding how people's backcountry decisions may be influenced unknowingly by carrying a cell phone.

Decision Making

Decisions are often complex and made under uncertainty (Tversky & Kahneman, 1974), but many decision-making theories do not address the complexity of decision making and the capacity for humans to make such decisions. Furman, Shooter, and Schumann (2010) described three major branches of decision-making theories: (a) classical normative models, (b) models that focus on the automated aspects of decision making, and (c) models that are a combination of the previous two. The classical models of decision making typically resemble mathematical equations where all variables are considered with likelihood and probability applied to each variable to maximize goal attainment based on the projected outcomes (Baron, 2004; Edwards, 1961; Savage, 1954; Von Neumann & Morgenstern, 1947). These models are more applicable to

decisions with narrow horizons where sufficient time is available and maximal goal attainment is requisite (Hannson, 1994), thus rendering them insufficient for many every day or simple decisions.

Models that focus solely on the automated aspects of decision making often focus on the role of affect, intuition, and heuristics (Furman et al., 2010). These models are beneficial because they address the complexity of decisions and the inability for all factors to be considered. Gigerenzer (2007) argued heuristics benefit decision making because they increase decision speed by limiting the number of potential factors that contribute to the decision-making process. Kahneman and Klein (2009) said intuition can aid complex decisions when under time pressure or with incomplete information. On the other hand, other authors contend that affect and heuristics are unwanted decision biases that negatively influence decision making (Forgas, 1995; Tverksy & Kahneman, 1974). Nonetheless, this study is not looking for the perfect process for decision making and how humans ought to make decisions. It is rather examining how people make decisions in situations where some information is present but the decision is also based on uncertainty. Theories combining normative models and automated models seem to fit best (Furman et al., 2010).

Behavioral Decision Theory. Behavioral Decision Theory (BDT) addresses the complexity and uncertainty of decision making, unlike many of the classical views of decision making, which explain decision making as if it were a perfect process (Einhorn & Hogarth, 1981; Slovic, Fischhoff, & Lichtenstein, 1977). BDT describes how people actually make decisions rather than how they ought to in a perfect situation with perfect information (Saad, 2015). Therefore, BDT allows for complex decisions made under uncertainty by allowing for the use of heuristics, affect, and intuition while still addressing the fact that people also make

decisions with all or part of available information. Payne, Bettman, and Johnson (1992) suggested people faced with complex decisions are more likely to simplify them by using heuristics. Decisions involving potentially risky situations in the backcountry are usually complex and made under uncertainty; therefore, this study is more concerned with the use of heuristics but also recognizes people may be using pieces of classical decision processes to make decisions while on outdoor adventures.

Heuristics. Aronson (2004) defined a heuristic as "a mental shortcut; it is a simple, often only approximate, rule or strategy for solving a problem" (p. 107). Heuristics are also known as *rules of thumb* (Gigerenzer, 2007). They may be effective in some cases (Gigerenzer, 2007), but not all (Tversky & Kahneman, 1974). For example, McCammon (2004) identified six heuristics that can effectively aid decision making in many situations but they have proven to lead to riskier decisions among backcountry skiers in avalanche terrain. He calls them heuristic traps. They include: (a) familiarity, (b) consistency, (c) acceptance, (d) the expert halo, (e) social facilitation, and (f) scarcity. Heuristics in general can prove to be beneficial in everyday life, but these six can lead to riskier decisions resulting in greater exposure to danger in avalanche terrain (Furman et al., 2010; McCammon, 2004). They may also adversely influence decisions in other outdoor pursuits such as hiking, the activity utilized to examine decision making in this study. This review discusses McCammon's heuristic traps that are particularly related to hiking within broader categories. They include (a) social influences, (b) familiarity, and (c) experience.

Social Influences

The presence or actions of others influence a person's decisions. Gstaettner (2015), in a study on people who crossed a sand barrier to an island despite the risks, found people engaged in potentially dangerous outdoor activities simply because they were with a group. Gardner and

Steinberg (2005) performed an experiment where participants were placed in groups or alone to respond to a questionnaire measuring risk taking with behavioral tasks. They found the participants took more risks, focused more on the benefits than the costs of risky behavior, and made riskier decisions when in peer groups rather than when alone.

Furedi (1997) claimed risk is perceived on the basis of the prevailing ideas and values held about society and its future. Multiple studies have shown people make decision based on the actions and influences of other people (e.g. Gardner & Steinberg, 2005; Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008; Zhou & Horrey, 2010). Despite the number of studies performed on social impacts on decision making, Nolan et al. (2008) contended that it remains under-detected.

Although it may be under-detected, research shows there are at least two ways people influence each other's decisions: (1) peer observation and (2) peer pressure (Harakeh & Vollebergh, 2012). Harakeh and Vollebergh (2012) found that among smoking teens, peer observation influenced a person's decision to start smoking more than peer pressure. This notion is supported by a number of study findings that indicate observing others participating in a task influenced them to participate also. For example, Zhou and Horrey (2010) found that people were more likely to cross a busy road when they saw others doing the same. Peer observation is also present in recreation settings. Hayes (2008) found that people were influenced to cross a safety barrier at a glaciers edge in a national park when they saw others on the other side of the barrier. Gstaettner (2015) found that people justified crossing a sandbar to an island was safe because seeing other people on the sandbar meant it was safe enough for them to do the same. They did this despite signs warning them of danger and risk.

Peer pressure is another important way that decisions are influenced. Gstaettner's (2015) research also showed being in a group influences a person to make risky decisions. Peer pressure in a group participating in risky activities, like seeing others cross a sandbar, also took precedence over formal warnings indicating an activity or action is dangerous or risky. This is supported by Nolan et al. (2008) in a study about energy conservation. They found people are more influenced to conserve energy by the actions of peers "than any of the standard appeals that are often used to stimulate energy conservation, such as protecting the environment, being socially responsible, or even saving money" (p. 921).

It is clear social factors influence the decisions people make, but age seems to play a role in how influential the social factors are. Gardner and Steinberg (2005) found not only does risk taking and risky decision making decrease with age, but the influence peers have on each other also decreases with age (Nolan et al., 2008; Zhou & Horrey, 2010). Although these studies described the social influences on decision making in such things as conservation, video games, and traffic signals, this notion is still applicable in an outdoor recreation setting. This further justifies the use of our specified age group (18-34 years of age) because this group is more likely to be influenced by social factors than would be an older age group.

Social influences recognized in heuristics. McCammon (2004) identified several heuristics related to social influences in a recreation setting. They are (a) acceptance, (b) social facilitation, and (c) the expert halo. Although he applied them to decision making in avalanche terrain, they can also be applied to other recreation settings.

Acceptance. Acceptance "is the tendency to engage in activities that we think will get us noticed or accepted by people we like or respect, or by people who we want to like or respect us" (McCammon, 2004, p. 4). In this sense, people may make flawed decisions in an outdoor setting

because they want to be accepted by a person or group. People may decide to continue in the face of danger because they think they may be looked down upon for not accomplishing what they think of as socially acceptable. McCammon (2004) says this is especially prevalent in men seeking the acceptance of women.

Social facilitation. Social facilitation influences decisions similarly to acceptance. The difference is social facilitation only requires the presence of other people to alter behavior and decisions rather than observing others actions or experiencing peer pressure (Plantania & Moran, 2001). McCammon (2004) said it "is a decisional heuristic where the presence of other people enhances or attenuates risk-taking by a subject, depending on the subject's confidence in their risk taking skills" (p. 5). In other words, people will put forth more or less effort when others are present (whether or not they are being judged or directly observed) depending on their level of confidence. In this heuristic, an expert skier would try to perform better near a ski lift and a novice singer might hold back from singing in public despite his or her ability to actually complete the task.

The expert halo. The halo effect is one of the oldest and most well-known psychological phenomena and "is generally defined as the influence of a global evaluation on evaluations of individual attributes of a person…" (Nisbett, & Wilson, 1977, p. 250). One example was a study that examined if a person's attractiveness or unattractiveness influences another person's perception of his or her personality **(**Miller, 1970). Miller found attractive people were generally associated with more desirable personality traits. The expert halo refers specifically to people's perceptions of another's expertise in a particular activity or task. The expert halo, in relation to recreation, happens when people place the responsibility to make decisions on one person in the group who is seen as the expert (McCammon, 2004). The basis for placing confidence in this

leader does not necessarily have to be on his or her experience in the activity at hand or his or her expertise. It can also be based on age (e.g., the oldest person in the group) or familiarity with the location. Relying on this heuristic can prove to be beneficial if the person chosen as the leader is indeed experienced in the activities and associated environment having the tools necessary to navigate them. If the chosen leader does not, the group may be falling into a heuristic trap and following a leader that leads them into greater risk because of his or her inability to make appropriate decisions in the given situation.

Familiarity

Familiarity has been studied in topics as diverse as consumer decisions (Park & Lessig, 1981) and in medical literature (Chapman, Nelson, & Hier, 1999). Literature on e-commerce suggests that people are more trusting of online marketers when they are familiar with them despite the marketer's reputation (Gefen, 2000). Familiarity also applies in an outdoor setting. When recreationists are familiar with an activity or the area where they are recreating, they may feel safe despite signs of encroaching danger, leading them to take greater risk inadvertently.

Familiarity as a heuristic. Familiarity has also been identified as a heuristic (McCammon, 2004). It is closely related to the availability heuristic identified by Tversky and Kahneman (1974) where people rely on the most easily recalled information to make decisions. This information is usually the most recently learned or most often used. This heuristic is usually reliable but can lead to predictable errors. McCammon (2004) said "the familiarity heuristic relies on our past actions to guide our behavior in familiar settings. Rather than go through the trouble of figuring out what is appropriate every time, we simply behave as we have before in that setting" (p. 3). This heuristic can prove to be useful in most situations but when hazards change and terrain does not, McCammon said it could prove to be a trap leading people

to make a decision placing them in greater risk. The familiarity heuristic is related to decision making in other recreational pursuits when people are recreating in familiar terrain. It can prove to be useful when signs of rising danger are identified to be out of the norm, but when subtle evidences of rising risk are showing and not identified, familiarity can lead participants into greater risk than intended. Being familiar with an area could influence people to make more or less risky decisions depending on the information the decision maker acknowledges or ignores.

Experience

As previously discussed in social facilitation and the expert halo, experience can influence decision making. These two heuristics explain how experience may influence decisions in group settings. It has also been argued in marketing literature that familiarity and experience with a product are the same thing (Raju, Lonial, & Mangold, 2015). Despite its similarities to these topics, experience can also influence an individual's decisions in its own way, in or out of group settings.

Maitland and Sammartino (2015) found experience improved heuristic decision making in potentially hazardous environments. They said people's previous experience allowed them to build a richer representation of the situation. It appears the outdoor guide community may be influenced in a similar way. As they gain experience, they develop heuristics that prove to be accurate in a majority of situations allowing them to make decisions quickly and spontaneously. Many of the training programs for guides teach them to make decisions in such a way. Scenario-based Wilderness First Responder courses are an excellent example of this type of training (e.g., Tilton, 2010). These courses teach multiple heuristics and are designed specifically for more experienced guides and professionals. An example from the Wilderness First Responder course is the following heuristic: if a person is experiencing abdominal pain for more than 12 hours the

person should be evacuated from a backcountry setting. Several dangerous medical problems can be indicated by prolonged abdominal pain. This does not necessarily mean that the current patient has one of these issues, but because of the inability of a guide to make such a determination, a heuristic is applied to evacuate after 12 hours. In this case, the heuristic works well because it is based on conservative information and aids in getting an ill person to help before larger issues arise whether or not the pain is caused by a true dangerous medical emergency.

The *American Mountain Guide Association Manual for Single Pitch Instructors* (Gains & Martin, 2014) on the other hand seems to rely less on heuristics, although it introduces several, by teaching the available information so guides can make informed decisions. This type of decision making is more similar to the classical models of decision making mentioned earlier (Baron, 2004; Edwards, 1961; Savage, 1954; Von Neumann & Morgenstern, 1947). This informed approach may work well for experienced guides because their background allows them to process more of the pertinent information to make a good decision. This may also differ from the Wilderness First Responder approach because of the context of the decision. Medical decisions may need to be simplified for the guides because they have less experience in the medical field and need to make quick decisions with little information, whereas when an individual is acting as a Single Pitch Instructor, he or she can take the time to assess situations and make decisions that are more informed because the decision is less time sensitive.

Risk Propensity

In addition to heuristics, a person's propensity toward taking risks may also influence the decisions they make while traveling in the backcountry. Risk propensity is "an individual's current tendency to take or avoid risks" (Sitkin & Weingart, 1995, p. 1575). It has been

conceptualized in two ways: as an emergent property that can be changed over time and as a stable dispositional attribute (Sitkin & Pablo ,1992; Sitkin & Weinhgart, 1995). Despite its dual conceptualization, according to Sitkin and Weingart (1995), "the tendency to take risks (i.e., risk propensity) is almost certainly related causally to making riskier decisions" (p. 1576).

Much of the literature on risk propensity comes from the business sector. It has focused on risk propensity of entrepreneurs (e.g., Brockhaus, 1980), business managers (e.g., Stewart & Roth, 2001), investments, and spending (e.g., Schubert, Brown, Gysler, & Brachinger, 1999; Sitkin & Weinhgart, 1995). Others have examined it in fields such as politics (e.g., Morgenstern & Zechmeister, 2001) and military operations (e.g., Sicard, 2001). Nevertheless, because risk is built into everything we do (Cater, 2006), risk propensity will likely be an important influential variable while making decisions in potentially dangerous situations in the backcountry.

Technology and the Backcountry

The impact of technology on backcountry users is accelerating. Technological development influences comfort (e.g., nylon, sleeping pads, tents, clothing) safety (e.g., first-aid supplies, navigation and communication devices, technical safety equipment) and even domesticity (e.g., devices that play music, games, videos).

Pohl (2006) suggested technology might not belong in the wilderness. She argued technology connects people to city life even while they are trying to escape it, thus destroying the reason for entering the wilderness in the first place. Pohl also said technological devices remove people from current experiences by providing fast or instantaneous results. She stated:

> We can compare using a GPS unit instead of topological maps and a compass to help navigate a route. GPS units are precise, easy to use, and quickly tell us where we need to go. A map and compass can be frustrating, and their use demands a certain level of skill.

> We need to continuously pay attention to the landscape around us; else we miss a key drainage or landmark to pinpoint our location. But the technology behind a GPS unit is unintelligible to the user. Its machinery is concealed. If we run out of batteries or the device breaks, we are unable to fix it. A GPS unit fails to tell us anything about our environment; it simply solves our problems for us. On the other hand, a compass is a simple tool. We know that the magnet inside it is drawn in the direction of magnetic north, and we can fix it if it breaks. As we are reading a compass and following a map, we have to pay attention to everything around us. We are engaged in the activity. (p. 154)

By relying on technology too heavily, people may be depriving themselves of a full backcountry experience and, more significantly, reliance on technology can truly be dangerous when it fails. As Pohl demonstrated, not giving oneself a full backcountry experience is only one small consequence of relying heavily on technology for assistance in the backcountry.

A cell phone's role in accident prevention and reaction. Each type of outdoor adventure—and even each individual—requires a different level of preparation. A walk on a front country trail may require little to no preparation while an expedition to a remote, high altitude mountain may require months of preparation and training. It is advised when embarking on an outdoor adventure of any kind to have at least the ten essentials. These include (a) some form of navigation (map, compass, GPS), (b) sun protection (sunscreen, long sleeve shirt, hat), (c) insulation or extra clothing, (d) illumination, (e) first-aid supplies, (f) a way to start a fire, (g) a repair kit and tools for gear, (h) nutrition or extra food, (i) water, and (j) an emergency shelter. These are to take care of basic needs, for several hours or a couple of days, in the case one gets unexpectedly delayed on an outdoor adventure. These are to sustain life, to prevent or

treat injury, and to prevent people from getting lost (Curtis, 2005; Eng, 2010). It is true modern smartphones can perform some of these functions, but a simple cell phone is not included because it cannot perform any of these functions.

Because of the lack of preparation of people who embark on an outdoor adventure and end up needing assistance from search and rescue, Boore and Bock (2013) stated,

> Education efforts should begin to move away from the traditional recommendations and target those items that were actually implicated in injury occurrence. Items that could be recommended based on this study include appropriate footwear, sufficient water, sufficient food, and trekking poles. Although cell phones were also suggested as being useful by survey respondents, a cell phone cannot help prevent incidents or help patients to self-rescue, and are cautiously recommended. (p. 6)

It is apparent from this statement that people who have called for assistance from search and rescue understand the value of having a cell phone to call for help, but they have realized cell phones can do little more than call for help and even then, they are not always reliable (Boore & Bock, 2013). Cell phones cannot be mistaken for preventative equipment such as a helmet or compass. They can only be used to call for help after an accident has occurred. Yet it appears people who carry cell phones in the backcountry are depending upon this technology to act as preventative equipment despite its inability to prevent accidents or injury. Due to this perceived dependence on technology in wilderness situations, a closer investigation is in order to discover the degree to which cellular technology influences decision making in the wilderness.

Cellular technology. Cell phones work on a set of frequencies much like a walkie-talkie. They run on a line of sight system, meaning that for a cell phone to transmit or receive information, it needs to be in the direct line of sight of an antenna on a cell tower (Brian, Tyson,

& Layton, 2015). They also use a short-range transmission, which covers a small area called a cell (Brian et al., 2015). Within a city or coverage area, there are multiple cells with an antenna in the center and as a cell phone travels from cell to cell, it changes which tower antenna it utilizes for transmission and reception (Brian et al., 2015). For the phone to continue communicating with the tower, it needs to be within the tower's range (Brian et al., 2015). The further from the tower the phone is, the weaker the signal, until the signal is lost (Brian et al., 2015). This system works great for cities and high travel areas, but in the backcountry, reception is spotty at best and not always reliable (Boore & Bock, 2013).

Recent research on communication technology in the backcountry. Few studies have been conducted on the effects of technology on decision making, risk, and safety in the backcountry (Holden, 2004; Martin & Pope, 2012; Pope & Martin, 2011). Holden's dissertation assessed the effects of satellite phones on perceptions of the wilderness experience, safety, coping with stressful situations, and risk taking among Outward Bound students in a wilderness program. Using a one-way ANOVA, he did not find a significant difference between people who were aware of a satellite phone and people who were not aware of a satellite phone in items relating their perceptions of safety, ability to cope with stressful situations, and risk taking. He mentioned the lack of significance might be due to a small sample size. Along with a small sample size, his study was limited by only being able to randomly assign groups of people to control groups rather than individuals. The ability to assign individuals to control groups would allow for using an ANCOVA for the analysis, increasing the ability to control for more variables in the model.

On the contrary, Pope and Martin (2011) found that people who were against technology in wilderness settings were less likely to rely on technology for safety and more likely to be

conservative in their decisions. They grouped their respondents into two groups, pro-technology and anti-technology. The pro-technology group was more likely than the anti-technology group to (a) think technology could be an effective substitute for skills, experience, and knowledge; (b) take chances that could increase risk if technology were present; (c) think technology reduces the dangers people associate with wilderness; (d) call for rescue even if self-rescue were possible; (e) think safety was not their personal responsibility; (f) feel safer in the presence of technology; and (g) think technology genuinely increases safety for wilderness users.

Furthermore, Martin and Pope (2012) found that people who had experienced a serious wilderness accident were more likely to think technology creates a false sense of security. It is clear from these studies technology affects people's perceptions of safety, but considering all three of these studies asked respondents about their perceptions of technology and how they feel it influences safety, it is still unclear if the presence of technology actually influences an individual's decisions in the backcountry. Because of the ethical concerns of randomly assigning people to actual risky situations as in an experimental design, testing decisions in scenarios portraying risky situations brings us closer to real decisions and helps clarify the discrepancy between Holden's (2004) dissertation and Pope and Martin (2011) and Martin and Pope (2012).

The Cellular Heuristic

Use of cell phones as a means to report an accident or call for assistance from search and rescue is on the rise (Hung & Townes, 2007). Many believe people are venturing into the wilderness ill prepared, relying too heavily on cell phones as their safety net in case something goes wrong (Holden, 2002). These cell phone *vigilantes* who take risks assuming rescue is just a cell phone call away (Hung & Townes, 2007) may be using cell phones as a heuristic trap that is oversimplifying the decisions necessary as they prepare for a trip in the backcountry. Or, as they

make decisions in the backcountry, they are making mistakes much like in the heuristic traps that cause people to travel in unsafe avalanche terrain introduced by McCammon (2004). For example, a person may be more likely to embark on a spontaneous hike or other outdoor activity without the adequate preparations because they have a cell phone; drawing the conclusion that reaching help and any multitude of information is in the palm of his or her hand.

A review of the literature provides insight about backcountry decision making, the reality and risks of heuristics, factors in backcountry decision making including social influence, familiarity, and experience. The growing force of technology has been addressed as well as its potential influence on backcountry decisions. However, no careful test of the influence of cellular phones on backcountry decisions has yet been undertaken. Therefore, the purpose of this study was to conduct a scenario-based decision model to test the influence of cell phones on backcountry decision making.

Hypotheses. Based on the literature we reviewed, we hypothesized is a significant difference in decision making while in potentially risky situations in the backcountry between those who carry a cellular phone and those who do not carry a cellular phone when controlling for experience, familiarity with the terrain, and companion hiker influence.

Methods

To help further understand the differences in decision making between those who carry a cell phone and those who do not, a scenario based decision model was developed for this study. The following sections outlines this method. It includes the following organizational pieces: (a) development of the instrument; (b) selection of subjects; (c) data collection procedures; and (d) analysis.

Development of Instrument

An electronic instrument was developed for this study (see appendix C). It consisted of a textual scenario of a hiking situation revealed in five stages. Each stage presented information about the hike as it progressed. Each stage also indicated increasing hypothetical dangerous situations presenting greater risk to the respondents. After each stage was revealed, the respondents were presented with an opportunity to continue hiking or retreat. If respondents chose to retreat in any stage, this marked the end of their progress through the stages and indicated the amount of risk they accepted in the scenario (the dependent variable). This was recorded on a six-point scale (1=turned back after the first stage, 5=turned back after the sixth stage, and 6=chose to continue hiking through each stage.)

The instrument was pilot tested in four rounds. Each round consisted of approximately 15 individuals. Each individual read the scenarios and responded to whether or not he or she would continue hiking. After each round, the researchers checked the data for good variance. Researchers altered the scenarios after each round to influence more variance and ran another round of pilot tests. For example: the first pilot test returned data showing most respondents returned after the first stage of the scenarios. This indicated the scenario stages were presenting too much risk, so the researcher reduced the amount of risk presented in the scenarios. In addition, after each round of pilot testing, the respondents were interviewed to determine the clarity of the scenarios and questionnaire, and the instrument was updated accordingly.

Each respondent was also assigned to one of four groups. These groups indicated whether the respondent was traveling with or without a cell phone (the independent variable) and solo or with companions (a control variable). The four groups were (1) traveling solo with a cell phone, (2) traveling solo without a cell phone, (3) traveling with companions with a cell phone, and

(4) traveling with companions without a cell phone. This information was randomly assigned to the respondents through the Qualtrics randomization feature. The respondents were given this information in the first stage of the scenario and they were told they were traveling solo or with companions and if they had or did not have a cell phone. If they were assigned to be hiking with a cell phone, they were also told they would have occasional service.

To match the scenarios with reality, each scenario described the gear list (i.e., what the individual had hypothetical access to). An expert review was held to check the validity of the scenarios with *real-life* situations with a panel of Utah County Search and Rescue incident commanders. This review indicated the typical person who requires search and rescue services carries much less than the 10 essentials (A. Wakefield & J. Sargent, personal communication, March 15, 2016). This is important because it embeds a level of increased risk in the scenarios that may be relevant to the interpretation of the findings. Therefore, the gear list in the scenarios did not include everything from the 10 essentials, nor what a typical person should carry on the hike presented in the scenarios.

The setting of the scenarios was the Aspen Grove Trail in the Mt. Timpanogos Wilderness Area in Northern Utah bordering Utah Valley. Mt. Timpanogos is visible from most anywhere in the surrounding cities and as such is a well-known attraction for locals, visitors, and students from two universities. Hiking the mountain has become a rite of passage for Utah Valley residents, especially the university students. The Aspen Grove Trail is about 15 miles (24.14 km) round trip and climbs approximately 4,580 ft (1395.98 m) of elevation before reaching the summit of 11,749 ft (3581.09 m). The scenario provided pertinent details of the trail and hike but further details were omitted to allow for familiarity of area to be assessed in the questionnaire.

The first stage of the scenario explained the subject was going on a hike from the Aspen Grove Trailhead with the goal of summiting Mt. Timpanogos to watch the sunset. This stage explained whether the subject was hiking solo or as the informal leader of a group with three friends. It also explained some of the technical details of the hike (e.g., total hike distance, hike time, elevation gain, weather) and their current location on the hike. The person was told they were about two miles up the trail and it was 50ºF with a slight breeze. The gear list (what the respondent, and group if applicable, hypothetically did or did not have with them) was also provided in this stage. They had two 16 oz. water bottles, rain jacket, map, lunch, snacks, and a flashlight. They did not have extra food or water, insulating jacket, compass, tarp or shelter, or lighter or another fire starter.

The second stage explained the respondent was further into the hike, were a little more tired than expected, ate their lunch early, drank half their water, and remember the weather forecast calls for rain early the next morning. The third stage increased the risk by stating the clouds are thicker, the temperature drops, and the wind changes direction. The fourth stage increased the danger by stating it has started to rain, their feet and legs are wet, and they are slightly cold. It was also starting to get dark so they pulled out their flashlight and the light is a little dim. The fifth and final stage further increased the danger by stating they are above the tree line and close to the peak when it starts to snow a little bit. They have seen some flashes of lightning accompanied by thunder in the distance and their flashlight is almost dead. They have also started to shiver because of the cold.

If they chose to retreat at any stage, they were given several open-ended questions asking them to explain why they chose to retreat. If they chose to continue through every stage, they

were given a separate set of open-ended questions asking them to explain why they continued despite increasing risk.

Before introducing the scenarios, subjects were asked basic demographic information including gender, age, zip code of primary residence, and marital status. Subjects were also asked about their outdoor experience and familiarity with the Mt. Timpanogos trail. Items about experience and familiarity were measured on a 7-point Likert type scale asking about the respondents' experience in outdoor activities, particularly hiking on long strenuous high peaks (1=very inexperienced and 7=very experienced), and about the level of familiarity of the Mt. Timpanogos Wilderness Area and the Aspen Grove Trail (1=very unfamiliar and 7=very familiar). Experience and familiarity were used as control variables in this study.

Selection of Subjects

The subjects for this study were volunteers from the Marriott School of Management at Brigham Young University (BYU). They were recruited through the Behavior Lab in the Marriott School. The Behavior Lab recruits subjects by arranging with course instructors to award a small amount of extra credit for each study a student participates in. Ultimately, the amount of extra credit is at the instructor's discretion, but the Behavior Lab limits students to receiving credit for up to eight studies per course. The Behavior Lab's guidelines for awarding extra credit are 0.25% grade increase for every 30 minutes of studies a student participates in. Therefore, if a student participates in all eight available studies, they can be awarded up to 2% of their final grade.

BYU students were appropriate subjects for this study for multiple reasons. According to the Outdoor Foundation (2013), 25% of people who participate in outdoor activities are students. The only larger group was people who Work for Someone Else Full-Time (35% of people). The

BYU student body likely contained a range of outdoor experience level and skill levels because of its proximity to the Wasatch Front that offers a variety of outdoor activities. This allowed for a consideration of all skill levels.

The sample consisted of 524 BYU students (see table 1 for a summary of descriptive statistics). There were 295 males (56.3%) and 229 females (43.7%). The sample had a mean age of 21.6 years (SD = 2.0). Four-hundred and seventeen (79.58%) participants reported having never been married, 106 (20.23%) reported being currently married, and one (0.19%) reported having been previously married. Ninety-one percent of the sample reported they generally hike with a cell phone.

Data Collection Procedures

The data were collected through a Qualtrics questionnaire distributed by the Psychological Research Participation System (SONA) provided by the Behavior Lab in the Marriot School of Management at BYU. Subjects were informed their response to the questionnaire indicated their implied consent; their participation was voluntary and they could withdraw at any time; and their identity would be kept confidential through the implied consent statement (see Appendix B). The data were collected over one week in early April of 2016.

Data Analysis

The data were cleaned using Microsoft Excel and 53 erroneous duplicate responses were removed. With the exception of one response being removed because the respondent was below the age threshold, no other responses were removed or altered. Every response was complete and appeared to be reliable on account the open ended questions were answered with appropriate answers for the questions. The final data set contained 524 responses.

After data cleaning, the responses to the binary questions indicating the stage respondents turned back were combined and turned into an ordinal variable (1=turned back in the first stage, 2=turned back after the second stage, and 6=never chose to turn back), indicating how far they hiked with increasing risk. The first stage of the scenarios, previously broken up into four randomly assigned groups, was combined into a single categorical variable indicating which group they were assigned to (1=hiking solo with a cell phone, 2=hiking solo without a cell phone, 3=hiking with a group of three friends with a cell phone, and 4=hiking with a group of three friends without a cell phone). Descriptive statistics were run to determine the underlying characteristics of the sample. Using Statistical Analysis Systems (SAS), the variables were tested for interaction effects and none were found. Then a backward elimination (Guyon & Elisseeff, 2003) ANCOVA was used to determine the most influential among experience, familiarity with the terrain, companion hiker influence, and sociodemographic variables.

The research question was then tested using the following null hypothesis: There is no significant difference in decision making while in potentially risky situations in the backcountry between those who carry a cellular phone and those who do not carry a cellular phone when controlling for experience, familiarity with the terrain, and companion hiker influence. This hypothesis tested the difference in means for the stage of the scenario where people turned back on the hike between those whose scenario included a cell phone and those whose scenario excluded a cell phone. This analysis used a Mixed-Model ANCOVA (Little, Milliken, Stroup, & Wolfinger, 1996) after adjusting for experience, familiarity with the terrain, companion hiker influence, and sociodemographic variables.

Results

The backward elimination ANCOVA provided results for the hypothesis test. Only two variables were significantly associated with how far people continued through the stages of the scenarios. These included risk tolerance ($F=17.87$, $p <.0001$) and long hike experience ($F=10.57$, $p=.0012$). Table 2 indicates the variables that were not significantly related to how far people continued through the stages of the scenario and were removed from the model. Although the variable indicating if they were hiking solo or with companions and with or without a cell phone ($F=2.18$, $p=.0898$) was not significantly related to how far people continued through the scenario, it was left in the model for the Mixed-Model ANCOVA (along with risk tolerance and long hike experience) because it was the variable of interest in this study. This stage of the mixed model revealed, on average, for every one-unit increase in risk tolerance people continued 0.25 ($p < .0001$) stages further in the scenario, and for each one-unit increase in long hike experience people continued 0.15 ($p=.0012$) stages further in the scenario.

Least Squares Means were then calculated for all of the assigned groups (e.g., hiking solo or with companions, hiking with or without a cell phone; table 3). These were used to calculate the difference of the means of the groups. Although, there was not a significant difference between any of the groups in regards to the number of scenarios they continued through (table 4), there was a suggestive difference (0.5160, $p=.0695$) between the hikers with companions who had and did not have a cell phone in the distance. This indicates traveling with companions may influences backcountry travelers to take more risks.

Discussion

The purpose of this study was to gain understanding about the influence of technology, specifically cellular phones, on backcountry decision making during potentially risky situations

in the backcountry. Past research indicated people perceived they are more likely to take risks when in the presence of technology (Martin & Pope, 2012; Pope & Martin, 2011) and the use of cell phones to report the need for search and rescue services is on the rise (Hung & Townes, 2007). It was hypothesized these two factors could contribute to more incidences resulting in injury, death, or the need for search and rescue services (Hung & Townes, 2007). On the contrary, when testing decision making in a scenario as in the present study, as opposed to *perceptions* of decision making, cell phones and other electronic devices may not influence people to take greater risks in the backcountry as presented in Martin and Pope (2012) and Pope and Martin (2011). This indicates people may not be using a cell phone as a heuristic to simplify decisions and disregarding other important cues that may indicate increased hazard and risk as proposed in this study's literature review.

Furthermore, the current study's findings do not support many of the findings in Pope and Martin (2011) who found people who are pro-technology in the backcountry are more likely than people who are anti-technology to (a) think technology could be an effective substitute for skills, experience, and knowledge; (b) take chances that could increase risk if technology were present; (c) think technology reduces the dangers people associate with wilderness; and (d) think technology genuinely increases safety for wilderness users. Their findings suggest people perceive technology is influencing riskier decisions, but when actual decisions were tested in the presence versus the absence of technology; there is not a significant difference between those who carried cell phones and those who did not.

In addition, Mansfield's (2016a) critical analysis of Pope and Martin (2011) said that many popular media sources (e.g., D'Antonio, 2011; Lewenton, 2016; Sullivan, 2016) are citing their study saying, "Inexperienced/untrained wilderness users can create a false sense of security,

leading to more risk-taking, more mishaps, and more demand for search and rescue" (Mansfield, 2016b, para. 1). His critical analysis stated Pope's and Martin's study was based on opinion and not experimental data. This alone makes the arguments less reliable than if the data came from an experiment. Furthermore, Mansfield also said although the pro-technology group, on the scales used in Pope and Martin, were more likely to falsely rely on technology, neither the pro-technology nor anti-technology groups were very likely to falsely rely on technology. These groups scored lower than 4 (the midpoint) on most of their 7-point Likert scales supporting this conclusion. Mansfield's (2016a) critical analysis points out, and supports the current study's findings, that most people are generally not influenced to make riskier decisions in the presence of technology and should not be discouraged from carrying a cell phone with them.

The Benefits of Carrying a Cell Phone

There are several other sources that include cell phones, not necessarily in the 10 essentials, but as *other suggested gear* (e.g., Wasatch Mountain Club, n.d.). Considering it does not appear people make decisions differently when on outdoor adventures with technology, this should be considered more frequently because of the many benefits of carrying a cell phone. Klimecky (2011) outlined many of these benefits. They include (a) the ability to call or text—assuming the availability of service—friends, family, or 911; (b) text pictures of surroundings to search and rescue to provide information about a person's location; (c) even if the phone does not show service, it may be pinging off a tower indicating your location to the coverage carrier and, therefore, search and rescue; (d) most cell phones come equipped with a GPS sensor and can transmit the GPS coordinates through picture texts, messages, or tower pings; (e) most smartphones come equipped, or can download, a flashlight application, and either this or the phone screen can be used to signal search and rescue, especially when search and rescue is using

a Forward Looking Infrared Sensor; (f) and when any of these functions are able to indicate a patient's location to search and rescue, it can decrease the time it takes for them to be on scene (Hill & Linford, 2016). All this considered, cell phones may not place people in greater danger, but rather actually *help* search and rescue locate and assist people faster.

Discussion on Variables Significantly Related to Decision Making

Although the variable of interest in this study did not influence decision making as predicted in this study, other variables did influence the distance people chose to continue through the scenarios. These included risk propensity and familiarity of area.

The Influence of Risk Propensity. A person's self-reported risk tolerance, or risk propensity, influenced their decision to continue hiking despite rising risk. This supports Furman et al. (2010) who found risk propensity was significantly related to the likelihood of skiing a slope despite the avalanche forecast. Nicholson, Fenton-O'Creevy, Soane, and Willman (2002) said, "Data show risk propensity to be strongly rooted in personality, with sensation seeking confirmed as a key component in most decision domains" (p. 2). Others have noted that risk propensity is not consistent across situations (Kahneman & Tversky, 1979). Therefore, personalities should be a topic in future research to determine if certain personalities may be more likely to make riskier decisions relating to risk and to determine the situations in which these personalities may make these decisions.

The Influence Experience and Familiarity. A person's general outdoor experience was not significantly related to the distance they chose to continue through the scenarios. However, their experience with long mountain hikes similar to the mountain referenced in the scenario was related to the distance they chose to continue through the scenarios. This indicates that McCammon's (2004) familiarity heuristic trap may be an influence. People who had been in

similar terrain continued further through the scenarios than people with more outdoor experience in general. This could be because a person who has spent more time developing outdoor experience has a greater amount of practical knowledge to rely on for judgment rather than just a similar location or hike. A secondary analysis of the data could examine if people who scored high in both categories were likely to turn back earlier than those with high levels of experience in long mountain hikes alone.

The findings indicating familiarity and risk-tolerance were significantly related to the amount of risk the participants were willing to accept in these scenarios suggest people are relying on the automated aspects of decision making as indicated in the literature review. I suggest risk tolerance may be an automated aspect of decision making like familiarity because people may be relying on past experiences where they took risks and did not suffer negative consequences as a result. By trusting in this information, they are pressing forward relying on the past rather than on current cues. In most cases, this will not result in harm or increased danger. Relying too heavily on the automated aspects of decision making is only dangerous in instances where negative cues are indicating increasing danger. Relying on the automated aspects of decision making in these situations could lead to erroneous decisions resulting in harm or the need for outside help (e.g., search and rescue). Backcountry travelers should always pay attention to current cues (e.g., inclement weather, hunger, fatigue).

Discussion on Variables Not Significantly Related to Decision Making

Although traveling with companions and gender were not statistically significant in their influence on decision making in the current study, they are discussed here because (1) groups and gender have shown to be influential on decision making in previous studies and (2) traveling solo

or with companions showed a suggestive difference in the distance people continued through the scenarios.

The influence of Traveling Solo or With Companions. There was a suggestive difference between the distance people continued through the scenarios based on the presence or absence of companion hikers ($F = 0.5160$, $p = .0695$). People who were assigned to hike with a group generally chose to continue further into the scenarios than those who were assigned to hike solo. This supports research by McCammon (2004) and Furman et al. (2010) who indicated the presence of other people influences a person to take greater risks. McCammon introduced and Furman et al. further tested factors that fit into this category, namely (a) social facilitation, (b) acceptance, and (c) the expert halo.

Social facilitation, "the presence of other people enhanc[ing] or attenuat[ing] risk-taking by a subject, depending on the subject's confidence in their risk taking skills" (McCammon, 2004, p. 5), does not fit as a potential influence in this study because, although the current study's respondents were assigned to hike both solo and with companions, they did not encounter any other parties on the trail. McCammon's (2004) description and test of this heuristic indicates this heuristic is the influence of other parties, not the subjects' companions that are influential in this regard.

Acceptance could be a likely factor as a social influence in this study because acceptance, as defined by McCammon (2004), "is the tendency to engage in activities that we think will get us noticed or accepted by people we like or respect, or by people who we want to like or respect us" (McCammon, 2004, p. 4). Considering the only other people encountered on the trail in the current study's scenarios were the subjects' companion hikers, the subjects may have pushed

further into the scenarios in fear of losing respect from their peers by not completing the group's goal, thus making acceptance a likely social influence in this specific study.

The expert halo could be an influence on the decision to continue hiking because those assigned to hike with a group were told they were the informal leader of the group. This heuristic refers to a person becoming the informal leader based on any number of several factors like age, assertiveness, or skill. This does not mean the leader has the requisite skill and experience to be effective in the given leadership position. When the proper skill and experience are not present, relying on the informal leader may lead to riskier decisions. Many of the subjects in this study who were assigned to hike with a group did not necessarily have the outdoor skills to be an effective leader. A secondary analysis of the current study's data comparing the self-reported outdoor skill of the group assigned to hike with companions to how far they decided to hike through the scenarios could reveal in part how much of an influence this heuristic had on the subject's decisions.

Groupthink Theory is another theory that supports the current finding that people chose to hike further into risky situations than those who traveled solo (Rose, 2011). Groupthink is defined as "a mode of thinking people engage in when they are deeply involved in a cohesive in-group, when the members striving for unanimity override their motivation to realistically appraise alternative courses of action" (p. 9). Those who were assigned to be hiking with companions may have been blinded by their striving for unanimity, causing them to hike further because they had a goal with the group to hike to the top of the mountain as depicted in the scenarios presented to the participants.

The Influence of Gender. The influence of gender on decision making in the present study was not consistent with research in other disciplines. Financial decision making and

management research suggests females are less likely to seek risk than males (Faccio, Marchica, & Mura, in press; Powell & Ansic, 1997). In a meta-analysis of 150 studies on risk-taking tendencies of males and females, Byrnes, Miller, & Schafer (1999) found males were greater risk takers than females in most topics (e.g., smoking, sex), but also noted gender differences seem to be reducing over time. Because studies in other disciplines indicate gender differences in risk taking, further study of this trend in regards to recreation would need to be conducted to determine if gender is actually a factor or not for risk taking in a backcountry setting.

Limitations

This study sought to understand the influence of cell phones on decision making in potentially dangerous situations in the backcountry through a scenario-based questionnaire. Certain limitations arose through this study. Some were a result of the chosen method; others were due to uncontrollable circumstances within the study. The following section discusses these limitations.

The use of backward elimination could be considered a limitation when variables are eliminated based on statistical contributions to explanation of variance rather than theory or conceptual frameworks. Backward elimination favors data over theory in determining the most parsimonious statistical model (Copas & Long, 1991). We addressed this by constraining the model to include conceptually relevant variables even when the backward elimination procedure would have dropped them.

This research sought to determine if a cell phone influences a person's decisions to accept more risk without informing the participants of the purpose. Therefore, the presence or lack of a cell phone in the list was not highly emphasized. It was hoped the participants would read the gear list and base their decisions on what they had or did not have. This being said, it is unclear

whether the participants paid particular attention to the gear list in their decision making. Another related issue may be that people are so accustomed to having a cell phone with them all the time, they made decisions accordingly despite being told they did not have a cell phone with them.

This research did not seek to define a cell phone for the participants. The interpretation of cell phone was left to the respondent. This is a limitation because people have varying definitions in the capabilities of a phone. Because phones are quickly evolving with every new model, a cell phone could be a simple device to make wireless phone calls using the cell phone interface or a sophisticated device that has GPS capabilities, mapping apps, internet access, apps designed for outdoor activity advise, and several different communication platforms. This limitation makes it difficult to determine what type of connectivity may be influencing a person's decisions.

Participants were told they could choose to return to their vehicle or continue hiking after each stage of the hypothetical scenarios. The fact that participants were only given two options when it came to decision making could be considered a limitation. Another possible option could have been *stop and wait for the weather*. This was not considered as an option because we wanted to force the participants to make a decision which was either increasing in risk with each stage or extremely conservative. The benefit of adding the third option would have been a more precise measure of the level of risky decision people are willing to make in potentially dangerous situations, but it would have also made it more difficult to detect the risky or conservative decisions.

Future Research

Although this research opposes the notion that cell phones are negatively influencing backcountry decision making, more research needs to be performed to clarify all aspects of the

issue. Cell phones could have less influence on decision making than other technologies such as Personal Locator Beacons (PLBs), satellite phones, and satellite messengers due to the extended coverage areas the latter devices have. These devices do have their limitations considering they require line of sight to a satellite to send and receive communications. The extended service capabilities of these devices function in many locations, but many backcountry travelers pass through heavily forested areas and deep canyons that may limit this ability. Cloudy days may also block service to satellite devices whereas cell devices are unaffected by this. Due to the different, yet clear, limitations of each type of device, it may be all communication devices have the same influence on decision making in the backcountry unless a situation arises in a particular location where either one device or another could be used to greater effect. The location used in this study was an area that has cell service along much of the trail and, therefore, tested for this influence. If the subject being tested was either overly confident in the quality of the cell service or distrusting of the reliability of cell service completely, these attitudes could have greatly affected how far the subject hiked in the scenario, when dependence on a cell phone was a key factor.

Three topics covered in Pope and Martin's (2011) analysis could use further research: the pro-technology group was more likely than the anti-technology group to (a) call for rescue even if self-rescue were possible, (b) think safety was not their personal responsibility, and (c) feel safer in the presence of technology. Testing these three assumptions in an experimental setting, as opposed to searching for perceptions and opinions, will help determine if technology is actually influencing people to call for help in instances where they do not actually need help, needlessly increasing the number of calls for search and rescue.

Another area in need of future research is the notion technology is influencing people to embark on outdoor adventures ill-prepared (Holden, 2004), leading to increased vulnerability to risk and need for search and rescue services. Although it does not appear people are making riskier decisions in the presence or absence of a cell phone while in the outdoors, people may be less likely to adequately prepare if they know they will be carrying a cell phone or other communication device into the backcountry.

On the other hand, other research indicates people are rescued faster when they carry wireless communication devices (Hill & Linford, 2016). This indicates carrying a cell phone or other wireless information technology may be better than going without. More research is needed to determine the positive effects of carrying these devices into the backcountry and if the benefits outweigh the drawbacks.

Further research is also needed in the social influences of the willingness to accept risk. The current research was able to suggest social influences may play a role in risk taking, but it did not clarify which particular social factors were influential. Continued research on McCammon's (2004) avalanche heuristic traps in other outdoor recreational settings will help clarify not only the social influences, but also the other heuristic traps and their influences on an individual in a potentially risky situation.

Conclusion

Although there are many anecdotal stories indicating some people make riskier decisions in the presence of a cell phone, as in the case of my students, the influence is not great enough for us to suggest discouraging the use of cell phones in the backcountry for the purpose of reducing risk taking. Considering there is not a significant difference between the decision making of those who carry a cell phone and those who do not, cell phones and smartphones are

good tools for backcountry use as long as the user understands their limitations and prepares accordingly.

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Tables

Table 1

Summary of descriptive statistics.

Variable	*n*	mean	*SD*	Min.	max
Age	524	21.641	2.001	18	34
Number of children	524	0.023	0.162	0	2
General outdoor experience	524	4.531	1.338	1	7
Experience on long mountain hikes similar to Mt. Timpanogos	524	4.53	1.704	1	7
Risk tolerance	524	4.573	1.365	1	7
Familiarity of area (Aspen Grove Trail)	524	2.143	1.568	1	7
Number of times hiked the Aspen Grove Trail	524	0.527	1.273	0	12

Variable	Frequency	Percent
Gender		
Female	229	43.7
Male	295	56.3
Marital Status		
Divorced	1	0.19
Married	106	20.23
Never Married	417	79.58
Generally hike with a cell phone		
No	47	8.97
Yes	477	91.03
Group assignment		
Hiking with companions and without a cell phone	131	25
Hiking with Companions and with a cell phone	133	25.38
Hiking solo and without a cell phone	128	24.43
Hiking solo and with a cell phone	132	25.19

Table 2

Summary of non-significant variables (p<.05) in the reverse elimination ANCOVA.

Variable	*df*	*df*	*F*	*p*
Self-reported outdoor experience (7 point Likert scale, 1=novice and 7=expert)	1	520	1.77	0.1834
Marital Status	2	519	0.96	0.3853
Age	1	520	0.43	0.3853
Number of times hiked the Aspen Grove Trail (the trail used in the scenario)	1	520	0.24	0.6222
Self-reported familiarity of the Aspen Grove Trail (7 point Likert scale, 1=not at all familiar and 7=extremely familiar)	1	520	0.15	0.7025
Gender	1	520	0.07	0.7861

Table 3

Summary of least square means for the presence or absence of companion hikers and the presence or absence of a cell phone in the scenario.

Group	Estimate	Standard Error	*df*	*t*	*P*
Hiking with companions and without a cell phone	2.9192	0.1479	518	19.73	<.0001
Hiking with Companions and with a cell phone	2.7555	0.1471	518	18.73	<.0001
Hiking solo and without a cell phone	2.4032	0.1498	518	16.04	<.0001
Hiking solo and with a cell phone	2.6023	0.1474	518	17.66	<.0001

Table 4

Summary of pairwise differences between least square means of groups.

First Group	Second Group	Difference	Standard Error	p-value
Hiking with companions and without a cell phone	Hiking with companions and with a cell phone	0.1637	0.2085	0.8611
Hiking with companions and without a cell phone	Hiking solo and without a cell phone	.0.5160	0.2108	0.0695
Hiking with companions and without a cell phone	Hiking solo and with a cell phone	0.3169	0.2089	0.428
Hiking with companions and with a cell phone	Hiking solo and without a cell phone	0.3523	0.2104	0.3381
Hiking with companions and with a cell phone	Hiking solo and with a cell phone	0.1531	0.2085	0.8831
Hiking solo and without a cell phone	Hiking solo and with a cell phone	-0.1992	0.21	0.7786

Appendix A

Proposal

Decision Making in the Backcountry while Carrying a Cellular Phone

As electronic devices become lighter, smaller, more reliable, and more affordable, the number of people relying on them for entertainment, navigation, and emergency communication on outdoor adventures is increasing. Increased use and accessibility may also contribute to increased impacts on the backcountry experience. Cell phones, in particular, seem to be a standard piece of gear. Undoubtedly, being able to contact emergency responders in case of an emergency can be invaluable, but people may be relying on them too heavily, substituting them for proper skill, preparation, judgment, and experience (Martin & Pope, 2012; Pope & Martin, 2011). It appears people may be using their cell phones to oversimplify decision making in the backcountry. This may influence them to omit other important information key to the decisions they are making and lead them to a false sense of security resulting in riskier decisions than they would otherwise make. Consider the following example.

Nine students and I departed Utah Valley University in Orem, Utah midmorning and took a three-hour drive to Fuller Bottom to hike the San Rafael Gorge. The gorge is a 16.6-mi hike from Fuller Bottom to the San Rafael Campground through a lush desert canyon with 1,500 ft of high red rock walls. The trailhead is 19 mi (roughly an hour) from the nearest town, Castle Dale, Utah, on improved and unimproved dirt roads. This town is also the location of the Emery County Search and Rescue headquarters. The nearest emergency room is located in Price, Utah, which is 39 miles (roughly an hour and a half) from Fuller Bottom. The hospital in Price is only an emergency care facility and does not have a trauma rating.

To descend the canyon successfully, one must cross the San Rafael River approximately 20 times as it meanders through the canyon. At the time we embarked on the journey, the river was running at about 7 cfs. At this flow the water barely reached a maximum depth of knee deep

at any of the crossings. Around mile eight, three of my students decided to jump off a 15-ft bank into the river without considering water depth or the consequences of their jump. Before they were able to jump, I instructed them not to, as this was not an appropriate activity for a class setting. One of the students pleaded, "I will check the water depth!" I told him that even if the water were deep enough, I would not let them jump. He proceeded to check the water depth anyway. It reached about waist deep. Immediately one of the other students ran toward the bank and yelled, "You have a satphone!" as he jumped in. Another student immediately followed. The first student assumed that having a satellite phone made the situation safer, when in reality a phone can, at best, only decrease the time it takes to notify emergency responders of needed help. Despite having a phone, an injury would have resulted in intense pain, trip delays, increased costs, and other frustrated students because he made a poor decision. Although this particular poor decision did not result in injury, placing this kind of skewed confidence on technology could obviously result in negative consequences.

My experience with those students is not the only example of poor judgment due to an overreliance on technology. Local land management and search and rescue authorities report similar stories of individuals who are making poor decisions as a result of carrying a cell phone (B. Hill, personal communication, January 5, 2016). Similarly, Martin and Pope (2012) reported a sizable portion of their respondents believed wireless communication devices reduced the dangers present in the backcountry and most of the same people admitted they had made decisions that increased their exposure to risk because they were carrying one.

Statement of Problem

This study aims to examine the difference in decision making between people who carry a cellular phone in potentially risky situations on outdoor adventures and those who do not.

Purpose of Study

The purpose of this study is to gain understanding about the influence of technology, specifically cellular phones, on decision making during potentially risky situations in the backcountry.

Justification

People are taking technology into backcountry and it is affecting their experiences (Ewert and Shultis 1999, Pohl 2006, Shultis 2012). Growing network coverage and increasing technology is bound to continue to affect the experiences people have in the backcountry with both positive and negative consequences.

The ability to call for assistance from search and rescue is a positive consequence of carrying wireless communication devices into the backcountry. A related negative consequence could be the number of calls for search and rescue and the associated costs. Vigneron (2014) reported an average of 11.2 search and rescue operations per day between 1992 and 2007 performed by the National Park Service (NPS). These operations resulted in cost totaling $58,572,164 funded by the NPS between the same years. The NPS is not the only agency responsible for search and rescue. Other federal, state, county, and local agencies are funding and sending volunteers for search and rescue operations. This is a financial burden to the agencies called upon to perform these searches and rescues (Heggie & Heggie, 2008).

Wireless communication devices appear to be particularly connected to search and rescue operations. These devices appear to be influencing the way people make decisions in the backcountry, causing them to behave in ways they would not otherwise (Holden, 2004; Martin & Pope, 2012; Pope & Martin, 2011). Cell phones in particular could be a major contributor to this problem (Martin & Pope 2012; Pope & Martin 2011; Vigneron, 2014). Vigneron reported 32

percent of calls for search and rescue came via cellular phone. This was the largest category. People asking in person, as opposed to using a wireless communication device, was the second largest category at 26 percent. Satellite phones were the only other means of calling for help reported by Vigneron. They accounted for only three percent of calls.

It is important for land managers and search and rescue teams to understand what influences people in their backcountry decision making. Understanding personal backcountry behaviors could allow land managers, search and rescue teams, and recreation professionals to encourage and educate backcountry users to make wise and safe decisions. This understanding may also provide insight that could assist in the successful rescue of individuals caught in backcountry emergencies.

Delimitations

This study will be delimited to the following:

1. Approximately 400 to 600 subjects of either gender.
2. Subjects between the ages of 18 and 34 years of age. Heggie and Heggie (2008) found the largest age group requiring search and rescue services in Utah's national parks was 20 to 29 years old; therefore, the age group chosen for this study is appropriate.
3. Subjects enrolled at BYU and volunteers at the BYU Behavior Lab.
4. The variables will include decision making (the decision to turn back or continue hiking), peer influence (the number of companions in the respondent's group), the equipment the respondent is carrying, whether or not they are carrying a cellular phone, general outdoor experience, and familiarity of area.

5. Subjects will be randomly assigned to two variables, hiking with a group or solo and carrying or not carrying a cell phone.
6. A survey using a hiking scenario where the respondent will be presented with a potentially risky situation and a gear list accompanied by a questionnaire will be created for this study.
7. Hiking will be the activity of choice because the most calls for search and rescue were made during hiking activities as compared to other outdoor recreation activities (Ela, 2004; Heggie & Amundson, 2009; Heggie & Heggie, 2008; Hung & Townes, 2007; The Search and Rescue Advisory Board, 2013; Vigneron, 2014).
8. A data collection period in the Winter semester of 2016.

Limitations

The following limitations will be considered when interpreting the results from this investigation:

1. The students participating in this study are volunteers and not a random sample.
2. The age range of the subjects is 18 years to 34 years.
3. Only one scenario with minor changes to isolate variables will be used.
4. We cannot control for the varying definitions of a cell phone and its capabilities (e.g., smartphone, mini-tablet, iPhone, simple cell phone, Blackberry, etc.); therefore, we do not attempt to define it as more than a wireless communication device.

Hypotheses

The study was designed to test the following working hypothesis and null hypothesis:

1. H_1: There is a significant difference in decision making while in potentially risky situations in the backcountry between those who carry a cellular phone and those who

do not carry a cellular phone when controlling for experience, familiarity with the terrain, and companion hiker influence.

2. H_{01}: There is no significant difference in decision making while in potentially risky situations in the backcountry between those who carry a cellular phone and those who do not carry a cellular phone when controlling for experience, familiarity with the terrain, and companion hiker influence.

Definition of Terms

The following terms are defined to clarify their use in the study:

1. *Hike*. A long distance walk in the front country or backcountry for pleasure or exercise. It can involve a single person or multiple people in a group (Ammer, n.d.).
2. *Front country*. An uninhabited area that is within one hour of definitive care (Tilton, 2010).
3. *Backcountry*. An area that is one or more hours from definitive care and is an "uninhabited area inaccessible by roads or by regular public transportation" (Backcountry, 2011, para. 1).
4. *Cellular phone or cell phone*. "A hand-held mobile radiotelephone for use in an area divided into small sections (cells), each with its own short-range transmitter and receiver" (Cellular Phone, 2013, para. 1). Because of our inability to interpret every subject's definition of a cell phone, this includes, but is not limited to, smartphones that have internet, Global Positioning System (GPS) capabilities, and other functions.
5. *Electronic communication devices*. Devices that can be used for communication in emergency situations. Only devices that can be easily carried into the backcountry are considered. These include Personal Locator Beacons (PLBs), cellular phones,

satellite phones, and satellite messengers. This definition does not include two way radios, AM and FM radios, weather band radios, and any other signaling device not mentioned above, electronic or non-electronic.

6. *Emergency responder*. People and equipment used for rescue or medical response in emergency situations.
7. *Risk propensity*. "The stable tendency to choose options with a lower probability of success, but greater rewards" (Abad, Sánchez-Iglesias, & de Tella, 2011, p. 392).

Literature Review

This research will be conducted to understand if the presence of technology, specifically cellular phones, alters the decisions hikers make in potentially risky situations in the backcountry. The related literature will be presented under the following topics: (a) risk in outdoor recreation, (b) decision making, (c) social influences, (d) familiarity, (e) experience, (f) technology and the backcountry, (g) preparedness for outdoor activities, and (h) the role of technology.

Risk in Outdoor Recreation

Risk is built into everything we do (Cater, 2006). It is a part of life and recreational pursuits. The British Medical Association (1990) stated, "Nobody sincerely believes that all recreational activities can be made free of risk. Indeed, some degree of risk is manifestly one of the attractions of many kinds of recreation…" (p. 146). Although there is a desirable level of risk in outdoor recreation (Ewert & Hollenhorst, 1989), not all risk is desirable (Cater, 2006).

Many recreationists are not seeking actual risk, but rather the fear and thrills associated with risk. Cater (2006) stated, "The most successful adventure tourism operators are those that have reduced their actual risk levels whilst effectively commodifying the thrills within" (p. 317).

Cater mentioned bungee jumping as an example. Bungee jumping involves relatively low risk, but bungee jumping operations are successful because they provide adequate equipment and they have performed the necessary calculations for height and bungee length for a safe jump. They are controlling the actual risk, but preserving the associated thrills of falling. Likewise, the decisions a recreationist makes while on outdoor pursuits can either decrease or increase the risk to which they expose themselves. Understanding how people perceive risk and then make decisions is integral to understanding how people's backcountry decisions may be unknowingly influenced by carrying a cell phone.

Decision Making

Decisions are often complex and made under uncertainty (Tversky & Kahneman, 1974), but many decision-making theories do not address the complexity of decision making and the capacity for humans to make such decisions. Furman, Shooter, and Schumann (2010) described three major branches of decision-making theories: (a) classical normative models, (b) models that focus on the automated aspects of decision making, and (c) models that are a combination of the previous two. The classical models of decision making typically resemble mathematical equations where all variables are considered with likelihood and probability applied to each variable to maximize goal attainment based on the projected outcomes (Baron, 2004; Edwards, 1961; Savage, 1954; Von Neumann & Morgenstern, 1947). These models are more applicable to decisions with narrow horizons where sufficient time is available and maximal goal attainment is requisite (Hannson, 1994), thus rendering them insufficient for many everyday or simple decisions.

Models that focus solely on automated aspects of decision making often focus on the role of affect, intuition, and heuristics (Furman et al., 2010). These models are beneficial because

they address the complexity of decisions and the inability for all factors to be considered. Gigerenzer (2007) argued heuristics benefit decision making because they increase decision speed by limiting the number of potential factors that contribute to the decision-making process. Kahneman and Klein (2009) said intuition can aid complex decisions when under time pressure or with incomplete information. On the other hand, other authors contend that affect and heuristics are unwanted decision biases that negatively impact decision making (Forgas, 1995; Tverksy & Kahneman, 1974). Nonetheless, this study is not looking for the perfect process for decision making and how humans ought to make decisions. It is, rather, examining how people make decisions in situations where some information is present but the decision is also based on uncertainty. Theories combining normative models and automated models seem to fit best (Furman et al., 2010).

Behavioral Decision Theory. Behavioral Decision Theory (BDT) addresses the complexity and uncertainty of decision making, unlike many of the classical views of decision making, which explain decision making as if it were a perfect process (Einhorn & Hogarth, 1981; Slovic, Fischhoff, & Lichtenstein, 1977). BDT describes how people actually make decisions rather than how they ought to in a perfect situation with perfect information (Saad, 2015). Therefore, BDT allows for complex decisions made under uncertainty by allowing for the use of heuristics, affect, and intuition while still addressing the fact that people also make decisions with all or part of information available. Payne, Bettman, and Johnson (1992) suggested people faced with complex decisions are more likely to simplify them by using heuristics. Decisions involving potentially risky situations in the backcountry are usually complex and made under uncertainty; therefore, this study is more concerned with the use of

heuristics but also recognizes people may be using pieces of classical decision processes to make decisions while on outdoor adventures.

Heuristics. Aronson (2004) defined a heuristic as "a mental shortcut; it is simple, often only approximate, rule or strategy for solving a problem" (p. 107). Heuristics are also known as rules of thumb (Gigerenzer, 2007). They may be effective in some cases (Gigerenzer, 2007), but not all (Tversky & Kahneman, 1974). For example, McCammon (2004) identified six heuristics that can effectively aid decision making in many situations, but they have proven to lead to poor decisions among backcountry skiers in avalanche terrain. He calls them heuristic traps. They include: (a) familiarity, (b) consistency, (c) acceptance, (d) the expert halo, (e) social facilitation, and (f) scarcity. Heuristics in general can prove to be beneficial in everyday life, but these six can lead to poor decisions resulting in greater exposure to danger in avalanche terrain (Furman et al., 2010; McCammon, 2004). They may also adversely influence decisions in other outdoor pursuits such as hiking, the activity utilized to examine decision making in this study. This review discusses McCammon's heuristic traps that are particularly related to hiking within broader categories. They include (a) social influences, (b) familiarity, and (c) experience.

Social Influences

The presence or actions of others also influence a person's decisions. Gstaettner (2015), in a study on people who crossed a sand barrier to an island despite the risks, found people engaged in potentially dangerous outdoor activities simply because they were with a group. Gardner and Steinberger (2005) performed an experiment where participants were placed in groups or alone to respond to a questionnaire measuring risk taking with behavioral tasks. They found participants took more risks, focused more on the benefits than the costs of risky behavior, and made riskier decisions when in peer groups rather than when alone.

Furedi (1997) claimed risk is perceived on the basis of the prevailing ideas and values held about society and its future. Multiple studies have shown people make decision based on the actions and influences of other people (e.g., Gardner & Steinberg, 2005; Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008; Zhou & Horrey, 2010). Despite the number of studies performed on social impacts on decision making, Nolan et al. (2008) contended that it remains under-detected.

Although it may be under-detected, research shows there are at least two ways people influence each other's decisions: (1) peer observation and (2) peer pressure (Harakeh & Vollebergh, 2012). Harakeh and Vollebergh (2012) found that among smoking teens, peer observation influenced a person's decision to start smoking more than peer pressure. This notion is supported by a number of study findings that indicate observing others participating in a task influenced them to participate also. For example, Zhou and Horrey (2010) found that people were more likely to cross a busy road when they saw others doing the same. Peer observation is also present in recreation settings. Hayes (2008) found that people were influenced to cross a safety barrier at a glacier's edge in a national park when they saw others on the other side of the barrier. Gstaettner (2015) found that people justified crossing a sandbar to an island, because seeing other people on the sandbar meant it was safe enough for them to do the same. They did this despite signs warning them of danger and risk.

Peer pressure is another important way that decisions are influenced. Gstaettner's (2015) research also showed being in a group influences a person to make risky decisions. Peer pressure, being with a group participating in risky activities, like seeing others cross a sandbar, also took precedence over formal warnings indicating an activity or action is dangerous or risky. This is supported by Nolan et al. (2008) in a study about energy conservation. They found

people are more influenced to conserve energy by the actions of peers "than any of the standard appeals that are often used to stimulate energy conservation, such as protecting the environment, being socially responsible, or even saving money" (p. 921).

It is clear social factors influence the decisions people make, but age seems to play a role in how influential the social factors are. Gardner and Steinberg (2005) found not only does risk taking and risky decision making decrease with age, but the influence peers have on each other also decreases with age (Nolan et al., 2008; Zhou & Horrey, 2010). Although these studies described the social influences on decision making in such things as conservation, video games, and traffic signals, this notion is still applicable in an outdoor recreation setting. This further justifies the use of our specified age group (18-34 years of age), because this group is more likely to be influenced by social factors than would be an older age group.

Social influences recognized in heuristics. McCammon (2004) identified several heuristics related to social influences in a recreation setting. They are acceptance, the expert halo, and social facilitation. Although he applied them to decision making in avalanche terrain, they can also be applied to other recreation settings.

Acceptance. Acceptance "is the tendency to engage in activities that we think will get us noticed or accepted by people we like or respect, or by people who we want to like or respect us" (McCammon, 2004, p. 4). In this sense, people may make flawed decisions in an outdoor setting because they want to be accepted by a person or group. A person may decide to continue in the face of danger because they think they may be looked down upon for not accomplishing what they think of as socially acceptable. McCammon says this is especially prevalent in men seeking the acceptance of women.

Social facilitation. Social facilitation influences decisions similarly to acceptance. The difference is social facilitation only requires the presence of other people to alter behavior and decisions rather than observing other's' actions or experiencing peer pressure (Plantania & Moran, 2001). McCammon (2004) said it "is a decisional heuristic where the presence of other people enhances or attenuates risk-taking by a subject, depending on the subject's confidence in their risk taking skills" (p. 5). In other words, people will put forth more or less effort when others are present (whether or not they are being judged or directly observed), depending on their level of confidence. In this heuristic, an expert skier would try to perform better near a ski lift and a novice singer might hold back from singing in public, despite his or her ability to actually complete the task.

The expert halo. The halo effect is one of the oldest and most well-known psychological phenomena and "is generally defined as the influence of a global evaluation on evaluations of individual attributes of a person…" (Nisbett, & Wilson, 1977, p. 250). One example was a study that examined if a person's attractiveness or unattractiveness influences another person's perception of his or her personality (Miller, 1970). Miller found attractive people were generally associated with more desirable personality traits. The expert halo refers specifically to people's perceptions of another's expertise in a particular activity or task. The expert halo, in relation to recreation, happens when people place the responsibility to make decisions on one person in the group because they are seen as the expert (McCammon, 2004). The basis for placing confidence in this leader does not necessarily have to be his or her experience in the activity at hand or his or her expertise. It can also be based on age (e.g., the oldest person in the group) or familiarity with the location. Relying on this heuristic can prove to be beneficial if the person chosen as the leader is indeed experienced in the activities and associated environment and has the tools

necessary to navigate them. If the chosen leader does not, the group may be falling into a heuristic trap and following a leader that leads them into greater risk because of his or her inability to make appropriate decisions in the given situation.

Familiarity

Familiarity has been studied in topics as diverse as consumer decisions (Park & Lessig, 1981) and in medical literature (Chapman, Nelson, & Hier, 1999). Literature on e-commerce suggests that people are more trusting of online marketers when they are familiar with them despite the marketer's reputation (Gefen, 2000). Familiarity also applies in an outdoor setting. When a recreationist is familiar with an activity or the area in which he or she is recreating, he or she may feel safe despite signs of encroaching danger, leading them to inadvertently take greater risk.

Familiarity as a heuristic. Familiarity has also been identified as a heuristic (McCammon, 2004). It is closely related to the availability heuristic identified by Tversky and Kahneman (1974) where people rely on the most easily recalled information to make decisions. This information is usually the most recently learned or most often used. This heuristic is usually reliable but can lead to predictable errors. McCammon (2004) said "the familiarity heuristic relies on our past actions to guide our behavior in familiar settings. Rather than go through the trouble of figuring out what is appropriate every time, we simply behave as we have before in that setting" (p. 3). This heuristic can prove to be useful in most situations but when hazards change and terrain does not, McCammon said it could prove to be a trap leading people to make a decision placing them in greater risk. The familiarity heuristic is related to decision making in other recreational pursuits when people are recreating in familiar terrain. It can prove to be useful when signs of rising danger are identified to be out of the norm, but when subtle

evidences of rising risk are showing but not identified, familiarity can lead participant(s) into greater risk than intended. Being familiar with an area could cause people to make wise or poor decisions depending on the information the decision maker acknowledges or ignores.

Experience

As previously discussed in social facilitation and the expert halo, experience can influence decision making. These two heuristics explain how experience may influence decisions in group settings. It has also been argued in marketing literature that familiarity and experience with a product are the same thing (Raju, Lonial, & Mangold, 2015). Despite its similarities to these topics, experience can also influence an individual's decisions in its own way, in or out of group settings.

Maitland and Sammartino (2015) found experience improved heuristic decision making in potentially hazardous environments. They said people's previous experience allowed them to build a richer representation of the situation. It appears the outdoor guide community may be influenced in a similar way. As they gain experience, they develop heuristics that prove to be accurate in a majority of situations allowing them to make decisions quickly and spontaneously. Many of the training programs for guides teach them to make decisions in such a way. Scenario-based Wilderness First Responder courses are an excellent example of this type of training (e.g., Tilton, 2010). These courses teach multiple heuristics and are designed specifically for more experienced guides and professionals. An example from the Wilderness First Responder course is the following heuristic: if a person is experiencing abdominal pain for more than 12 hours, the person should be evacuated from a backcountry setting. Several dangerous medical problems can be indicated by prolonged abdominal pain. This does not necessarily mean that the current patient has one of these issues, but because of the inability of a guide to make such a

determination, a heuristic is applied to evacuate after 12 hours. In this case, the heuristic works well because it is based on conservative information and aids in getting an ill person to help before larger issues arise whether or not the pain is caused by a true dangerous medical emergency.

The *American Mountain Guide Association Manual for Single Pitch Instructors* (Gains & Martin, 2014), on the other hand, seems to rely less on heuristics, although it introduces several, by teaching the available information so guides can make informed decisions. This type of decision making is more similar to the classical models of decision making mentioned earlier (Baron, 2004; Edwards, 1961; Savage, 1954; Von Neumann & Morgenstern, 1947). This informed approach may work well for an experienced guide because his or her background allows him or her to process more of the pertinent information to make a good decision. This may also differ from the Wilderness First Responder approach because of the context of the decision. Medical decisions may need to be simplified for the guides because they have less experience in the medical field and they need to make quick decisions with little information, whereas when an individual is acting as a Single Pitch Instructor, he or she can take the time to assess situations and make more informed decisions because the decision is less time sensitive.

Technology and the Backcountry

The impact of technology on backcountry users is accelerating. Technological development impacts comfort (e.g., nylon, sleeping pads, tents, clothing), safety (e.g., first-aid supplies, navigation and communication devices, technical safety equipment), and even domesticity (e.g., devices that play music, games, and videos).

Pohl (2006) suggested technology might not belong in the wilderness. She argued technology connects people to city life even while they are trying to escape it, thus destroying

the reason for entering the wilderness in the first place. Pohl also said technological devices remove people from current experiences by providing fast or instantaneous results. She stated:

> We can compare using a GPS unit instead of topological maps and a compass to help navigate a route. GPS units are precise, easy to use, and quickly tell us where we need to go. A map and compass can be frustrating, and their use demands a certain level of skill. We need to continuously pay attention to the landscape around us; else we miss a key drainage or landmark to pinpoint our location. But the technology behind a GPS unit is unintelligible to the user. Its machinery is concealed. If we run out of batteries or the device breaks, we are unable to fix it. A GPS unit fails to tell us anything about our environment; it simply solves our problems for us. On the other hand, a compass is a simple tool. We know that the magnet inside it is drawn in the direction of magnetic north, and we can fix it if it breaks. As we are reading a compass and following a map, we have to pay attention to everything around us. We are engaged in the activity. (p. 154)

By relying on technology too heavily, people may be depriving themselves of a full backcountry experience and, more significantly, reliance on technology can truly be dangerous when it fails. As Pohl demonstrated, not giving oneself a full backcountry experience is only one small consequence of relying heavily on technology for assistance in the backcountry.

A cell phone's role in accident prevention and reaction. Each type of outdoor adventure—and even each individual—requires a different level of preparation. A walk on a front country trail may require little to no preparation while an expedition to a remote, high altitude mountain may require months of preparation and training. It is advised when embarking on an outdoor adventure of any kind to have at least the ten essentials. These include (a) some

form of navigation (map, compass, GPS), (b) sun protection (sunscreen, long sleeve shirt, hat), (c) insulation or extra clothing, (d) illumination, (e) first-aid supplies, (f) a way to start a fire, (g) a repair kit and tools for gear, (h) nutrition or extra food, (i) water, and (j) an emergency shelter. These are to take care of basic needs for several hours or a couple of days in the case one gets unexpectedly delayed on an outdoor adventure. These are to sustain life, to prevent or treat injury, and to prevent people from getting lost (Curtis, 2005; Eng, 2010). It is true modern smartphones can perform some of these functions, but a simple cell phone is not included because it cannot perform any of these functions.

Because of the lack of preparation of people who embark on an outdoor adventure and end up needing assistance from search and rescue, Boore and Bock (2013) stated,

> Education efforts should begin to move away from the traditional recommendations and target those items that were actually implicated in injury occurrence. Items that could be recommended based on this study include appropriate footwear, sufficient water, sufficient food, and trekking poles. Although cell phones were also suggested as being useful by survey respondents, a cell phone cannot help prevent incidents or help patients to self-rescue, and are cautiously recommended. (p. 6)

It is apparent from this statement people who have called for assistance from search and rescue understand the value of having a cell phone to call for help, but they have realized cell phones can do little more than call for help, and even then, they are not always reliable (Boore & Bock, 2013). Cell phones cannot be mistaken for preventative equipment such as a helmet or compass. They can only be used to call for help after an accident has occurred. Yet it appears people who carry cell phones in the backcountry are depending upon this technology to act as preventative equipment despite its inability to prevent accidents or injury. Due to this perceived dependence

on technology in wilderness situations, a closer investigation is in order to discover the degree to which cellular technology influences decision making in the wilderness.

Cellular technology. Cell phones work on a set of frequencies much like a walkie-talkie. They run on a line of sight system, meaning for a cell phone to transmit or receive information, it needs to be in the direct line of sight of an antenna on a cell tower (Brian, Tyson, & Layton, 2015). They also use a short-range transmission, which covers a small area called a cell (Brian et al., 2015). Within a city, or a coverage area, there are multiple cells with an antenna in the center and as a cell phone travels from cell to cell it changes which tower antenna it utilizes for transmission and reception (Brian et al., 2015). For the phone to continue communicating with the tower, it needs to be within the tower's range (Brian et al., 2015). The further from the tower the phone is, the weaker the signal, until the signal is lost (Brian et al., 2015). This system works great for cities and high travel areas, but in the backcountry, reception is spotty at best and not always reliable (Boore & Bock, 2013).

Recent research on communication technology in the backcountry. Few studies have been conducted on the effects of technology on decision making, risk, and safety in the backcountry (Holden, 2004; Pope and Martin, 2011; Martin and Pope, 2012). Holden's dissertation assessed the effects of satellite phones on perceptions of the wilderness experience, safety, coping with stressful situations, and risk taking among Outward Bound students in a wilderness program. Using a one-way ANOVA, he did not find a significant difference between people who were aware of a satellite phone and people who were not aware of a satellite phone in items relating to their perceptions of safety, ability to cope with stressful situations, and risk taking. He only found a significant difference in perceptions of the wilderness experience. He mentioned the lack of significance might be due to a small sample size. Another limiting factor

in his study was the way he was only able to randomly assign groups of people, rather than individuals, to control groups. The ability to assign individuals to control groups would allow for using an ANCOVA for the analysis, increasing the ability to control for more variables in the model.

On the contrary, Pope and Martin (2011) found that people who were against technology in wilderness settings were less likely to rely on technology for safety and more likely to be conservative in their decisions. They grouped their respondents into two groups, pro-technology and anti-technology. The pro-technology group was more likely than the anti-technology group to (a) think technology could be an effective substitute for skills, experience, and knowledge; (b) take chances that could increase risk if technology were present; (c) think technology reduces the dangers people associate with wilderness; (d) call for rescue even if self-rescue were possible; (e) think safety was not their personal responsibility; (f) feel safer in the presence of technology; and (g) think technology genuinely increases safety for wilderness users.

Furthermore, Martin and Pope (2012) found that people who had experienced a serious wilderness accident were more likely to think technology creates a false sense of security. It is clear from these studies technology affects people's perceptions of safety. Yet considering all three of these studies asked respondents about their perceptions of technology and how they feel it affects safety, it is still unclear if the presence of technology actually affects an individual's decisions in the backcountry. Testing actual decisions in risky situations will help to clarify the discrepancy between Holden (2004) and Pope and Martin (2011) and Martin and Pope (2012).

The Cellular Heuristic

Use of cell phones as a means to report an accident or call for assistance from search and rescue is on the rise (Hung & Townes, 2007). Many believe people are venturing into the

wilderness ill prepared, relying too heavily on cell phones as their safety net in case something goes wrong. These cell phone vigilantes who take risks, assuming rescue is just a cell phone call away (Hung & Townes, 2007), may be using cell phones as a heuristic trap that is oversimplifying the decisions one needs to make in preparation for a trip in the backcountry. Or, as they make decisions in the backcountry, they are making mistakes much like in the heuristic traps that cause people to travel in unsafe avalanche terrain introduced by McCammon (2004). For example, a person may be more likely to embark on a spontaneous hike or other outdoor activity without the adequate preparations because they have a cell phone; drawing the conclusion that reaching help and any multitude of information is in the palm of his or her hand.

A review of the literature provides insights about backcountry decision making, the reality and risks of heuristics, factors in backcountry decision making including social influence, familiarity, and experience. The growing force of technology has been addressed as well as its potential influence on backcountry decisions. However, no careful test of the influence of cellular phones on backcountry decisions has yet been undertaken. Therefore, this research study proposes a scenario-based decision model to test the influence of cell phones on backcountry decision making.

Methods

The problem of this study will be to examine the difference in decision making while in potentially risky situations between people who carry a cellular phone on outdoor adventures and those who do not carry a cellular phone. The methods of the study will include the following organizational pieces: (a) selection of subjects; (b) development of the instrument; (c) data collection procedures; (d) and analysis.

Selection of Subjects

The subjects for this study will be volunteers from the Marriott School of Management at Brigham Young University (BYU). They will be recruited through the Behavior Lab in the Marriott School. BYU students are appropriate subjects for this study for multiple reasons. According to the Outdoor Foundation (2013), 25 percent of people who participate in outdoor activities are students. The only larger group was people who work for someone else full-time (35 percent of people). The BYU student body likely contains a range of outdoor experience level and skill levels because of its proximity to the Wasatch Front that offers a variety of outdoor activities. This allows for a consideration of all skill levels.

Power analysis suggests the target number of subjects should be approximately 450 to ensure sufficient subjects for the utilization of four scenarios and up to four control variables. Subjects will be given a scenario and randomly assigned to be hiking in a group or solo. They will also be randomly assigned a gear list. Each of the two possible gear lists will be identical except for the presence or absence of a cell phone. The question randomizer in Qualtrics will perform the randomizations.

After 400 questionnaires have been completed, an initial analysis will check for adequate variance in variables of gender, experience, and familiarity across all scenarios. Additional subjects will be sought, if necessary, from the BYU Behavioral Lab or Recreation Management classes during Winter semester 2016.

Development of Instrument

An electronic instrument will be developed for this study (see appendix C). It will consist of four textual scenarios, which will be randomized to each subject (one scenario per respondent) along with an electronic questionnaire.

The setting of the scenarios will be the Mt. Timpanogos Wilderness Area. The scenarios will give pertinent details of the trail and hike but further details will be omitted to allow for familiarity of the area to be assessed in the questionnaire. The scenarios will explain the subject is going on a hike with the goal to summit Mt Timpanogos from the Aspen Grove Trailhead. This hike is about 15 miles round trip and climbs approximately 4,580 feet of elevation before reaching the summit of 11,749 ft.

Because of the high use of the area and the frequency of the need for rescue, the Timpanogos Emergency Response Team (TERT) has several members' camp along the trail at several locations on summer weekends and holidays (TERT, 2011). The other form of help for the area is the Utah County Sheriff's Search and Rescue Team (SAR) whose headquarters are located in Spanish Fork, Utah (Williams, 2014) and is 45 minutes away from the trailhead. Therefore, the total time it would take for SAR to respond would be the 45 minutes plus the time it takes to reach the location of the victim from there.

The research subject will be given information about their hike with five opportunities to turn back home as conditions related to weather, light, and food become riskier along the way. The gear and equipment brought on the hike will be listed for the respondent. All scenarios will be exactly the same except for significant detail differences in each. In each scenario, the hiker will have typical day-hiking equipment. To match the scenarios with reality, the gear list will not include everything from the ten essentials. Personal communication with panel of Utah County Search and Rescue incident commanders indicated that the typical person who requires search and rescue services carry much less than the ten essentials (A. Wakefield & J. Sargent, personal communication, March 15, 2016). A list of these supplies and equipment, including those the subject does not have, will be given to the subject. In the first scenario, the hiker will be alone

and will have a cell phone. In the second scenario, the hiker will be alone and will not have a cell phone. In the third, the hiker will be with a group of others anxious to summit Mt. Timpanogos, and the group will have a cell phone. In the fourth scenario, the hiker will be with a group of others anxious to summit, and no one in the group will have a cell phone. These four scenarios will be used to determine if the possession of a cell phone influences a person's decision to retreat or continue a hike as the potential for a risky situation increases.

Before introducing the scenarios, subjects will be asked about basic demographic information including gender, age, zip code of primary residence, marital status, and number of children. Subjects will also be asked about their outdoor experience and familiarity with the trail up Mt. Timpanogos. Items about experience and familiarity will be measured on a seven-point Likert type scale asking about the respondent's experience in outdoor activities, particularly hiking on long strenuous high peaks (1, very inexperienced to 7, very experienced), and about the level of familiarity of the Mt. Timpanogos Wilderness Area and the Aspen Grove Trail (1, very unfamiliar to 7, very familiar). Experience and familiarity will be used as control variables in this study.

As the scenario unfolds and the risk increases, subjects will be asked at four different stages if they would choose to continue on or turn back. Any choice to turn back would complete the questionnaire. The amount of risk the subject is willing to accept in the scenario before turning back will be used to construct an ordered variable from 1 to 5, with 5 representing the greatest acceptability of risk. This variable will function as the dependent variable. Gender, age, major, experience, familiarity and the presence of hiking companions will be tested as control variables. The presence of a cell phone will be the independent variable.

The instrument will be pilot tested in several rounds. Each round will consist of approximately 15 individuals. Each individual will read the scenarios and respond to whether or not they would continue hiking. After each round, the researchers will check the data for good variance. If needed, the researcher will alter the scenarios after each round to influence more variance and run another round of pilot tests. For example: if the first pilot test returns data showing most respondents returned after the first stage of the scenarios, this indicates the scenario stages are presenting too much risk and the researcher will reduce the amount of risk presented in the scenarios. If most respondents are continuing to hike through all of the scenario stages, this indicates there is not enough risk and the researcher will then add risk elements to the scenario stages to create variance in the stages, resulting in respondents varying where they are choosing to retreat from the hike. In addition, after each round of pilot testing, the respondents will be interviewed to determine the clarity of the scenarios and questionnaire.

Data Collection Procedures

The data will be collected in the behavioral lab in the Marriot School of Management at BYU. The medium for presenting the scenarios and questionnaire will be through Qualtrics and will be administered on a computer. Participants will be informed of their implied consent through an information sheet presented to them prior to their participation in the study. They will be notified through the implied consent form (see Appendix B) they are consenting to their participation in the study by completing the questionnaire. They will also be informed their participation in this study is voluntary and they can withdraw at any time. They will be promised their identity will be kept confidential and no identifying information will be kept. After they have read the information sheet, they will then be allowed to respond to the questionnaire.

Analysis

The software SAS will be used to analyze the data. Descriptive statistics and ANCOVA will be the primary means of data analysis.

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Appendix B

Implied Consent Statement

Implied Consent

My name is Quinn Linford and I am a graduate student at Brigham Young University. I am conducting this research under the supervision of Professor Brian Hill, from the Department of Recreation Management. You are being invited to participate in this research study examining decision making in a backcountry setting.

This survey will begin with questions asking for some basic demographic information, and then it will present scenarios in stages about an outdoor activity. You will be given a list of equipment and supplies you will have with you and equipment and supplies you do not have with you. Please read each stage of the scenario and gear list carefully and respond to the questions that follow. This should take approximately 10 minutes of your time. Your participation will be anonymous and you will not be contacted again in the future. You will not be paid for being in this study. This survey involves minimal risk to you.

You do not have to be in this study if you do not want to be. You do not have to answer any question that you do not want to answer for any reason. We will be happy to answer any questions you have about this study. If you have further questions about this project or if you have a research-related problem you may contact me, Quinn Linford at quinnlinford@gmail.com or my adviser, Brian Hill, at brian_hill@byu.edu or 801-422-1287.

If you have any questions about your rights as a research participant you may contact the IRB Administrator at A-285 ASB, Brigham Young University, Provo, UT 84602; irb@byu.edu; (801) 422-1461. The IRB is a group of people who review research studies to protect the rights and welfare of research participants.

The completion of this survey implies your consent to participate. If you choose to participate, please complete the following survey. Thank you!

Appendix C

Instrument

Section 1: *Given to every respondent.*

Enter the 5-digit zip code of your primary residence:

Enter your age (in years):

What is your gender?

- Male
- Female

What is your marital status?

- Married
- Widowed
- Divorced
- Separated
- Never married

How many children do you have?

Please rate the following:

	Novice						Expert
Your overall outdoor experience.	❍	❍	❍	❍	❍	❍	❍
Your hiking experience on long strenuous day hikes to high mountain peaks like Mt. Timpanogos, Lone Peak, Mt. Nebo, and Longs Peak (Colorado).	❍	❍	❍	❍	❍	❍	❍

Please characterize your general tolerance and willingness to accept risk:

	Very low risk tolerance						Very high risk tolerance
	❍	❍	❍	❍	❍	❍	❍

How familiar are you with the Aspen Grove Trail to Mt. Timpanogos?

	Not at all familiar			Moderately familiar			Extremely familiar

How many times have you hiked the Aspen Grove Trail to Mt. Timpanogos?

Section 2: *The picture of Mt. Timpanogos was shown to every respondent along with one of four scenarios randomly issued to each respondent. Then they were asked the question at the end of this section. If they responded "*Continue hiking*", they were given stage 3. If they responded "*Return to vehicle*", the were given section 8.*

Mt. Timpanogos along the Aspen Grove Trail

Scenario 1.

You are on a hike alone with a goal of reaching the summit of Mt. Timpanogos to see the sunset or city lights. It is your last semester living in Utah Valley and you want to hike Mt. Timpanogos before leaving. You started at the Aspen Grove trailhead near Sundance Ski Resort. You got a late start and began the hike at 4:00pm. The trail ascends about 4900 ft. as it winds 7 miles to the peak. The trail is on the east side of the mountain. You are planning on taking 8 - 10 hours to reach the summit and return to your vehicle at the trailhead at about midnight. It is a cool September Thursday at about 50°F. When you left the parking lot, a slight breeze was coming from the east. Now, after about 45 minutes of hiking, you are about 2 miles in.

You are wearing pants and a t-shirt with low top hiking shoes. You are also carrying the following **(Please pay careful attention to your gear and clothing. The list will not be available on later stages of the questionnaire)**:

- 2-16oz. water bottles
- Rain jacket
- Map
- Cell phone (with occasional service)
- Lunch and Snacks
- Flashlight

A picture of your rain jacket, water, flashlight, and map. The picture does not include your lunch and snacks.

You do not have the following:

- Extra food or water
- Insulating jacket
- Compass
- Tarp or shelter
- Lighter or other ways to start a fire

Scenario 2.

You are on a hike alone with a goal of reaching the summit of Mt. Timpanogos to see the sunset or city lights. It is your last semester living in Utah Valley and you want to hike Mt. Timpanogos before leaving. You started at the Aspen Grove trailhead near Sundance Ski Resort. You got a late start and began the hike at 4:00pm. The trail ascends about 4900 ft. as it winds 7 miles to the peak. The trail is on the east side of the mountain. You are planning on taking 8 - 10 hours to reach the summit and return to your vehicle at the trailhead at about midnight. It is a cool September Thursday at about 50°F. When you left the parking lot, a slight breeze was coming from the east. Now, after about 45 minutes of hiking, you are about 2 miles in.

You are wearing pants and a t-shirt with low top hiking shoes. You are also carrying the following **(Please pay careful attention to your gear and clothing. The list will not be available on later stages of the questionnaire):**

- 2-16oz. water bottles
- Rain jacket
- Map
- Lunch and Snacks
- Flashlight

A picture of your rain jacket, water, flashlight, and map. The picture does not include your lunch and snacks.

You do not have the following:

- Extra food or water
- Insulating jacket
- Cell phone
- Compass
- Tarp or shelter
- Lighter or other ways to start a fire

Scenario 3.

You are on a hike with a group of 3 friends with a goal of reaching the summit of Mt. Timpanogos to see the sunset or city lights. It is your last semester living in Utah Valley and you want to hike Mt. Timpanogos before leaving. Your friends have never climbed Mt. Timpanogos before. You are the informal leader of the group because you have the most hiking experience. You started at the Aspen Grove trailhead near Sundance Ski Resort. You got a late start and began the hike at 4:00pm. The trail ascends about 4900 ft. as it winds 7 miles to the peak. The trail is on the east side of the mountain. You are planning on taking 8 - 10 hours to reach the summit and return to your vehicle at the trailhead at about midnight. It is a cool September Thursday at about 50°F. When you left the parking lot, a slight breeze was coming from the east. Now, after about 45 minutes of hiking, you are about 2 miles in.

All people in your group are dressed similarly and carrying the same items. You are wearing pants and a t-shirt with low top hiking shoes. You are carrying the following **(Please pay careful attention to your gear and clothing. The list will not be available on later stages of the questionnaire):**

- 2-16oz. water bottles
- Rain jackets
- Map
- Cell phone (with occasional service)
- Lunch and Snacks
- Flashlight

A picture of your rain jacket, water, flashlight, and map. The picture does not include your lunch, snacks, and cell phone.

You and the members of your group do not have the following:

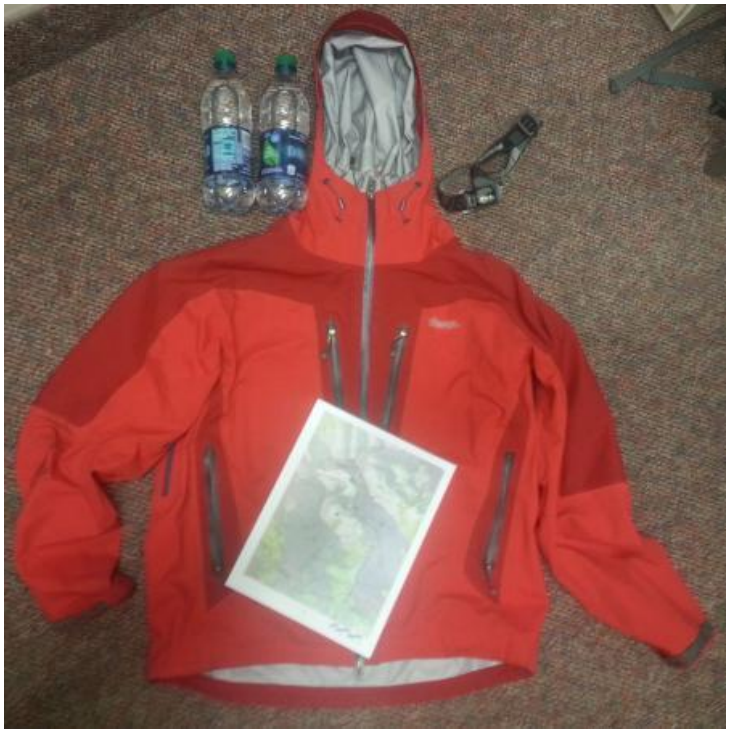
- Extra food or water
- Insulating jackets
- Compasses
- Tarps or shelters
- Lighters or other ways to start a fire

Scenario 4.

You are on a hike with a group of 3 friends with a goal of reaching the summit of Mt. Timpanogos to see the sunset or city lights. It is your last semester living in Utah Valley and you want to hike Mt. Timpanogos before leaving. Your friends have never climbed Mt. Timpanogos before. You are the informal leader of the group because you have the most hiking experience. You started at the Aspen Grove trailhead near Sundance Ski Resort. You got a late start and began the hike at 4:00pm. The trail ascends about 4900 ft. as it winds 7 miles to the peak. The trail is on the east side of the mountain. You are planning on taking 8 - 10 hours to reach the summit and return to your vehicle at the trailhead at about midnight. It is a cool September Thursday at about 50°F. When you left the parking lot, a slight breeze was coming from the east. Now, after about 45 minutes of hiking, you are about 2 miles in.

All people in your group are dressed similarly and carrying the same items. You are wearing pants and a t-shirt with low top hiking shoes. You are carrying the following **(Please pay careful attention to your gear and clothing. The list will not be available on later stages of the questionnaire):**

- 2-16oz. water bottles
- Rain jacket
- Map
- Lunch and Snacks
- Flashlight



A picture of your rain jacket, water, flashlight, and map. The picture does not include your lunch and snacks.

You and the members of your group do not have the following:

- Extra food or water
- Insulating jackets
- Cell phones
- Compasses
- Tarps or shelters
- Lighters or other way to start a fire

Based off the information presented, will you continue hiking or return to your vehicle?

- Continue hiking
- Return to vehicle

Section 3: *Was given to every respondent who chose "*Continue hiking" *in section 2. In this section, if they chose "*Continue hiking", *they were given section 4. If they chose "*Return to vehicle*", they were given section 8.*

You are now about 3.5 miles from the trailhead. You have not seen anyone else on the trail. You have been hiking for 1 hour and 30 minutes and you are a little more tired than expected, so you stop to eat your lunch and drink half your water. You notice a few gusts of wind and some low puffy clouds moving over the mountains from the west. This reminds you the weather forecast calls for a 55% chance of rain early tomorrow morning after you plan to be home, but a few clouds make for a great sunset.

Based off the information presented, will you continue hiking or return to your vehicle?

- Continue hiking
- Return to vehicle

Section 4: *Was given to every respondent who chose "*Continue hiking" *in section 3. In this section, if they chose "*Continue hiking", *they were given section 5. If they chose "*Return to vehicle*", they were given section 8.*

You are about 4 miles from the trailhead (about 3 miles from the peak). You have been hiking for 2 hours and 30 minutes. The sun has dropped behind the mountain but you still have light to hike. You are still on schedule for the sunset but you need to keep moving to make it. You have noticed an increase in wind as it changes direction and the temperature is slightly lower than before. The clouds are also a little thicker and you feel a few scattered sprinkles of rain.

Based off the information presented, will you continue hiking or return to your vehicle?

- Continue hiking
- Return to vehicle

Section 5: *Was given to every respondent who chose "*Continue hiking*" in section 4. In this section, if they chose "*Continue hiking*", they were given section 6. If they chose "*Return to vehicle*", they were given section 8.*

You are slightly past Emerald Lake (about 5 miles from the trailhead and 2 miles from the peak). You have been hiking for 3 hours and 45 minutes. The peak would be in sight if it weren't for the clouds and nearly dark. There is a somewhat consistent rain. Despite wearing your rain jacket, you are a little cold and your feet and legs are damp from the rain. It is starting to get dark, so you pull out your flashlight and it is dimming.

Based off the information presented, will you continue hiking or return to your vehicle?

- Continue hiking
- Return to vehicle

Section 6: *Was given to every respondent who chose "*Continue hiking*" in section 5. In this section, if they chose "*Continue hiking*", they were given section 7. If they chose "*Return to vehicle*", they were given section 8.*

You are now above the tree line on the final ascent to the peak. You have about 1 mile to go to the peak. You have been hiking for about 4 hours and 30 minutes. Your flashlight is nearly dead. The wind continues, but the rain starts to change to snow. You have been seeing flashes of lightning and hearing thunder in the distance. You start to shiver from the cold and you are tired. There is no sign of the storm letting up soon.

Based off the information presented, will you continue hiking or return to your vehicle?

- Continue hiking
- Return to vehicle

Section 7: *Was given to every respondent who chose "*Continue hiking*" in section 6 to evaluate why they continued despite increasing risk.*

Please explain why you chose to continue hiking, despite increasing hazards.

What would have influenced you to retreat from the hike and return to your vehicle?

What equipment or supplies did you consider most important to your hike?

Section 8: *Given to any respondent who chose "*Return to vehicle*" in any previous section.*

Please explain why you chose to return to your vehicle.

What equipment or supplies might have prompted you to continue further on your hike?

Section 9: *Given to every respondent. These questions were the end of the questionnaire.*

What influence did a cell phone have on your decision?

Do you normally carry a cell phone with you on hikes or other outdoor activities?

- Yes
- No

How might you use your cell phone in the scenario you have been presented?