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Trusting your bearings: outdoor navigation and the link between perceived competence, actual skill, and flow state in the Adirondack region of New York

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Trusting Your Bearings: Outdoor Navigation and the Link Between Perceived Competence, Actual Skill, and Flow State in the Adirondack Region of New York

by

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The purpose of this study was to examine the relationship between perceived competence and flow theory in the activity of outdoor navigation. This relationship was examined at beginner, intermediate, advanced, and expert skill levels of navigation, targeting a population in the Adirondack Region due to its challenging, thickly forested terrain. The study used a multi-method approach encompassing both quantitative and qualitative data. Surveys were administered to examine beginner, intermediate, and advanced navigators following a formal navigation course at SUNY Cortland's Outdoor Education Practicum at Raquette Lake or an Advanced Map and Compass Bushwhack Course or Map and Compass Fundamentals Course at the Adirondack Mountain Club in Lake Placid. Surveys were adapted from a study by Iso-Ahola, La Verde, and Graefe (1989) to measure *specific* (day of) and *general* (long term) *perceived competence* in the activity of navigation. The Flow State Scale by Jackson and Marsh (1996) measured nine critical dimensions of flow state, including (1) *challenge-skill balance*; (2) *action and awareness merging*; (3) *clear goals*; (4) *unambiguous feedback*; (5) *total concentration*; (6) *sense or paradox of control*; (7) *loss of self-consciousness*; (8) *time transformation*; and (9) *autotelic experience*. These nine dimensions were used to conduct semi-structured interviews with the expert skill level of navigators to understand the complexity of backcountry experiences. A total of 50 participants completed the survey, and 11 experts completed interviews. It was concluded from the quantitative data that there is a simple positive correlational relationship between perceived competence and flow state. *Specific perceived competence* has a stronger correlation to flow state than *general perceived competence* for each skill level. Interview data with experts also demonstrated this relationship but also showed a fluctuating involvement in a flow state during navigation rather than a continuous one.

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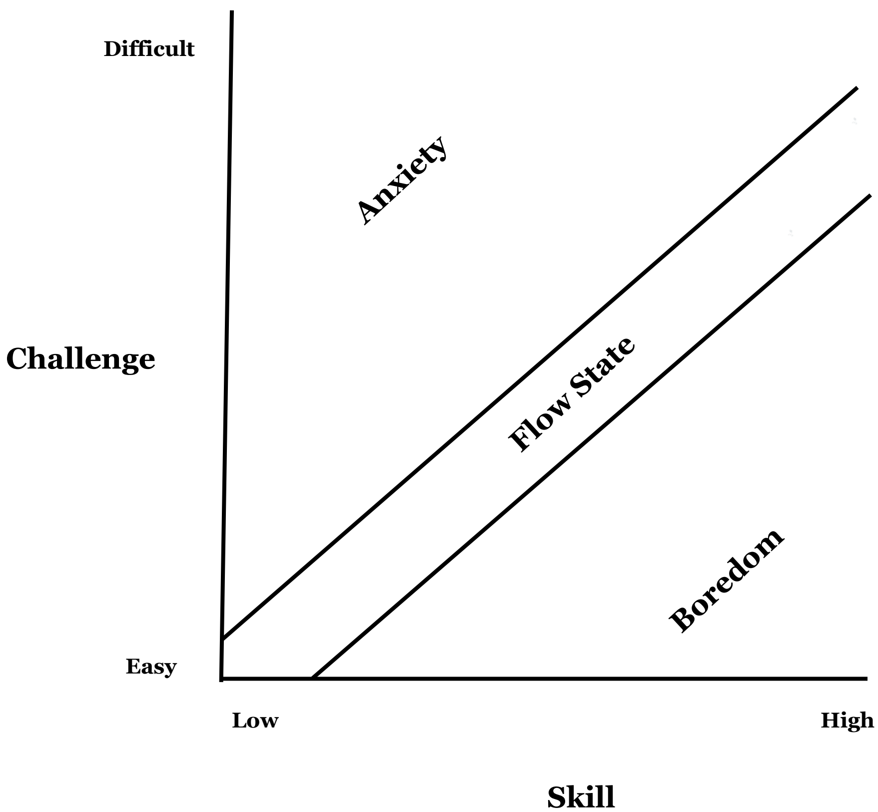
Chapter 1

INTRODUCTION

Navigation is an extensive topic that has been studied across a range of research fields. Most studies, however, are conducted in controlled environments such as buildings, cities, or even virtual settings (Li, Klippel, 2016; Dalton et al., 2019; Slone, Burles, Robinson, Levy, & Iaria, 2014). Research is limited to navigation in a natural, uncontrolled environment. Part of the challenge of researching navigation in natural environments is the ability to capture authentic experiences, especially at the expert level of backcountry navigators (Hill, 2013). Additionally, there must be consideration of outlying variables that simultaneously occur while navigating an outdoor environment, particularly for hikers, which may affect the study's internal validity. Socialization, exercise, and the effects of being in nature contribute to the individual's experience while they hike or navigate. Therefore, this multi-method study aimed to isolate the variable of outdoor navigation by targeting different skill levels, terrain settings, and the perceived competence of navigators in their experiences. This study aimed to examine the relationship between the perceived competence of outdoor navigators and their ability to enter a flow state, as defined by Csikszentmihalyi (1990). This research further explored the mental benefits that the activity of navigation may have on those participating in it.

The level of mastery of an activity contributes to the different skill levels of participants. The more complex an activity is, the more skills are required to complete the challenge, which is represented by Figure 1 (Csikszentmihalyi, 1990).

Figure 1: Basic Flow State Diagram



The skill levels used in this study include beginner, intermediate, advanced, and expert navigators. Individuals have varying skill sets at each level, including fundamentals of map and compass, terrain reading, wayfinding skills, and spatial knowledge. The research was conducted in the Adirondack region of New York. The Adirondack Park is home to the mountainous range of 46 peaks above 4,000 feet. It is a temperate forest with a high population of spruce trees, bogs, lakes, rivers, and plant and animal life (Department of Environmental Conservation, 2020). The vegetation is thick with green spruce, moss, and fern beds in the summer months. To navigate in such areas of the backcountry, one must possess the technical skills to navigate and trust their abilities in unpredictable terrain. Expert navigators need to have higher perceived competence to accept such challenges.

While expert navigators may need more complex experiences to feel challenged, each skill level of navigators has an opportunity to challenge their abilities in the field and reap the benefits. According to Csikszentmihalyi (1990), meeting a challenge with adequate skills offers a chance to experience a highly satisfying state of mind known as flow state. Flow theory is studied in recreational activities such as marathon running and mountain climbing (Schüler, 2009; Wöran, 2013). In activities that produce flow, an individual is entirely focused and can make decisions to complete the challenge. In this state, one feels entirely absorbed by the experience resulting in happiness, self-confidence, and personal growth (Csikszentmihalyi, 1990). However, if adequate skills cannot meet the challenge, individuals may feel anxiety and fear.

Similarly, if individuals are more skilled than the challenges the experience presents, they may feel bored. Navigational activities fit the conditions of experiences that may produce flow. Conditions of the activity include the necessity to learn skills, the chance to set up goals, consistent feedback to the individual throughout the experience, and the possibility of control (Csikszentmihalyi, 1990). Navigators learn skills of navigation, set up routes as goals, receive feedback based on the success of the route, and can control the experience. These elements fall under the scope of nine flow-state dimensions developed by Jackson and Marsh (1996). These nine dimensions include (1) *challenge-skill balance* as described by the original flow theory; (2) *action and awareness merging* or feeling as though the participant is on autopilot; (3) *clear goals* as set by the individual; (4) *unambiguous feedback* or feedback that affirms the participant is doing the activity well; (5) *total concentration* on the activity at hand; (6) *sense or paradox of control* or the ability to feel as though they are in control of the challenge; (7) *loss of self-consciousness* or the lack of awareness of an individuals' place in societal norms; (8) *time transformation* or the phenomenon of time slowing down or speeding up; and (9) *autotelic experience* or the act of doing something for its own sake. These nine dimensions were used in the study for quantitative data using the Flow State Scale, developed by Jackson and Marsh (1996), and to create the interview guide for experts.

Csikszentmihalyi (1990) explains that to achieve flow state, the participant should perceive their skills as sufficient. Iso-Ahola, La Verde, and Graefe (1989) define this phenomenon as *perceived competence.* In this study, the variable of perceived competence is utilized from a study by Iso-Ahola, La Verde, and Graefe (1989) on rock climbers' experiences between self-esteem and perceived competence. *General perceived competence* is relative to their overall skillsets, while *specific perceived competence* is relative to that day's experience. There are only brief instances of deliberate action as people navigate, such as taking a bearing and following the bearing. Navigators, particularly experts, must trust their brief action is correct as they follow the bearing into the dense wilderness. High perceived competence in their skill set specific to the activity would benefit the navigator. This study explores that relationship and how it may correlate to the state of flow in navigation.

Significance of Study

The concept of perceived competence *versus* actual skill has not been heavily researched in the relationship to flow state. During navigation, the conditions for flow are continually disrupted. Navigators sporadically control their decisions regarding the direction of travel and trust their skills to execute the goal. Though there may be fluctuation in *specific perceived competence,* actual skill or *general perceived competence* remains the same. This multi-method study design builds upon itself. The purpose of this study is (1) to add to the literature on whether navigation produces flow state; (2) to examine the relationship between *specific and general perceived competence* and flow state through the act of navigation; (3) further explore the benefits that result from navigation. Without further research on these topics, the value of navigation as recreation is not being thoroughly utilized.

Flow state is a powerful psychological tool for individuals. The benefits of flow are known to produce happiness, self-confidence, a sense of control, and creativity (Csikszentmihalyi, 1990). Research on whether navigating outdoors can produce flow may provide a foundation for developing its value as a recreation activity and understanding flow theory. Research may advocate navigation programming, hiker safety and enjoyment, and awareness of search and rescue operations for lost persons.

Highlighting the value of flow state in navigation may aid education on that issue. Results may contribute to hiker education, advocacy, and preparedness.

Furthermore, this study offers a chance to examine the fundamental variables of flow theory and how they may interrelate in non-continuous activities like navigation. The study observed how perceived competence, actual skill, and the challenge interrelate to produce flow conditions. The implications of this research are further described in the discussion chapter.

Statement of Problem

This study investigated the relationship between flow theory and the perceived competence of outdoor navigation of hikers in the Adirondack Region. This relationship was studied at each skill level of navigation, including beginner, intermediate, advanced, and expert navigators.

Hypotheses

The following were hypothesized:

1. The perceived competence of navigational skills in participants taking an organized navigation course will affect their ability to encounter dimensions of flow. Those with

higher *specific perceived competence* are more likely to encounter dimensions of flow than those with low *specific perceived competence*.

2. The act of navigation is not continuous and includes both brief and continuous moments of decision making, assessment, and movement. Though missing some of Csikszentmihalyi's (1999) conditions for flow state, the dimensions of flow as defined by Jackson and Marsh (1996) will be encountered regardless during the activity of navigation at each skill level.

3. The intensity or depth of flow state increases with the complexity of the challenge. Therefore, experts will encounter more elements of flow in a backcountry experience than the beginner, novice, or intermediate navigators do in organized courses.

Delimitations

The scope of this study delimits to people who participate in navigation of the Adirondack Wilderness area. Additionally, this study delimits to those who have participated in a navigation course or skill-building workshop and the snowball sampling recommendations from experts. The study included students who signed up for SUNY Cortland's Outdoor Education Practicum at Raquette Lake during two of the organized navigation courses in the program. Additionally, it included individuals who took navigation skill-building workshops at the Adirondack Mountain Club, either Map and Compass Fundamentals or Advanced Map and Compass Bushwhack, which ranges in different skill levels. Samples chosen from participants in courses and workshops serve as beginner, intermediate, and some advanced navigators. The highly advanced or expert navigators sample includes those who instruct these courses at the Adirondack Mountain Club and snowball sampled to additional experts. Additionally, this study did not include the scope of immediate data collection of those that participate in self-guided recreation at the expert level. Instead, experts were interviewed within the scope of their previous experiences.

The scope of this study delimits the research under the lens of flow theory as defined by Csikszentmihalyi (1990). While flow theory often implies benefits such as self-confidence, happiness, and satisfaction, these variables were not tested independently within this study. It only tested for optimal experience or flow state while navigating.

Limitations

This study is limited due to the variable nature of navigation. When an individual engages in navigational activities like reading a map to follow a trail, there are numerous variables at play. Hikers in this study navigate in natural, outdoor settings, which may also contribute to their change in attitudes, feelings, or perceptions towards the experience. Similarly, navigation courses offer a chance for socialization and learning new material, which also may contribute to their perceptions of the experience.

The nature of formal navigation courses also presents opportunities for testing skills in a safe environment. Navigators could make choices that test their skills in ways they may not have done otherwise if they were in an uncontrolled, self-guided environment. An option to call for help and remove oneself from a situation that becomes too challenging limits the generalization of the results to the field. Conducting a study to put people in this situation through experimentation intentionally would be unethical as it may cause psychological, physical, or mental distress. The exception to this limitation is the expert level of navigators reflecting on their previous experiences. Semi-structured interviews aimed to study past instances where individuals were vulnerable to the challenge but safely completed it.

Since navigational decisions are made in sporadic, brief moments rather than continuously throughout a hike, traditional methods for testing flow theory are not applicable. The Experience Sampling Method (ESM) is one of the most used methods to test for flow in which participants record answers throughout their experience (Csikszentmihalyi, 1990). To preserve the delicate nature of navigation and collect authentic results, ESM was not used for this study. Therefore, it is limited to responses by observing flow from a past tense rather than a present occurrence. Additionally, the data collected from survey participants are limited to the fundamental correlation between flow and perceived competence. The richness of survey data does not provide as many details as the qualitative interviews with experts.

Finally, the variable of skill level was not assigned through observation by researchers as other navigation studies do. Instead, the scope of this study was designed to allow participants to self-assess their skill level through their perceived competence in the activity. Research shows that one self-assessment measurement validly and reliably represents skill level through the development of items like perceived skill, knowledge, and frequency of participation (Todd, 2003). There may be limitations to assessing skill-level without direct observation of participants. However, self-assessment of their skill set is the best fit of measurement for finding the correlation of their perceived competence to flow theory.

Assumptions

The assumptions of this study are determined by the participants of each of the data collection designs. Survey participants are assumed to assess their skill-level measurements accurately. It is assumed that survey participants were honest in their answers while completing the survey. As discussed in the limitations section, this study also assumes that there were no other variables at play during their navigation course. Participants are likely to have encountered other variables, but the questions on the survey stay within the scope of perceived competence and flow.

Though conducting follow-up interviews with survey participants would allow for further research on their flow experiences, this study only operates under the assumption that experts have more complex experiences with the terrain. That is not to say that beginner, intermediate, and advanced navigators are not subject to unique navigation experiences. Instead, it is assumed that the controlled navigation experience offers a chance to safely research flow through a quantitative lens. However, it is assumed that a controlled experience does not accurately represent experts in the field and, therefore, would not provide sufficient data through survey collection.

The assumptions of the interview process include those of the researcher and participants. It is assumed that the researcher remained neutral and unbiased while conducting the interviews. It is also assumed that the interviewees answered questions honestly and could pinpoint other experts in the field through snowball sampling. The interviews were semi-structured and therefore included some variability depending on the participant.

Definition of Terms

1.) *Navigation* is a routine or activity that requires memory, reasoning, and perceptions to position oneself in their environment (Dalton et al., 2019). Navigation has a broad scope, including elements of wayfinding techniques, navigation assistance, and the planning process of route finding, decision making, and positioning. It includes using tools, learned skills, and the decision-making processes of navigators. Navigation in this study was limited to organized navigation courses and workshops. *Self-guided navigation*, or navigation that is planned and executed by the individual and not by a formal organization, was used only for expert-level navigators in the scope of past experiences. *Navigation assistance* is any tool that may assist a navigator on their journey. Paper maps, compasses, and digital Global Positioning Systems (GPS) are standard navigation assistance devices (Münzer, S., Lörch, L., & Frankenstein, J., 2020). *Wayfinding* is defined as a means of navigation that relies entirely on the individual without maps or tools for assistance. The act of wayfinding includes distinguishing where an individual is, where they want to go, and how to get there

(Dalton et al., 2019). Expert and advanced level navigators are more likely to use wayfinding skills than beginner and intermediate navigators due to the nature of the terrain they navigate. *Spatial knowledge* is the means of orientation through the direct experience of an individual in their immediate environment (Münzer, Lörch, & Frankenstein, 2020). Researchers have closely tied this term to constructing a cognitive map that allows people to organize information about the environment they are in. It allows navigators to make decisions, assess surroundings, and act on them (Zhang, Zherdeva, & Ekstrom, 2014). In this study, *spatial knowledge* refers to the internal decision-making processes in the act of navigation, similar to wayfinding.

2.) *Flow state* is defined as the state people experience while involved in an activity where their skills meet the challenge with complete control of their actions as defined by flow theory (Csikszentmihalyi, 1990). It results in immense enjoyment, satisfaction, and happiness (Csikszentmihalyi). Conditions for optimal experience include rules and skills that must be learned, set up goals by the participant, the opportunity for direct feedback from experience, and the possibility of control (Csikszentmihalyi). The opposite of flow is defined as *psychic entropy*, in which people are unable to meet the challenge and have inadequate skills and focus for the experience. In this study, *flow state* aligns with Csikszentmihalyi's definition. However, the disordered state of psychic entropy will be used with negative attitudes such as anxiety rather than the term itself. Flow was measured during navigation after participants' experience by using Jackson and Marsh's (1996) Flow State Scale (FSS). This scale was developed to measure flow in sport and physical activity. Using nine dimensions, Jackson and Marsh outline the essential components of flow that are measured in the FSS. These nine dimensions include (1) *challenge-skill balance*; (2) *action and awareness merging*; (3) *clear goals*; (4) *unambiguous feedback*; (5) *total concentration*; (6) *sense or paradox of control*; (7) *loss of self-consciousness*; (8) *time transformation*; and (9) *autotelic experience*. These nine dimensions are used in the collection FSS section of the quantitative survey data and the criteria used for the qualitative interview guide.

3.) *Perceived Competence* is defined as how individuals judge their abilities to complete a challenge (Iso-Ahola et al., 1989). *General perceived competence* results from multiple years of accumulated experience, whereas *specific perceived competence* results from a particular experience (Iso-Ahola et al.). In this study, *general perceived competence* was used for participants to self-assess their skill level and reflect on their overall navigation skills. *Specific perceived competence* was used to test how they felt about their skills that day of the navigation course. *Skill Level* refers to the amount of experience and overall abilities to achieve a task or complete an action (Csikszentmihalyi, 1990). The success of the experience, the comfort level in various terrain, the time spent with navigation, and the complexity of the situation contribute to the perceived competence of the navigator.

This study labeled skill levels as *beginner, intermediate, advanced,* and *expert*. *Beginner navigators* have little to no fundamentals of navigation and, therefore, may feel uncomfortable navigating alone or beyond well-marked terrain. *Intermediate navigators* should have basic navigation skills, including reading a map and compass.

They may feel uncomfortable beyond well-marked terrain and may not have developed skills like wayfinding beyond navigation assistance. *Advanced navigators* should have well-developed navigation skills. If they become disoriented, they may be able to reorient themselves through wayfinding, navigation assistance, and spatial orientation. Advanced navigators may be able to navigate backcountry terrain with confidence in their abilities. They may not feel comfortable on extended backcountry trips. *Expert navigators,* however, have a dense history of experience in the backcountry. They should be confident in their navigation abilities to travel through unmarked, backcountry terrain.

4.) *Complexity* is defined by Csikszentmihalyi (1990) in both internal and external ways for participants in an activity. Internally, an individual's cognitive function of how well information is processed. However, this study focused on the external factor of complexity. In an external sense, *complexity* refers to the various goals, environments, and experiences that are challenging to individuals in new and different ways. It is not how they process information but rather the elements of the challenge itself. In this study, *complexity* refers to the varying challenges of the natural environment and terrain that navigators experience at different skill levels. *Natural environment* refers to outdoor spaces that may be utilized for outdoor recreational activities. A natural setting may range from remote backcountry locations to low-intensity trails. Bobilya and Marsh (2013) define *backcountry* as areas of wilderness that require skill and effort to access. *Backcountry* in this study includes remote, unmarked, and hard to access locations. This study includes w*ell-marked* *and maintained trails, marked and unmaintained trails, herd paths,* and *bushwhacks. Herd paths* are unmarked and unmaintained trails but are heavily trafficked enough for a distinct path. *Bushwhacks* encompass navigation without trails. These ratings are used for survey participants to self-assess the complexity of the terrain they are most comfortable. Navigation workshops run by the Adirondack Mountain Club operate out of the Adirondack Loj in the High Peaks Wilderness Area. The navigation course run by SUNY Cortland's Outdoor Education Practicum operates out of The Outdoor Education Center at Raquette Lake. Therefore, the natural environments used for beginner, intermediate, and advanced levels include outdoor spaces that may be accessed primarily from those two locations. Expert levels encompass all state-designated wilderness areas in The Adirondack Park.

Positionality Statement

Since this study utilized qualitative methods, my positionality as a researcher is important to note. This statement provides insight into how the interpretation of the data may have been affected. Inspiration for this study stems from my interest in natural navigation techniques such as using the moon, stars, plants, animals, terrain, or the sun to navigate, including the history thereof. I have taught basic map and compass skills, led interpretive paddles on natural navigation, and am familiar with those needed in the backcountry. These interests may affect qualitative analysis interpretations because I already see a meaningful value of outdoor navigation beyond practical purposes.

Although my experience in outdoor recreation is extensive, it is limited in the field of bushwhacking. I have rarely had to use the complex skills of map and compass to navigate the field beyond essential map reading. Although this lack of experience removes some bias towards expert navigation interviews, it may limit my interpretation of the data without direct involvement.

Finally, it is important to note my demographic background. I am a graduate student completing this research for my master's degree in Outdoor and Environmental Education in the Recreation, Parks, and Leisure Studies Department at SUNY Cortland. I am the only researcher involved in this research and therefore was the one interviewing, transcribing, and analyzing the data from experts. Although this dynamic may ensure consistency, it limits the perspective to one lens. I am white and identify as a cis-gendered woman. I am familiar with inequalities in the outdoor field across genders and races and the intersectionality that exists in society. This awareness may influence how the demographic data are interpreted.

This study serves as a foundation for future research on recreational navigation, which is remarkably limited. The study examines a simple correlational relationship between flow theory and navigation. This research may serve as a point to better understand how that relationship works. With the anticipation of further research, the qualitative data analysis may be impacted by the positive positionality of the researcher on the topic of navigation.

Chapter 2

REVIEW OF THE LITERATURE

This chapter reviews the literature important on the relationship between navigation as a recreational activity and the perceived competence of the participant. The following sections are included: (1) introduction; (2) definitions of terms and concepts; (3) brief history of navigation; (4) navigation in the Adirondack region of New York State; (5) methods and theories used to observe navigation, skill level, and flow; (6) critiques and gaps in the literature; and (7) summary.

Introduction

Navigation is a diverse topic that may be researched across varied fields of study, such as psychology, biology, and engineering. Few studies exist on navigation in the field of recreation. Navigation has previously been studied in virtual environments, buildings, and cities (Li, Klippel, 2016; Slone, Burles, Robinson, Levy, & Iaria, 2014; Dalton et al., 2019). Outdoor and wilderness navigation has received little attention in research. This kind of navigation takes on entirely new challenges. Outdoor navigation studies must consider the authenticity of the experience of the navigator and outlying variables during the experience, such as environmental factors and socialization. At the expert level of wilderness navigation, authentic research is especially challenging due to ethical concerns of experimental design (Hill, 2013). Expert-level navigation is often paired with adventure recreation activities that require precise planning. *Risk recreation* or *adventure recreation* is any outdoor activity that involves an appropriate level of risk of physical dangers, serious injury, or even death (Iso-Ahola, Verde, & Graefe, 1989). It is essential to have well-developed navigation skills for these activities such as backcountry hiking, paddling, skiing, and camping. Individuals must have distinguished skill sets in both the activity itself and navigation to participate in such activities.

Csikszentmihalyi (1990) suggests that those able to match a challenge with a proper skill set will experience a state known as optimal experience, as coined in flow theory. In optimal experience, individuals may experience satisfaction through focused attention on the challenge. Flow theory has been researched in adventure recreation activities such as mountain climbing, marathon running, and rock climbing (Wöran, 2013; Schüler, 2009; Csikszentmihalyi, 1990). Like other adventure recreation, navigation meets the criteria for achieving optimal experience by learning skills, setting up goals, receiving feedback, and controlling the challenge (Csikszentmihalyi, 1990). However, due to the lack of research on outdoor navigation as a recreation activity, the benefits that may result from it are not yet fully known. Due to the varying nature of outdoor navigation challenges, there is an opportunity to research the different skill levels of navigators, from beginner to expert.

This study aims to focus on optimal experience during outdoor navigation. This chapter provides the framework necessary to understand navigation, skill level, and flow theory.

Definitions of Terms and Concepts

The following section defines the terms and concepts relevant to flow theory, skill level, and navigation. The definition of the terms helps establish a foundation for measuring perceived competence, skill level, and navigation.

Flow Theory

Successful experiences often cause positive emotional, motivational, and cognitive reactions within the individual (Danielsson & Bengtsson, 2016). Flow theory, as coined by Csikszentmihalyi (1990), highlights positive reactions produced from experiences where challenge matches skill level. In a state of harmony and balance of skills and the challenge, participants may encounter *optimal experience* or *flow state*. The interchangeable condition of flow state or optimal experience produces a feeling of complete focus, attention, and control (Csikszentmihalyi, 1990). If a participant's skill falls above the challenge demands, they may feel bored. If their skill falls below the challenge's demands, they may experience anxiety or fear with a disordered state of consciousness. Csikszentmihalyi (1990) calls this negative state *psychic entropy*.

However, in optimal experience, the balance between challenge and skill may present the participant with immense satisfaction, happiness, and creativity.

Certain activities meet the conditions necessary for achieving optimal experience. Csikszentmihalyi (1990) includes six elements of conditions necessary to produce flow state. As described by Jones, Hollenhorst, and Perna (2003), the conditions of flow state, according to Csikszentmihalyi, include the following elements. First, an individual matches awareness and action through complete attention in the present moment of the activity so much that they are automatic (Jones et al., 2003). Second, Jones et al. explain that goals are clearly defined, and feedback is immediate throughout the process, which aids involvement and focus on the activity. This involvement is the third element which includes complete concentration and attention to the activity (Csikszentmihalyi). In this concentration, an individual feels complete control over their actions and environment without worry of failure, which acts as the fourth element (Jones et al.). The fifth element builds upon this idea, which Jones et al. describe as the loss of self-consciousness through complete focus on the activity. In this state, individuals may forget worries, physical pain, or anything beyond the activity itself during the experience. Finally, the sixth element includes the alteration of time. In flow, time is dictated by the requirements of the activity versus the reality of time passed (Jones et al.). Under these six conditions, an activity may produce *optimal experience*. Activities studied under the scope of flow theory include rock climbing, painting, and sometimes work (Csikszentmihalyi).

Navigation fits under the conditions necessary for *optimal experience*. It requires skills to meet the demands of the challenge. Navigation provides clear goals and immediate feedback based on the success of staying on route. It requires immense concentration in specific scenarios, which may result in the loss of self-consciousness and an altered understanding of time. There is the possibility of control in the activity with adequate skills and focus. Since navigation has not been heavily studied as a recreational activity, it has not been studied under the scope of flow theory. Skill level plays an essential role in testing flow theory since different skills are required to meet challenges.

Skill Level

The activity of navigation offers multiple levels of challenges and risks based on the terrain. Terrain may range from well-marked, heavily trafficked trail systems to remote backcountry environments. As the topic of navigation extends to large-scale wilderness areas, however, the literature is much neglected (Hill, 2013). Skills are easily tested in controlled environments such as buildings, neighborhoods, and campuses (Ploran, Rovira, Thompson, & Parasuraman, 2015). However, the skills needed to navigate forested and natural terrain are entirely different from urban environments. In urban environments, structural components such as signs, hallways, and roads guide navigation (Ploran et al.). Outdoor navigation success is more dependent on the competence and skill level of the navigator.

Skill level is pertinent to the ability to complete a challenge of varying complexities. Complex challenges require more skills to complete (Csikszentmihalyi, 1990). In the study of flow theory, the skill level is the independent variable of achieving optimal experience. Csikszentmihalyi suggests that participants with more skills than the complexity of the challenge may become bored or frustrated with the experience. If they have inadequate skills to meet the challenge's demands, they will experience anxiety or fear. When someone can meet the challenge with precisely the skill level required, they will have optimal experience. As discussed in the prior section, the balance between skill and challenge is pertinent to success (Csikszentmihalyi). The demands of the challenge are known as *complexity,* which Csikszentmihalyi defines as the participant's various goals, environments, and experiences. In navigation, complexity most likely refers to the varying degrees of challenging terrain. As the complexity of the terrain increases, the risk is likely to be higher for the navigator.

The flow state construct is similar to the Adventure Experience Paradigm developed by Martin and Priest (1986). However, the Adventure Paradigm includes a modification of the balance between *perceived* risk and competence to achieve peak adventure, which is similar to optimal experience (Jones, Hollenhorst, & Perna, 2003). The five conditions of the *Adventure Experience Paradigm* are exploration and experimentation, adventure, peak adventure, misadventure, and devastation and disaster (Martin & Priest). Jones, Hollenhorst, & Perna explain that in experimentation, exploration, and adventure states, a challenge has lower risk while the individual has high competence. It results in relaxed reactions. Authors further explain that at stages of *misadventure* and *devastation and disaster*, individuals have the competence that does not meet the risks of the challenge. At the extreme of devastation and disaster, the participant may be overwhelmed, resulting in injury or death (Jones, Hollenhorst, & Perna).

The skill level of navigators results from years spent navigating, perceived competence of abilities, or cognitive spatial skills. Years of experience in navigation is a self-explanatory skill. However, perceived competence and cognitive spatial skills are important terms to define skill level. *Cognitive spatial skills* receive significant attention in the literature on urban navigation skills (Ploran, Rovira, Thompson, Parasuraman, 2015). These skills include memory, sense of direction, and map reading. Ploran et al. designed one of the few studies on cognitive spatial skills in unscaled, forested environments using experimental design. Studies on navigation often use some form of experimental design to measure and rate the skill level of navigators based on observation (Li Klippel, 2016; Dalton et al., 2019). However, the literature on the self-defined skill level of navigation is vastly limited. Other forms of recreation serve as a basis for self-defined rating of skill level.

Iso-Ahola et al. (1989) conducted a study on the perceived competence of rock climbers. Rock climbing is a form of adventure or risk recreation or an activity that exposes participants to dangers, injury, or death (Iso-Ahola et al.). As explained in the Adventure Experience Paradigm, to achieve peak experience, competence should match perceived risk (Jones, Hollenhorst, & Perna, 2003). *Perceived competence* also plays a role in the willingness to participate in a difficult challenge. *General perceived competence* is whether an individual believes they can control and successfully complete a challenge (Iso-Ahola et al.). *Specific perceived competence* is relevant to the particular day-of experience. Authors suggest that people tend to feel better about themselves in successful experiences resulting in greater perceived competence in the activity. As skill level develops, participants need more complex experiences to feel challenged (Csikszentmihalyi, 1990). However, successful experiences may be crucial to developing the perceived competence to take on those challenges. Therefore, skill level both is dependent on successful experiences and self-determined by the individual's perceived competence. While navigation is rarely studied as a recreational activity, it may fall under the category of adventure recreation at expert levels in challenging terrain. To reach an expert level of navigation, navigators must have sufficient levels of perceived competence to participate. This self-defined rating of skill level is further discussed in this chapter's methods and theories section.

Navigation

Navigation relies on mental aspects such as memory, reasoning, decision making, and perception to perform a routine or activity (Dalton et al., 2019). Paper maps, compasses, and Global Positioning Systems or GPS are types of navigation assistance. Digital forms of assistance, such as GPS, are the most used for navigation today (Hergan & Umek, 2016). They assist in planning, positioning, and decision-making during the navigational process (Münzer et al., 2020). These tools can often decrease risk in navigational situations. Navigators are encouraged to carry at least one form of navigation assistance regardless of the difficulty of the terrain (Mason, Selim, Williams, 2013). However, some argue that navigation assistance with tools hinders an individual's ability to actively engage and interpret spatial information while navigating (Hergan & Umek, 2016). At the expert level of navigation, tools alone may not be sufficient to navigate unpredictable and unmarked terrain. Experts, therefore, must also have well-developed internal navigation skills or wayfinding skills.

Wayfinding is a form of navigation that does not use maps or tools for assistance. Dalton, Hölscher, and Montello (2019) distinguish wayfinding as finding out where you are, where you want to go, and how to get there. These cognitive skills become inherently crucial in disorientation or particularly challenging terrain. The terminology associated with wayfinding is vital to understand at the expert level.

Locomotion, *survey-type knowledge*, *navigational handrails*, and *route knowledge* are some of the important terms included in the definition of wayfinding. *Locomotion* in navigation is how individuals move around their immediate environment (Dalton et al., 2019). This term refers to the actual movement after making a decision in navigation. *Survey-type knowledge* is the awareness of the distance and the direction between known landmarks (Hill, 2013). *Navigational handrails* are a linear feature in the environment that can help guide a navigator to their destination (Hill). Unlike locomotion which defines the movement of the individual, survey-type knowledge and navigational handrails are methods and skills navigators may possess to orient themselves through wayfinding.

Route knowledge is the awareness of certain natural landmarks on a specified route. This type of knowledge is acquired through shared experiences and familiar areas, not as a reorientation. Route knowledge is often used by indigenous peoples, like the Inuit routes, to hunt for survival in the arctic (Hill, 2013). Inuit have often used the same routes as their ancestors to hunt for food as in modern-day. As climate change increases, traditional routes, seasonal patterns, and changing sea in the arctic ice disrupt the route knowledge and wayfinding skills of Inuit peoples (Pearce, Ford, Willox, Smit, 2015). The literature on wayfinding often addresses the route knowledge indigenous peoples use for survival. Wayfinding seldom is researched in outdoor settings beyond indigenous communities. Furthermore, it is rarely studied in a recreational sense as people who use wayfinding skills are often doing so to pursue another form of adventure recreation. Unlike map and compass courses and orienteering, wayfinding is seldomly practiced for its own sake in the backcountry.

Adventure recreation in the backcountry requires wayfinding skills more than any other recreation activity. Hunters often use wayfinding skills while traveling in thickly forested areas on backcountry hunting trips (Hill, 2013). Backcountry skiers seek remote descents in alpine mountain environments where weather is subject to quick change (Taczanowska, Bielański, González, Garcia-Massó, & Toca-Herrera, 2017). The nature of backcountry recreation often exposes the participant to environmental and activity-specific risks. To engage in such activities, participants must be experts in their field and expert navigators to reach their destination of recreation. Loss of route, weather, or miscalculated navigation decisions may jeopardize the original planned route. In these instances, wayfinding skills become crucial to reorient the participant and navigate safely. Even with navigational tool assistance as backup, getting lost in remote wilderness areas is inherent. Therefore, the competence of expert navigators in wayfinding and navigation must be well developed. There is little research on the outcomes of these experiences and whether there are benefits to successful completion of navigating. This research is limited on beginner, intermediate, advanced, and expert skill levels. Individuals must have developed competence in spatial knowledge acquisition at each skill level to navigate correctly.

Spatial knowledge acquisition is the cognitive function of an individual that determines how they mentally acquire information about space (Zhang, Zherdeva, & Ekstrom, 2014). Spatial knowledge is acquired through direct experience. It is the means of the orientation of an individual in their environment (Münzer, Lörch, Frankenstein, 2020). It is closely tied to wayfinding as it relies heavily on the individual's ability to make decisions, act upon them, and assess their surroundings. Furthermore, spatial knowledge is essentially a cognitive map that helps people organize information about their environment (Zhang, Zherdeva, & Ekstrom). Tactics for acquiring spatial knowledge include studying maps, estimating route distances, identifying landmarks, and reassessing orientation in changed layouts (Richardson, Montello, & Hegarty, 1999). It may be developed by observing familiar objects, associating landmarks, and surveying the environment, all of which are skills that can develop at every skill level. In developing spatial knowledge, a navigator may gain the ability to construct routes, make decisions, take shortcuts, and indicate the directions of their travels (He, 2019).

Spatial knowledge plays a vital role throughout every level of navigation. Between navigating through cities, trail systems, or in instances of disorientation, spatial knowledge is a mental tool that is constantly in use. These cognitive maps play a crucial role in the decision-making process of navigation. Münzer et al. (2020) argue that navigation assistance, such as GPS systems, may deter the mental benefit of the spatial acquisition. As discussed earlier, GPS is the most used form of navigation (Hergan & Umek, 2016). As society drifts away from wayfinding and previous tools for navigation assistance, there may be unresearched benefits to the cognitive processes associated. Observing the history of the tools and methods of navigation provides a base to understand the role that it has played in society. The following section establishes that foundation to explain further the relationship between navigation within society.

Brief History of Navigation

Navigation has been a part of human history for centuries. The earliest ancestors of humankind would navigate local environments for hunting and survival. Thousands of years later, expeditions expanded globally and led to the exploration of the rest of the world (Kemp & D'Olier, 2016). In modern-day, navigation assists people every day to commute to jobs, fly across the world in planes, and embark on outdoor recreation expeditions. Some navigation is intuitive. Commuting to the exact location every day does not require intentional navigation. However, navigation requires more attention and focus when embarking on new destinations and unknown terrain. This section aims to give a brief history of the navigational methods and tools developed throughout history to explore new areas.

Indigenous Navigation

Navigational methods by indigenous peoples provide a solid foundation for historic navigation. It is valuable to understand these roots, especially in modern-day wayfinding. Aboriginal Australians were excellent navigators based on their shared knowledge of astronomy. Through stories, songs, and written documents, they could share celestial navigation knowledge between generations and use the sun, moon, planets, and stars to track their routes (Norris, 2016). Polynesian tribes are also advanced celestial navigators (Eckstein & Schwartz, 2019). The Māori People, for example, navigated by canoe from Polynesian Islands to New Zealand. The distance alone without tools demonstrates the power of navigation by nature (Ray, 1927). Celestial navigation techniques are often researched in the historical sense and within indigenous peoples that still use these methods today. However, these techniques are limited to some regions of the world and not researched in the broader recreational field.

In other indigenous societies, people cannot rely on the predictability of clear night skies for navigation due to environmental factors. Terrestrial methods of navigation are valuable to these communities. Inuit, for example, often travel through blizzarding conditions, navigating by snowdrift patterns, animal behavior, and tidal cycles (Aporta & Higgs, 2005). These skills are passed between generations and remain relevant in their communities today. Indigenous communities are some of the few and final places in the world where the importance of navigation is collectively shared and valued. Many other places around the world have lost ancestral ties to navigation with the reliance on tools. There is a lost connection to the land and the shared and learned aspects of navigating it with this dependence. Furthermore, this loss suggests that the navigation experience is increasingly less immersive and may be hindering the benefits that can result from Consideration of the tools that replaced natural wayfinding strategies helps to understand this development further.

History of Navigational Tools

Maps are one of the oldest tools of navigation. Clarke (2013) argues that the oldest maps predate any writing documentation. In the earliest sense, cartography was used to share knowledge of the land of areas for hunting, gathering, locating shelter, and avoiding predators (Clarke). Detailed maps allowed for exploration of the farther territory. However, maps alone were limited to documented areas. When coupled with advanced navigational tools, maps aided the exploration of uncharted and unknown lands. Viking communities were some of the earliest European sea navigators, traveling west from Nordic countries. Using sky polarization, the Vikings created tools like the sun compass and sunstone, which allowed them to navigate by the sun on cloudy days (Száz & Horváth, 2018). The initial advancement of navigation technology allowed Vikings to maintain control of the European oceans for years. However, the invention of the mariners' compass changed that (Száz & Horváth, 2018).

The magnetic compass dates to China as early as 1100 AD (Apuzzo, 2010). It was used in China for terrestrial navigation long before Europeans discovered it. The magnetic compass from China and the wind rose from Europe, which indicated sea wind direction, eventually aided the development of the mariner's compass (Apuzzo, 2010). Eventually, the coupling of technology led to the development of the modern-day compass. By the 13th century, Europeans were navigating the Mediterranean Sea with a compass that included an air floating magnetic needle, a sixteen-point compass card signaling direction, and an enclosed wind rose with 360 degrees of rotation (Apuzzo, 2010). The compass extended outward exploration. These tools advanced global interconnectedness and are still important methods of modern-day navigation. However, the preference for maps and compass is slowly being replaced by technological means since the late 1900s.

Global positioning systems, or GPS, are the most common tools used in modern-day navigation (Hergan & Umek, 2016). The technology for the GPS was developed using the functions of the atomic clock by calculating the length of time that a radio signal traveled from the GPS receiver to a satellite (Aughey, 2011). At first, GPS technology was used to measure movement velocity in participants and athletes in team sports. However, GPS moved quickly to tracking the locomotion of animals and humans, which is how it is used today (Aughey, 2011). GPS is even built into smartphones with popular navigation software apps such as Google Maps and Apple Maps. Though these apps are most often used for urban environments, some GPS devices assist in outdoor wilderness areas. Hiking specific GPS devices aid outdoor recreators in planning, mapping, and tracking their routes. GPS devices, however, are not the most reliable tool for outdoor navigation. Weather, battery life, and connectivity are all problems that may affect GPS devices outdoors. The discussion is ongoing about the role GPS may have for outdoor recreation. While some argue that any added navigation assistance is helpful, others suggest that reliance on technology is too risky in outdoor pursuits.

Hiking Context

Hikers often use navigational tools such as GPS, maps, and compass as assistance during their hike. Skill level may determine how prepared a navigator is for their hike with navigation assistance. For example, a beginner may be unable to navigate without tools regardless of the complexity of a challenge. An expert navigator may bring tools for safety but ultimately need more cognitive skills in the navigation to maneuver the terrain successfully. Regardless of hike complexity, recreational and environmental organizations recommend ten essential tools, including a map and compass, to bring on every trip, no matter the intensity. Other items include extra clothing, rain gear, a fire starter, a light source, extra food and water, a knife, a first aid kit, and a whistle (Mason, Selim, & Williams, 2013). In carrying these items, hikers may reduce the risk of dangerous situations such as getting lost, unanticipated weather changes, or non-urgent medical emergencies. In turn, hiker preparedness may reduce the need for search and rescue missions.

Mason et al. (2013) uncovered relevant information on hiker habits regarding preparedness. People who chose not to bring the ten essential items on their hikes typically did so because it was a shorter trip, less than 12 hours, while hikers on longer trips tended to be more prepared. This study concluded that people deemed short trips less risky. Additionally, there was a trend of a decrease in overall preparedness of hikers that only carried a GPS, including smartphone apps, for navigation. This conclusion indicates that these hikers were heavily relying on GPS as their only form of navigation preparedness. The use of these tools in modern-day help to develop a foundation of navigational habits during recreational activities. By understanding these habits, education and advocacy on navigation may be improved. In this literature review, it is therefore important to explore the navigational circumstances in the location of this study, the Adirondack Region in New York State.

Navigation in the Adirondack Region of New York State

The Adirondack Park is in the Northeast region of New York State, home to 6 million acres of recreational wilderness area. It is a unique preservation area as it consists of three million acres of private land and 2.8 million acres of state-owned land (Braymer, 2009). Millions of people recreate in the Adirondacks each year for a variety of reasons, such as skiing, mountain biking, climbing, paddling, hiking, and camping. Many of these activities require navigational planning throughout this vast and varying terrain of the park.

There are over 2,300 miles of trails, 3,000 lakes and ponds, and over 30,000 miles of rivers and streams within the Adirondack Park (Department of Environmental Conservation, 2020). Recreators must abide by leave no trace rules, fire regulations, wildlife safety, and other state regulations. The DEC recommends carrying the same ten essential items for hiking as mentioned prior while recreating in the Adirondack Region.

Navigation preparedness is of utmost importance due to the varying terrain of the park. However, the DEC includes advice for recreators in case they become lost within the park. Lost persons are advised to remain calm, assess their situations, look for recognizable landmarks, and stay put if they are unable to navigate with a map and compass (Department of Environmental Conservation, 2020). Furthermore, they urge people who are lost not to panic as it may lead to wasted time and poor decisions. Regardless of their advocacy campaigns, however, forest rangers are responsible for over 200 lost or stranded people each year, which often require risky rescue operations (Department of Environmental Conservation, 2020).

Due to the complex and varying nature of park recreation, there are a variety of emergency incidents. They range from moderate accidents to fatal emergencies anywhere from well-operated campgrounds to remote backcountry areas (Sadeghi, 2015). The diverse landscape full of mountains, forests, wetlands, and other natural features, often makes wilderness search and rescue, or SAR, operations more difficult. A study by Sadeghi demonstrated that hikers were the largest demographic of recreators that needed a SAR operation between the years 2008 and 2009. Of 144 strictly search missions, or no injury or medical aid, 67% of the victims did not have any form of orientation equipment such as a map, compass, or GPS (Sadeghi). Other than medical incidents, the authors concluded that the best way to reduce SAR operations is through hiker education on planning and preparation. The Adirondack Park in New York state demonstrates an area where navigation is valued as an essential component of recreation. However, despite the shared value, there is minimal research specific to the benefits navigation has as recreation beyond safety precautions. Furthermore, there is even less research on wayfinding habits in the remote backcountry of the Adirondacks. As discussed earlier, navigation fits the criteria under flow theory to achieve optimal experience from the activity (Csikszentmihalyi, 1990). Therefore, flow theory is a promising start to research the benefits of navigation on the recreator. Since the literature is limited in these areas, the next section outlines the variables independently to understand further how other academic studies have measured them.

Methods and Theories Used to Observe Navigation, Skill Level, and Flow

The benefits of outdoor navigation have seldomly been methodologically studied as a recreational activity. Hill (2013) observed wilderness wayfinding with a multimethod approach on Nova Scotia Deer Hunters. Data were collected from advice from wayfinding experts, self-reports, and questionnaires. A multi-method approach was necessary to address outlying variables of outdoor navigation, including the authenticity of experience (Hill, 2013). This design was unique because it targeted backcountry recreators specifically. While there is limited research on outdoor navigation alone, backcountry navigation is even more neglected due to the complicated nature of the study. Experimental research that is used for other navigational studies would be unethical and dangerous in the backcountry. This study by Hill (2013) is one of the few that observed wilderness navigation by recounting previous events. Other studies on navigation were conducted in building settings, city layouts, and virtual environments where experimental data design is possible (Li, Klippel, 2016; Dalton et al., 2019; Slone, Burles, Robinson, Levy, Iaria, 2014).

Of the experimental designs outdoors, few studies highlight the mental benefits that may result from the experience. Ploran et al. (2015) targeted navigation in unconstrained forested environments by asking participants to find flags using only a map and compass. The purpose of this study was to understand the underlying spatial skills that aid people in navigation. This topic is heavily researched in the field of navigation. Limited research explores the meaningful navigation experiences in the outdoors. The sport of orienteering is a form of navigation that receives some attention in this area. Orienteering is a sport of navigation that is performed by teams who race to find a series of marked points in outdoor terrain using a map and compass (Mottet, Eccles, Saury, 2016). Using qualitative analysis, Mottet et al. (2016) conducted a study on orienteers that captured the conscious, meaningful experiences of navigators during navigation. This study highlights the mental reactions from navigation but aims to gather a general perspective of the cognitive processes during the experience. Additionally, this study focuses on the sport of orienteering which differs from other forms of outdoor navigation. It pays little attention to the challenge and skill dynamic specifically. In outdoor navigation used for hiking, there are entirely different challenges than those in the sport of orienteering.

Flow theory is one of the main methods used to study the balance between challenge and skill level. Csikszentmihalyi (1990) defines *flow* or *optimal experience* as a positive cognitive state that results from total involvement in an activity. It results when an individual finds a balance between the challenge and their skillset (Beard, 2015). In the literature, flow theory is often applied to strenuous activities like marathon running, skiing, or climbing. For example, flow theory was used to study marathon runners, and the authors concluded that flow state might motivate continued participation in the activity (Schüler, 2009). Participants experiencing flow may have the cognitive reward that results from optimal experience. Csikszentmihalyi (1990) suggests flow state may produce creativity, increased self-esteem, and increased satisfaction.

Wöran (2013) used this theory to study the effect of outdoor environments and specialization in recreation activity on the flow experience. The study used a standardized questionnaire at four different mountain ranges with the Flow-Short-Scale to study various levels of mountain hiker experiences. The Flow-Short-Scale is often used in one of the original methods of measuring flow, known as the Experience Sampling Method or ESM. In using the ESM, participants record their current activity, and their current feelings and answer questions related to flow throughout their experience (Csikszentmihalyi, 1990). Flow theory has not been tested on navigation despite meeting the criteria for optimal experience. In the activity of outdoor navigation, the brief decision-making and outlying factors of the experience must be considered in choosing a method for measuring flow. The Experience Sampling Method may disrupt the authenticity of the responses. Therefore, flow theory should be measured after the activity rather than during it. The Flow State Scale, as developed by Jackson and Marsh (1996), is a 36-item instrument that may be used after the experience rather than during it. Finally, since flow is dependent on the skills of the individual, it may be studied at each skill level, from beginner to expert.

Skill level plays a vital role in most activities. In navigation, it determines how complex of a terrain an individual can explore. The literature on the skill level of navigation in varying complexities in outdoor environments is limited. However, skill level in other forms of navigation like orienteering receives significant attention. Like other variables that have been tested in navigation, a well-researched topic of skill level is in the sport of orienteering.

Since navigation has seldomly been studied as a recreation activity alone, the research of the individual variables provides a foundation for further studies. As navigation is typically regarded as part of other recreational activities, the benefits are not yet completely understood. The following section observes the gaps and limitations of the existing research on this topic. Eccles, Walsh, Susanne, and Ingledew (2002) describe studies on mastery and skill level as expertise attained from experience and practice. This study used interviews to obtain verbal reports on the conscious planning process. Authors chose their samples of novice and expert orienteers based on years of experience. Measuring the skill level of navigation in orienteers is less challenging than measuring it in non-athletes such as recreators that use navigation for other activities like hiking, camping, and paddling. Though orienteers may have some prior experience in navigation to the sport, there is typically a set timeline of participation and rankings based on competition results (Eccles et al., 2002). Regardless, the skill level is often determined by years of engagement, specifically at the expert level. Macquet, Eccles, and Barraux (2012) describe expert level as over a decade of engagement and deliberate practice to develop cognitive skills and strategies. This study used a participant to collect qualitative data through recorded videos of navigation courses and post-competition interviews

(Macquet et al., 2012). Orienteering, as discussed earlier, offers a chance to collect precise and observable data from competitions and set courses. While some of the navigation skills may apply to uncontrolled outdoor navigation, the methods of study are not entirely possible. Years of engagement may be valuable to measuring outdoor navigator skill level, but this item alone cannot entirely determine the measure the abilities in outdoor settings.

Abilities and competence should be self-rated in addition to years spent in navigational engagement to measure skill level in outdoor navigation within the scope of flow theory. That is, navigators should have a sense of their skills and abilities to accept the varying complexities of navigational challenges. Therefore, navigators in an uncontrolled setting should have the ability to express their skill level. In the study by Iso-Ahola et al. (1989), researchers used an administered questionnaire to rock climbers to measure their perceived competence. This questionnaire included both *general perceived competence* and *specific climb perceived competence*. *General perceived competence* included four items: (1) climber's self-rated skill level from beginner/novice, intermediate, advanced, and expert, (2) self-rated climbing skills (poor, fair, average, good, very good), (3) the highest grade of climbing they are comfortable with on the Yosemite Decimal System, and (4) the highest grade of climbing they are comfortable leading others on (Iso-Ahola et al. 1989). These scores were converted to Z scores by Iso-Ahola et al. and analyzed with Cronbach's alpha of .91. *The specific climb perceived competence* regarded that day's activity and measured (1) if they felt they climbed well that day, (2) if they climbed as well as they expected to, (3) if their skill was higher as ever on the day's climb, (4) if they were disappointed with the climb, and (5) if they believed the climb was a waste of their time. These questions were measured on a Likert scale from strongly disagree to strongly agree and measured with a Cronbach's alpha of .76 (Iso-Ahola et al., 1989). This study serves as an example of self-determined skill level ratings by the participant. When measuring skill level in navigation, this may prove to be an important study.

Due to the limited nature of research on outdoor navigation as a recreational activity, the variables of flow theory and skill level have not been directly tested. However, the prior studies and methods may be combined and utilized for further development. The following section focuses directly on the existing gaps in the literature to further guide the direction of the study.

Critiques and Gaps in the Literature

There are significant gaps in the literature on outdoor navigation and the effects that meaningful experiences within it may have on the participant. Many studies research navigation in controlled and observable scenarios such as virtual courses or the sport of orienteering (Richardson et al. 1999; Mottet et al. 2016). Studying navigation in this way is valuable as it eliminates the outlying variables that often occur in outdoor or wilderness navigation. Outdoor navigation, however, is often neglected in the literature. The limitations in research extend further on navigation in deep backcountry wilderness areas (Hill, 2013). Navigation, however, is necessary for certain forms of outdoor recreation.

Activities such as backcountry camping, hiking, or skiing require advanced navigation skills for participation. Though there has been considerable research on adventure recreation, the literature fails to include outdoor navigation as an adventure recreation activity independently. At the expert level of navigation, there is considerable risk based on the highly challenging terrain of the backcountry. However, the risk is dependent on the level of skill and experience of the participant. From heavily trafficked and well-marked trails to densely forested areas of the backcountry, participants may find challenges in different terrain. Therefore, participants react to experiences they find challenging accordingly. This challenge and skill balance that is required for navigation fits under the conditions of flow theory (Csikszentmihalyi, 1990). Though flow theory has been tested on other adventure recreation such as rock climbing, the lack of research on navigation as recreation has excluded it from the literature on flow. Additionally, quantitative measures like the FSS are often used for athlete performance or continuous physical activity. Using this scale on an activity such as navigation may contribute to developing the credibility of the instrument in a non-continuous physical circumstance. Finally, testing flow theory on various skill levels of outdoor navigation may be a vital first step to understanding the mental benefits of the experience.

There are gaps between the mediation of perceived competence and its role in achieving flow. *General perceived competence*, as defined by Iso-ahola et al. (1989), remains consistent as a result of years of experience. *Specific perceived competence,* the authors note, is subject to change. Some studies have explored the relationship between actual and perceived skill (Moharrer, 2011; Hargittai & Steven, 2006; McIntyre, Parker, Chivers, & Hands, 2008). How this relationship between perceived and actual skill affects flow state is limited in the literature. Ward (2019) observed this relationship partially through the lens of the Dunning Kruger effect, which suggests that people believe they know more than they can complete. Someone more skilled may perceive themselves as less capable. This diagram shows a peak of perceived skill at the beginning of skill progression, which quickly falls off over time. This diagram has not been rigorously tested, and research on the topic is very new. There is much room for development in this area of the literature.

Summary

The reliance on navigation assistance may deter the development of cognitive navigation skills. However, the skills used in navigation beyond technology may prove to be a more meaningful experience. Tristan Gooley (2013) suggests that the processes beyond tools are valuable to the navigational experience. In a personal voyage, Gooley (2013) concluded that a navigator would receive a more enjoyable, rich, and detailed account of a journey by using natural wayfinding skills. Gooley (2013) explains that navigators feel in control and more in tune with their surroundings in these moments. This study demonstrates the need for more research on the mental effects of navigational experiences. Understanding the value and benefits of these experiences contributes to the value of outdoor navigation as an independent recreation activity.

While understanding the benefits of outdoor navigational may hold value to the participant, it may also be valuable to the practical use of institutions. Further research on the benefits of heightened awareness, participation, and enjoyment in navigational experiences may act as advocacy for hiker education and preparedness. Navigation education may decrease the necessity for search and rescue missions. Finally, researching outdoor navigation in the scope of flow theory may serve as a strong foundation for advancing research in the field of navigation and recreation as well as developing the fundamentals of how flow state is understood.

Chapter 3

METHODS

This study examined the relationship between flow theory and outdoor navigation of beginners, intermediates, advanced, and experts. In developing the Flow State Scale, Jackson and Marsh (1996) reiterate that "the moment we say that 'flow is the balance of challenges and skills,' or that 'flow is a score of "x" on the flow questionnaire,' we have lost it" (as cited in Csikszentmihalyi, 1992, p. 183). Considering this limitation, this study implemented the Flow State Scale (FSS) instrument as developed by Jackson and Marsh (1996), combined with semi-structured interviews with experts in the field. This method of triangulation utilized qualitative methods to further understand the quantitative data's findings. This correlational study captured the complexities of the challenges of outdoor navigation at each skill level. The following sections are included in this chapter: (1) study design and positionality statement; (2) selection of sample; (3) instrumentation; (4) collection of data; (5) data analysis.

Study Design

This study examined the correlational relationship between participants' perceived competence in navigation skills and the construct of flow state. Using a multi-method approach, this relationship was observed at each skill level of beginner, intermediate, advanced, and expert. Implemented surveys measured participants' *general* and *specific perceived competence*, and the Flow State Scale (FSS) by Jackson and Marsh (1996) to measure flow state. Surveys assessed beginner, intermediate, and advanced navigators who have completed an official organized navigation course. Semi-structured interviews were conducted at the expert level to understand the complexity of their experiences in the backcountry. The interviews were transcribed and qualitatively coded by the nine dimensions of flow as defined by Jackson and Marsh (1996). The nine dimensions of flow used in this study are (1) *challenge-skill balance*; (2) *action and awareness merging*; (3) *clear goals*; (4) *unambiguous feedback*; (5) *total concentration on task at hand*; (6) *paradox or sense of control*; (7) *loss of self-consciousness;* (8) *transformation of time;* and (9) *autotelic experience*. These nine dimensions are further explained in chapter one, the definition of terms.

Selection of Sample

Survey data were collected from two outdoor education locations in the Adirondack Park in New York State. This study sample represents the Adirondacks' beginner, intermediate, and advanced navigation population. Participants were chosen using simple random sampling from two different organized beginner map and compass courses, SUNY Cortland’s Outdoor Education Practicum at Raquette Lake in early May and the Adirondack Mountain Club’s Map and Compass course in Lake Placid in August and October. All of the participants enrolled in each of the courses were asked to complete the survey. The survey participants were selected based on the criteria of the navigation courses, which were designed for beginner map and compass skills. The Raquette Lake navigation courses are for college students participating in the Outdoor Education Practicum credit class at SUNY Cortland. However, the Adirondack Mountain Club offers its courses up to the general public with more advanced skill development. The surveys were implemented for their course, Advanced Map and Compass Bushwhack and Map and Compass Fundamentals, with the Adirondack Mountain Club. This course requires some basic navigation skills and reaches more intermediate to advanced level navigators. These courses also extend the sample to the more significant population of the Adirondack Region.

The qualitative study sample addressed the complex challenges that are unique to backcountry navigation. Semi-structured interviews were conducted among expert navigators in the Adirondack Region. These interviews represent the population of expert navigators, which is not included in the sample of participants enrolled in beginner navigation courses. The Adirondack Mountain Club is an established launch point for backcountry hiking in the High Peaks Wilderness Area. Therefore, interviews began with instructors for navigation courses at the Adirondack Mountain Club for their familiarity and involvement in the outdoor navigation scene.

Participation in the quantitative and qualitative portions of the study was completely voluntary. Responses to the survey were anonymous unless participants chose to include their emails which the researcher only knew. Interview participants were read a script that informed consent and described the purpose of the study. Once interviews were transcribed, the tapes were erased for confidentiality. See Appendix A for the complete informed consent statements for surveys and interviews.

Instrumentation

This study utilized both a paper and digital version of the survey. The complete survey is included in Appendix B. Surveys were designed to measure two variables, including (1) participants' self-assessment of both *specific and general perceived competence* in navigation and (2) the flow construct as measured by Jackson and Marsh's (1996) Flow State Scale. The items that measured perceived competence were adapted from the study by Iso-Ahola, La Verde, and Graefe (1989) on rock climbing. *General perceived competence* was measured to self-assess the comfort level of participants when it comes to navigation as an activity in general. The *specific perceived competence* assessment was measured relative to the exact navigation course that the survey was administered after. Both measurements were necessary to understand the correlation to flow state. The four items from Iso-Ahola et al. (1989) were modified to address navigation skills rather than rock climbing. Other measures were asked of participants, including (1) how long have participants been navigating; (2) the number of trips taken each year that require navigational skills; (3) gender; (4) age; and (5) ethnicity.

The modified items to measure *general perceived competence* on the survey include the following: (1) participant's ratings of themselves as navigators (beginner/novice, intermediate, advanced, expert, not the expert I used to be); (2) participant's ratings of their navigation skills (poor, fair, average, good, very good); (3) the highest terrain of difficulty participants generally feel comfortable navigating; and (4) the highest terrain of difficulty participants generally feel comfortable leading others while navigating (Iso-Ahola et al. 1989). Participants used the terrain scale shown in Figure 2 to answer the questions regarding their *general perceived competence* in navigation.

Figure 2
Navigation Terrain and Skill Ranking (as displayed in navigation survey)

Well-marked and maintained trails	**Beginner navigation** – Recurrent markers, junction signs, and clear paths. Map and compass are recommended, but trails may be navigable without assistance.
Marked and unmaintained trails	**Intermediate navigation** – Trails may be marked with cairns, blazes, or occasional junction signs. Paths are present on maps, but some navigation is required due to overgrowth or distance between markers. Some map and compass skills may be required.
Herd path – Unmarked and unmaintained trails	**Advanced navigation** – Officially unmarked and unmaintained trails that may not appear on a map. High use of herd paths often keeps a visible path for most or all the routes. Other herd paths may be deceiving and lead off main trail. Some terrain reading and map and compass are required.
Bushwhacks – Unmarked and unmaintained trails	**Expert navigation** – Trails are unmarked, unmaintained, and low use may provide little to no visibility of trail due to overgrowth. Hiker must plot their route and use navigation skills almost every step of the way. Map and compass, extensive terrain reading, proper wilderness emergency gear, and other navigation skills are required.

These four items were developed to replace the Yosemite Decimal System used to measure rock climbing route difficulty in the study by Iso-Ahola et al. (1989). The terrain scale provided consistency in results from participant ratings. Additionally, participants answered four questions regarding their recent navigation experience to measure *specific perceived competence*. The modified items adapted from Iso-Ahola et al. (1989) study included the items: (1) I feel like I navigated well; (2) I did not navigate as well as I expected to; (3) my skill was high as ever; and (4) I was disappointed with my navigating. The items were measured on a Likert Scale with four indicators including (1) strongly disagree; (2) disagree; (3) agree; (4) strongly agree. The Cronbach's alpha coefficient for *general perceived competence* was .91 and *specific perceived competence* was .76 (Iso-Ahola, et al.). The original scale included a fifth question regarding whether participants believed today's climb was a waste of time. This question was omitted from the specific perceived competence scale in this study as it did not accurately represent participation in a formalized course or relativity to their competence in navigation.

The Flow State Scale (FSS), as developed by Jackson and Marsh (1996), measured the construct of flow. The FSS was developed as a valid instrument to measure flow experiences during physical activity. The FSS is a 36-item instrument that uses five-point Likert scales, including (1) strongly disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; (5) strongly agree. The FSS measures the nine components of flow. The Cronbach's alpha for each of the dimensions was calculated by Jackson and Marsh from a sample of 395 athletes. The *challenge-skill* alpha was .80, the *action-awareness* alpha was .84, *clear goals* was .84, *unambiguous feedback* was .85, *concentration on task* was .82, *sense of control* was .86, *transformation of time* was .82, and *autotelic experience* was .81. The alpha for the full flow state scale was .83. There were four questions for each component within the questionnaire. The breakup of questions per dimension and the entire FSS is listed in Appendix B.

Using the same nine dimensions of the flow construct as Jackson and Marsh (1996) defined, an interview guide was created to implement with expert navigators. Interview questions encouraged conversation about navigators' perceived general and specific navigation skill level, their backcountry experiences, and the presence of the dimensions of flow state. The purpose of administering semi-structured interviews rather than surveys for expert-level navigation is to target the complexity of their experience. Appendix C includes the complete interview guide.

Collection of Data

The instructors implemented the surveys after each of the navigation courses at Raquette Lake and the Adirondack Mountain Club. Participants completed surveys following the navigation course at Raquette lake using pencil and paper. The course instructor read a script to students with instructions and the purpose of the study. Appendix B includes the full script. The first course happened on May 27, 2021. The second course took place on June 3, 2021. Participants at Raquette Lake completed an orienteering course, where they must find flags in forested terrain with two to three other participants. Navigators take four bearings to find the flags and finish the course. At the beginning of the course, participants are given safety instructions for the course including back bearings, panic bearings, whistles, time limits, and general safety tips. Instructors double-check bearings before participants set out on their first flag. Additional safety measures are in place, such as stationing people throughout the woods to double-check participants as they navigate. Immediately following the course, participants completed the surveys.

The surveys for the Adirondack Mountain Club were administered digitally due to the nature of the courses. The instructor indicated that there would be no location for participants to comfortably complete the survey due to the remote nature of the advanced courses. The Map and Compass Fundamentals course includes a classroom-style lecture and application in the field afterward. Participants in the Advanced Map and Compass Bushwhack course must sign waivers. The group meets at the McKenzie Mountain and Haystack Mountain Trailhead near Route 86 in Ray Brook, New York, in the morning. Before registration, individuals must have some map and compass skills and complete the Map and Compass Fundamentals course with the Adirondack Mountain Club. At the beginning of the course, instructors teach a quick refresher of compass bearings, map bearings, declination, and the intended route of travel. The course runs five miles on and off-trail with 1,000 feet of elevation gain. During the course, participants calculate bearings together and decide on an average to use as a group. Everyone stays within eyesight and takes turns leading the group. The instructors scout the area before the course and carry a large first aid kit, SpotX communication device, and all participants are screened for physical fitness. Similar to the course at Raquette Lake, instructors discuss emergency situations. Participants are instructed to hike south if they are lost to hit a major roadway in the area. Following the course, the instructor emailed a digital version of the survey and script the day after their course. The workshop dates for the Adirondack Mountain Club were the Advanced Map and Compass Bushwhack on August 21, 2021, Map and Compass Fundamentals on October 3, 2021, and the Advanced Map and Compass Bushwhack on October 24, 2021. The survey took 15 minutes to complete. Participants stayed anonymous unless they chose to include their email. Appendix B includes the scripts for administering the surveys.

Semi-structured interviews began with instructors who teach the map and compass courses at the Adirondack Mountain Club. Using snowball sampling, participants were contacted by email to set up interviews. The interviews continued based on recommendations from experts until names began repeating and responses stopped. They were conducted both in-person and remotely using video and phone calls. The researcher conducted all interviews. Each interview followed the general structure of the interview guide and began with a script that included informed consent and the dimensions of the study. There were some consistent questions to all participants, such as "how long have you been navigating," "what was your most memorable navigation experience," and "why do you navigate." Appendix C includes the complete interview guide and criteria for coding. After attaining permission from the participants, the researcher recorded each conversation using two digital devices. The files were renamed with anonymous labels. Additionally, the date, time, location, gender, general navigation motive, and the interview length were recorded with each collection.

Data Analysis

Paper surveys were kept in a safe location by the instructors of the Raquette Lake course. Once transported to the researcher, each survey was coded in SPSS, including the survey ID number and which navigation course the individual participated in. The four individual items within each of the nine flow dimensions, as designated by Jackson and Marsh (1996), were computed into nine condensed variables in SPSS. The means scores for each dimension were calculated using the four individual items within each of nine variables. The 36-items were computed together to create mean scores for the entire flow scale for each participant. Cronbach's alpha coefficient tested the scales reliability. Appendix B includes the full breakdown of items per scale.

General perceived competence items were computed into z-scores for each participant to weigh the items equally. These scores were computed into mean scores. Items for *specific perceived competence* were reverse coded to analyze the data accurately. The scores for these items were calculated into z-scores to compare them to the *general perceived competence* scores. Combing the items allowed specific perceived competence to function as a full scale rather than two separate ones. As shown in Figure 3, questions two and four originally were negatively worded. Therefore, these two questions were positively coded, and the data were treated respectively.

Figure 3
Specific Perceived Competence Items in Survey

Item as Displayed in the Survey	Item Positively Coded
1. I feel like I navigated well.	1. I feel like I navigated well.
2. I did not navigate as well as I expected it to.	2. I navigated as well as I expected to.
3. My skill was as high as ever.	3. My skill was as high as ever
4. I was disappointed with my navigating	4. I was not disappointed with my navigating.

The inferential tests were run after computing the mean scores for specific perceived competence, general perceived competence, the nine flow dimensions, and the total flow state scale. The Pearson correlation coefficient determined the relationship between the two variables of perceived competence and flow. Additional descriptive statistics were run for items such as the number of years with navigation, number of trips that require navigation has taken each year, age, gender, and ethnicity. Although interview names were collected, no follow-up interviews were conducted for the surveys.

Following the interviews, the researcher manually transcribed the conversations, including notes taken during the process. This process used intelligent transcription to eliminate pauses, stutters, and filler words. The interview guide included specific questions that targeted each of the nine designated flow dimensions, and transcription codes were assigned within them using open and structural coding. Deductive coding was used within the nine dimensions of flow used by Jackson and Marsh (1996). Quotes and excerpts were compiled into charts within the nine dimensions. Then, each dimension received either a positive, negative, or both positive and negative marking. These markings indicated whether the excerpt indicated that the dimension was present or not within their flow experience. In the second round of analysis, pattern coding helped to understand the general trends of expert navigators in the field. The codes were counted, marked with positive or negative correlations, and analyzed for subthemes. Finally, thematic coding targeted other aspects of the data beyond the nine flow dimensions. Other dimensions of each interview were marked, such as the description of terrain, years of experience, gender, navigation intent, and interview logistics. From these codes, the final narrative concluded the data. Additionally, member checks were performed with the participants and received no conflicting perspectives.

Chapter 4

RESULTS

This chapter includes the findings from the quantitative and qualitative data collections. Rather than presenting the two types of data in two separate sections, the data are in sections of relevancy. To further understand the relationship between perceived competence and the state of flow at each skill level, the sections in this chapter are broken down by the variables. In doing so, the data from the quantitative survey results from beginner, intermediate, and advanced navigators can be compared more accurately to the qualitative interview results collected from experts. The following sections are included: (1) profile of participants; (2) perceived competence; (3) flow state; (4) relationships between perceived competence and flow state; (5) other qualitative findings.

The qualitative data were analyzed through the lens of nine dimensions of flow as defined by Jackson and Marsh (1996). The nine dimensions in this study are presented under the scope of the variables and designated under the most relevant section, including perceived competence, flow state, or the relationship between the two. This designation shows how each of the nine dimensions corresponds to the studied variables. The dimensions of *challenge-skill balance*, *clear goals*, and *concentration on task* are all skill and competency-based criteria. Therefore, these dimensions are included in the section on perceived competence. *Action-awareness merging, loss of self-consciousness,* and *transformation of time* are all dimensions that represent the mental phenomenon of a flow state. Therefore, these dimensions are included in the flow state section. Finally, three flow dimensions stood out as most connected to the perceived competence of expert navigators. *Sense of control, unambiguous feedback,* and *autotelic experience* are in the relationship between competence and flow section. To reiterate, all dimensions are related to flow, but they are organized as such to present the data better.

The Cronbach's alpha for each of the variables is included in Table 1. Appendix B includes the Cronbach's alpha for this study if certain items were removed from the scale. Some alphas were higher in the Flow State Scale, but were included in the results to maintain consistency and generalizability with Jackson and Marsh's (1996) study. Appendix B also includes the comparative Crobach's alpha to the original study on the scale.

Table 1
Cronbach's Reliability Test for Each Scale in Survey

Flow	N of items	Valid Responses	Excluded Responses	α
Challenge and Skill	4	47	3	.847
Awareness and Awareness	4	47	3	.861
Clear Goals	4	46	3	.892
Unambiguous Feedback	4	47	4	.834
Total Concentration	4	47	3	.880
Paradox of Control	4	47	3	.926
Loss of Self-Consciousness	4	47	3	.802
Transformation of Time	4	46	4	.674
Autotelic Experience	4	46	4	.951
Total Flow Scale (FSS)	36	44	6	.965
Specific Perceived Competence	4	44	6	.679
General Perceived Competence	4	46	4	.837

Profile of Participants

A total of 50 surveys were collected for analysis. The first group of participants at Raquette Lake included 15 volunteers to complete the survey immediately following their navigation course. The second group included 26 participants at Raquette Lake. In August, the first group at The Adirondack Mountain Club received one participant from the Advanced Map and Compass Bushwhack. In early October, the second course, Map and Compass Fundamentals, received three participants. The third group at the Adirondack Mountain Club received five participants from the Advanced Map and Compass Bushwhack in late October. The final counts included 41 participants from the OEP navigation course at Raquette lake and nine from the Map and Compass courses at the Adirondack Mountain Club.

Demographics of survey data show that over 80% of participants were white and between the ages of 20 through 29, as shown in Table 2. There were more women than men survey participants, as shown in Table 2. The surveys also represented navigators' experiences, as shown in Table 3. The questions measuring perceived competence allowed participants to self-assess their skill level.

Table 2
Survey Participants by Age, Gender, and Ethnicity

Age	Frequency (*f*)	Percentage (%)
Under 20	4	8.0%
20-29	36	72.0%
30-39	15	4.0%
40-49	1	2.0%
50-59	2	4.0%
60-69	2	4.0%
Over 70	1	2.0%
Total	48	96.0%
Missing	2	4.0%
Total	50	100.0%

Gender	Frequency (*f*)	Percentage (%)
Female	34	68.0%
Male	14	28.0%
Total	48	96.0%
Missing	2	4.0%
Total	50	100.0%

Ethnicity	Frequency (*f*)	Percentage (%)
White	44	88.0%
Black	3	6.0%
Total	47	94.0%
Missing	3	6.0%
Total	50	100.0%

The snowball sampling used in interviews resulted in 11 participants that identified as expert navigators. Participants were interviewed for 20 to 40 minutes. Of those chosen for interviewees, ten participants identified as men, and one identified as a woman. All the participants interviewed were white, and their age was not asked. The participants' roles as navigators included park ranger, hunter, climber, outdoor guide, teacher, and recreational hiker. Some participants identified with a combination of multiple of these roles. Each participant had more than ten years of experience with backcountry navigation, including the following years of experience: 10, 16, 16, 20-25, 20, 25, 25-30, 35, 40, and 50-55 years.

Table 3
Navigation Experience of Survey Participants

Years of Experience	Frequency	Percentage
0	30	60.0%
1	4	8.0%
2	2	4.0%
3	5	10.0%
5	1	2.0%
6	1	2.0%
10	2	4.0%
12	1	2.0%
15	1	2.0%
40	2	4.0%
Total	49	98.0
Missing	1	2.0
Total	50	100.0%

Yearly Trips	Frequency	Percentage
0	23	46.0%
1	8	16.0%
2	4	8.0%
3	3	6.0%
4	5	10.0%
5	1	2.0%
6	2	4.0%
10	2	4.0%
20	1	2.0%
25	1	2.0%
Total	50	100.0%

Perceived Competence

The questions measuring general perceived competence included navigation skill ranking, skill level title, comfort in general terrain, and leading others through the terrain. Participants self-rated their navigation skill level relative to their general perception of their navigation skills and the specific navigation experience of the formal course. Seventy-two percent of participants ranked their skills from poor to average, as shown in Table 4. Eighty percent of participants identified as beginner/novice or intermediate navigators, as shown in Table 5. Their comfort in terrain is represented in Table 6.

Table 4
Navigation Skills Rankings of Participants

Navigation Skill	Frequency	Percentage
Poor	6	12.0%
Fair	15	30.0%
Average	15	30.0%
Good	9	18.0%
Very Good	3	6.0%
Total	48	96.0%
Missing	2	4.0%
Total	50	100.0%

Table 5
Skill Level of Survey Participants

Skill Level	Frequency	Percentage
Beginner/Novice	31	62.0%
Intermediate	11	22.0%
Advanced	5	10.0%
Expert	2	4.0%
Total	49	98.0%
Missing	1	2.0%
Total	50	100.0%

Table 6
Survey Participants' Highest Level of Terrain Comfort

Terrain Comfort by General Rankings	Frequency (*f*)	Percentage (%)
Well-marked and maintained trails	18	36.0%
Marked and unmaintained trails	11	22.0%
Herd Paths	9	18.0%
Bushwhacks	9	18.0%
Total	48	94.0%
Missing	3	6.0%
Total	50	100.0%
Terrain Comfort by Leading Others	Frequency (*f*)	Percentage (%)
Well-marked and maintained trails	24	48.0%
Marked and unmaintained trails	14	28.0%
Herd Paths	6	12.0%
Bushwhacks	4	8.0%
Total	48	96.0%
Missing	2	4.0%
Total	50	100.0%

Since the items included varying responses, the scores for *general perceived competence* were converted into z scores to weigh the items equally. These scores are represented in Table 7 for both *specific* and *general perceived competence*. This table includes the raw frequencies for *specific perceived competence* as positively coded.

Table 7
Total Perceived Competence Scores of Survey Participants (Z-Scores)

	General Perceived Competence	**Specific Perceived Competence**
N	49	49
Mean	-.0143	.0323
SD	.82150	.72708
Minimum	-1.12	-1.45
Maximum	2.20	1.21

Specific Perceived Competence Scores (*f*)

I feel like I navigated well.	Frequency (*f*)	Percentage (%)
Strongly disagree	2	4.0%
Disagree	5	10.0%
Agree	24	48.0%
Strongly agree	48	34.0%
Missing	2	4.0%
Total	50	100.0%

I navigated as well as I expected to.	Frequency (*f*)	Percentage (%)
Strongly disagree	9	18.0%
Disagree	10	20.0%
Agree	18	36.0%
Strongly agree	9	18.0%
Missing	4	8.0%
Total	50	100.0%

My skill was as high as ever.	Frequency (*f*)	Percentage (%)
Strongly disagree	6	12.0%
Disagree	13	26.0%
Agree	15	30.0%
Strongly agree	10	20.0%
Missing	6	12.0%
Total	50	100.0%

I was not disappointed in my navigating.	Frequency (*f*)	Percentage (%)
Strongly disagree	8	16.0%
Disagree	6	12.0%
Agree	15	30.0%
Strongly agree	16	32.0%
Missing	5	10.0%
Total	50	100.0%

The approach to measuring experts' perceived competence relied on snowball sampling from participants to determine their skill level. Sampling began with individuals that teach map and compass skills to ensure their credibility as navigators. This data collection relied on participants’ ability to select other expert navigators, thus verifying the validity of their skill levels. Participants answered questions related to *general perceived competence*, such as “how long have you been navigating,” “do you navigate alone or in groups,” and “where did you learn to navigate.” All participants actively engaged in navigation for ten or more years for both professional and recreational purposes. Their comfort level fluctuated based on the specific experience they recalled, which is discussed in the following sub-section on the relationship between their competence and the presence of flow state. Unlike survey participants, experts reflected on their long-term experiences rather than immediately following a specific navigation experience. All felt comfortable in backcountry terrain alone and with groups. However, some expressed a preference for one or the other.

When asked about their most memorable navigation experience, all but one of the participants recalled either a negative or a combination of positive and negative experiences. A *negative* experience constitutes a memory where the individual was lost, disoriented, in a challenging situation, or made a navigation error. These negative experiences suggest that the individual was not in a flow state in their most memorable moments but the state that Csikszentmihalyi describes as *psychic entropy* or anxiety (1990). The one participant that reflected on a strictly positive navigation experience was the one participant that identified as a woman.

Of the nine flow dimensions highlighted in Jackson and Marsh (1996), three represent qualitative variables relative to perceived competence in skill level, including *challenge-skill balance, clear goals*, and *total concentration*. Jackson and Marsh (1996) define *challenge-skill balance* as when an individual experiences balance between their skills and the situational demand. There were 45 accounts of the *challenge-skill balance* in the qualitative data. This dimension is the most common descriptor of flow state. The interview accounts show that expert navigators have a high *general perceived competence* based on the dimension of their *challenge-skill balance*. Of those accounts, 36 descriptions were positive, indicating that participants felt their skills were adequate to face the challenge at hand. These findings establish one of the foundations of a flow state.

Nine descriptions indicated that experts' skills inadequately matched the challenge resulting from feelings such as overconfidence. These descriptions are more closely tied to their *specific perceived competence* relative to a specific experience rather than their general skillsets. When experts felt too comfortable with their skills, they tended to make an error. However, this comfort also allowed them to embark on challenging courses initially. Sample descriptions of both positive and negative accounts in the *challenge-skill balance* dimension are displayed in Table 8. Within this dimension, experts described feelings of confidence and trust in their skills from experience, which are critical subthemes under this analysis. This table, and consecutive tables throughout this chapter, represent the *positive* (+) and *negative* (-) descriptions. In navigation, the challenge is the terrain of the backcountry, and the skills of the navigator include things like taking and following bearings, reading the landscape, and map reading. These are the skills pertinent to achieving high perceived competence in backcountry navigation.

Table 8
Sample Challenge-Skill Balance Quotes from Interview Participants

Challenge Skill Balance	
Hiking is a combination of trying to figure in staying on course, finding the best course of your path, in other words, the path of least resistance with the least amount of dangers – cliffs, drop-offs, spruce thickets, bogs. But also, enjoying the experience of seeing the beauty of those drop-offs and bogs. In finding that happy medium, I think that's what every hiker tries to do, or anybody wants to venture off into the wilderness.	
Confidence, trust, and comfort +	I study maps a lot, so I know that there's – you can't really, you can get lost, but you can't really get lost for that long because there's just, if you know what you're doing, if you know how to read a map, and you know where you are, and you know where you want to be, it really is as easy as that. And the more you do it, the more confident you get in it.
experience +	Well, there's no substitute for experience… my value system for so many things in life is patience, reflection, experience different things, intuition…experience has amplified a value experience I already brought. But, without experience the value system would fail because being in the Adirondack wilderness is a daunting thing.
too comfortable -	The trouble with learning navigational skills is that, at times, you can become overconfident and wander into such dense, deep, and remote areas that you tend to panic.

Expert navigators must possess a certain level of general perceived competence to set goals of entering the challenges of backcountry terrain, as indicated by the challenge-skill balance. Therefore, perceived competence is also affected by the ability of experts to establish clear goals. Jackson and Marsh (1996) describe this dimension by the participants' clarity of their set goals. Table 9 represents sample quotes of the 20 descriptions from the qualitative data on this dimension. Eighteen descriptions were positive, with subthemes of getting to their objective, such as a lookout or summit and safely getting out of the woods. Another key subtheme is the ability to survive in such a terrain. Goals in the backcountry differ significantly from the formalized navigation courses. In courses, participants are provided clear goals with locations or objectives they must meet by the instructor. Unstructured expert navigation requires individuals to set their own goals, time constraints, and initiative in executing the task. There were two descriptions of *clear goals* not being present, which included wandering accounts. In these cases, they failed to meet their objective and did not enter a flow state.

Table 9
Sample Clear Goals Quotes from Interview Participants

Clear Goals	
I have ideas of places I want to go, and a weekend will come up or whatever, and here's an opportunity to get to a place I've been wanting to get to. It's not like I'm planning a route on the map. I have the maps. I have the materials. I have the time and energy to do it. It gets me to a starting place where I can park my car. The map kind of tells me where I need to go.	
meeting set objectives +	I want to get there, and I want to get back home.
survival +	You know you have to do it to get out, and you know you *need* to get out eventually because your survival depends on it. The woods can swallow you up. It's happened to others.
wander -	Sometimes I'll just wander aimlessly, but I know if that's my approach, I'm not going to go far.

Finally, interview participants were attuned to the situations in which their perceived competence elevated. This theme emerged under the dimension of *concentration on task* as defined by Jackson and Marsh (1996). Authors define this as feeling total focus on the task at hand, noting that this was one of the most common flow dimensions. There were 23 descriptions of moments where participants felt complete concentration on the task. Of these descriptions, 15 were positive, and eight were negative. Concentration increased when the terrain conditions increased in difficulty when experts felt they were more likely to mess up if they lost focus. For example, conditions like blizzards forced an expert to stay focused on the navigation aspect of the hike as it decreased visibility. However, when experts found themselves at a moment of rest or reflection, that concentration was alleviated with feelings of enjoyment and immersion. At times, however, prolonged relaxation could cause individuals to make an error. The sample quotes from this dimension are represented in Table 10.

Table 10
Sample Concentration on Task Quotes from Interview Participants

Concentration on Task	
If my mind drifts elsewhere, I start drifting elsewhere. So, there are times it does drift off, and those are usually the times I have to correct something or another. But otherwise, I'm pretty focused on exactly where I want to go. You know, checking line of sight navigation features, I'm pretty focused when I'm on task.	
challenging terrain +	More often, in those challenging circumstances – blizzards, fog, flat terrain, featureless terrain, that is when I am more focused and thinking about the task of navigation.
clear thinking +	When you are in the deep woods and miles away from anybody, your sense of survival tends to take over. Adrenaline has a way of making you think clearly – a combination of adrenaline and fear – makes you think clearly, think through the problem rather than "oh my gosh, what do I do?"
carried away -	You might get carried away with a set of cliffs with a gorgeous lookout of miles and miles of pristine wilderness, and you tend to forget the fact that you're not staying on course for where you want to go.

Flow State

The flow state was measured using Jackson and Marsh's (1996) Flow State Scale and the nine dimensions included within it. Table 11 shows the mean scores of survey participants for each flow dimension. Additionally, all nine dimensions were present in the interviews with 11 participants, which is represented in Table 12 by their positive and negative descriptions.

Table 11
Survey Participants' Flow State Scale Dimension Scores

Flow Dimension	N	Mean	SD
Challenge and Skill	50	3.6100	.98219
Action and Awareness	50	3.0500	1.02145
Clear Goals	50	3.7500	.97022
Unambiguous Feedback	50	3.8633	.93417
Concentration on Task	50	4.1000	.84061
Paradox of Control	50	3.8250	.96395
Loss of Self-Consciousness	50	3.7850	.89216
Transformation of Time	50	3.0850	.89444
Autotelic Experience	50	3.7783	1.17883
Total Flow Scores	50	3.6496	.74616

Clear goals, *concentration on the task*, and *unambiguous feedback* are the highest-ranking dimensions of survey participants. The lowest ranking scores were *time transformation, action and awareness merging, and challenge-skill balance*.

The survey score dimension rankings vary from the qualitative findings, demonstrating that *challenge-skill, a paradox of control*, and *autotelic experience* were most positively described in the interviews. The dimensions least described positively are *the transformation of time, action and awareness merging, unambiguous feedback*, and *loss of self-consciousness. Unambiguous feedback* also received the most negative descriptions in interviews. *Sense or paradox of control* also received 11 descriptions that met both positive and negative criteria, discussed in the following subsection.

Table 12
Interview Participants' Flow State Scale Dimension Descriptions

Flow Dimension	N of descriptions	Positive	Negative	Combined
Challenge and Skill	40	36	9	-
Action and Awareness	13	10	3	-
Clear Goals	20	18	2	-
Unambiguous Feedback	32	11	21	-
Concentration on Task	23	15	8	-
Paradox of Control	31	21	8	11
Loss of Self-Consciousness	20	13	7	-
Transformation of Time	14	11	3	-
Autotelic Experience	25	20	5	-

The qualitative data demonstrate that participants are likely to encounter flow state during navigation. As discussed, dimensions like *challenge-skill, concentration on task,* and *clear goals* focus on the action of the activity rather than the effects. However, *action and awareness merging, loss of self-consciousness,* and *transformation of time* represent the mental aspects of flow state. Jackson and Marsh (1996) define *action and awareness merging* as involvement so deep that it becomes automatic. A sample of quotes from participants for the dimension of *action and awareness merging* is included in Table 13. Experts described feelings like going through the motions, feeling as if it is second nature, and self-actualization for the ten positive accounts. Three negative accounts included feelings like fear, worry, and doubt. The negative descriptions within this dimension relate to a lower *specific perceived competence* of expert navigators when they felt particularly challenged by an experience.

Jackson and Marsh (1996) define *the loss of self-consciousness* as the participant losing concern for their sense of self and how others perceive them. The qualitative descriptions examine the concept of ego and second-guessing oneself in the act of navigation. Table 14 demonstrates sample quotes from the dimension *of loss of self-consciousness.* In 13 positive descriptions, experts described leaning into fear, losing themselves in the experience, and not worrying about their performance. Seven negative descriptions regarded times when navigators were in a particularly challenging experience, in an unknown area, or leading a group in the wrong direction. These negative descriptions again relate to *specific* and not *general perceived competence.*

Table 13
Sample Action-Awareness Quotes from Interview Participants

Action Awareness Merging	
You feel self-actualized in that moment of just doing a task you're an expert at. I get that 80% of the time, and 20% of the time, I drift into those moments of critical thinking and problem-solving, where it's not feeling the landscape drape around you or encountering the stream and just going with it as a handrail.	
Motions, observant +	My body is going through the motions, and I'm checking everything, but I'm constantly thinking about how I'm off trail; I'm just there.
second nature +	I rarely ever break out my GPS because I can just go with the flow of the land. I basically have a photographic memory for maps, so I have the map in my head; I know what it looks like. I know where things are. Having done it for 25 years in the Adirondacks, it's hard to explain; it's just kind of like second nature now.
sense of direction depreciates –	But a half a mile later, dodging around cliffs, through gullies, and around dead trees, your sense of direction depreciates.

Table 14
Sample Loss of Self Consciousness Quotes from Interview Participants

Loss of Self Consciousness	
You're really observant, and you kind of get lost in taking care of yourself, too. When you're not worrying about some of the other social pressures that you have, and so you're really just focusing on, yeah, navigating and taking care of yourself. Am I hungry? Am I cold? Do I need water? And I love that about multi-day travel – you're just focusing on that – the necessities, where you're going.	
autopilot +	As long as everything else is going smoothly, I totally am just on autopilot and definitely feel myself just getting lost in the experience.
not worrying +	Anyone that professes not to have had fear in the Adirondack backcountry is just dishonest. I embrace that fear. It's kind of delicious.
second-guessing -	I'm constantly second-guessing myself, especially if I haven't been in the area in a while.

Finally, the *transformation of time* is defined as the perceived alteration of time, either slowing down or speeding up (Jackson & Marsh, 1996). Authors add that this dimension may also include the idea of time slipping from awareness. Csikszentmihalyi (1990) and Jackson and Marsh (1996) note that this dimension may not be universal as some activities demand an awareness of time, such as athlete performance. The same may be true for navigation which requires concise attention to time.

Though survey participants scored lowest on this dimension, it was undoubtedly present in the interview data with expert participants. Survey participants were constricted by time limitations set by the organizations to complete the course. Interview participants, however, recalled experiences that they planned and executed on their own. Experts' time constraints are much more flexible than the beginner, intermediate, and advanced navigators. There were 11 descriptions from expert navigators of accounts where time either sped up or slowed down in the backcountry. The three negative descriptions from experts regarded times that it was important to keep track of time, such as guiding or beating the sunset to avoid hiking in the dark. These negative descriptions are more similar to survey participants with set time constraints. Table 15 represents a sample quote from a participant who experiences this alteration and one who does not. This table does not represent subthemes as the trends that emerged focused primarily on either the presence or absence of time transformation.

Table 15
Sample Time Transformation Quotes from Interview Participants

Time Transformation	
+ I would say speed up when you're in some phenomenally beautiful location, say a mountain, or some remote pond, or possibly just some view that few ever go to, or maybe it hasn't even been discovered by anybody but you yet. Time tends to speed up in those situations, and you find, "oh my gosh, I got to get out of here if I'm going to make it out by a reasonable hour." Then, time slows down on a bushwhack. Bushwhacking is off-trail. What will feel or seem like on a trail is just a few minutes of hiking can seem interminable when you are struggling through extremely thick vegetation such as the Adirondacks; it's spruce for the most part. But there's also witch hobble, and other prickers, nettles. Especially down in the Catskills, prickers and nettles are a problem. Then, time tends to slow down and becomes a long, long journey. But, you know, the payoffs are worth it.	
aware of time -	Me, no. There's always the "time flies when you're having fun" phenomenon. I always have a wristwatch on me, so I'm conscious of the time passing anyway. Especially when the days are getting shorter, and there's only x amount of sunlight, you really have to be back by a certain time. Otherwise, the experience starts becoming unpleasant. I'm personally always aware of what time it is. Losing track of time is not an option for me.

This chapter has thus far explored the variables of perceived competence and flow state independently of each other. To further understand the findings relative to the hypotheses, the variables are displayed in relation to one another.

Relationships Between Perceived Competence and Flow State

This section is divided by hypotheses to present the relationship between the variables. Three major dimensions stood out as the most impactful to experts' ability to enter flow state, including *sense of control, unambiguous feedback,* and *autotelic experience*. Each of the dimensions is discussed under the respective hypotheses.

Hypothesis One

Hypothesis one is as follows: "The perceived competence of navigational skills in participants taking an organized navigation course will affect their ability to encounter dimensions of flow. Those with higher *specific perceived competence* are more likely to encounter dimensions of flow than those with low *specific perceived competence*."

Over 60% of survey participants identified as beginner, novice, or intermediate navigators. Though the *general perceived competence* scores of survey participants were relatively low, the nature of the formal course allowed their skills to be tested in a controlled environment. With these comforts, their specific perceived skills were high on the day of the challenge. Table 7 shows the z scores of their perceived competence. Table

16 shows the Pearson correlation coefficient between each flow dimension and both *specific* and *general perceived competence*.

All results showed positive correlations; however, the strength of the correlations varied between dimensions. The correlation coefficients operate in a range from 0.0 to 1.0. Values from 0.0 to 0.33 are regarded as weak, 0.333 and .666 as medium, and 0.666 to 1.0 as strong (IBM, 2021). *Specific perceived competence* had a stronger correlation between variables than *general perceived competence*, with seven values in the medium category, one in the strong category (*clear goals*), and one in the weak category (*transformation of time*). *General perceived competence* had six flow dimensions fall into the medium category but none in the strong category. *Action-awareness merging, loss of self-consciousness, time transformation,* and *autotelic experience* demonstrated weak correlations between *general perceived competence*. *Unambiguous feedback* and *clear goals* showed the highest R-value for both competence items, with a moderate positive correlation in *general perceived competence* and a strong positive correlation with *specific perceived competence*.

The correlations of general and perceived competence were statistically significant at either a 0.01 or 0.05 level for all but one dimension, as indicated by the table. *Transformation of time* was the lowest and not-statistically significant.

Table 16
Flow Dimensions and Perceived Competence of Survey Participants

Flow Dimension	Specific Perceived Competence	General Perceived Competence
Challenge-Skill Balance		
Pearson Correlation	.473**	.336*
Significance: (2 tailed)	.001	.018
N	49	49
Action-Awareness Merging		
Pearson Correlation	.473**	.382**
Significance: (2 tailed)	.001	.007
N	49	49
Clear Goals		
Pearson Correlation	.672**	.582**
Significance: (2 tailed)	.000	.000
N	49	49
Unambiguous Feedback		
Pearson Correlation	.649**	.587**
Significance: (2 tailed)	.000	.000
N	49	49
Total Concentration		
Pearson Correlation	.466**	.420**
Significance: (2 tailed)	.001	.003
N	49	49
Paradox of Control		
Pearson Correlation	.591**	.550**
Significance: (2 tailed)	.001	.000
N	49	49
Loss of Self-Consciousness		
Pearson Correlation	.461**	.299*
Significance: (2 tailed)	.001	.037
N	49	49
Transformation of Time		
Pearson Correlation	.200	.089
Significance: (2 tailed)	.168	.542
N	49	49
Autotelic Experience		
Pearson Correlation	.413**	.303*
Significance: (2 tailed)	.003	.035
N	49	49
Total Flow Score		
Pearson Correlation	.629**	.507**
Significance: (2 tailed)	.000	.000
N	49	49

***Correlation is significant at the 0.01 level (2-tailed)*

** Correlation is significant at the 0.05 level (2-tailed)*

Hypothesis Two

Hypothesis two is as follows: “The act of navigation is not continuous and includes both brief and continuous moments of decision making, assessment, and movement. Though missing some of Csikszentmihalyi’s (1999) conditions for flow state, the dimensions of flow as defined by Jackson and Marsh (1996) will be encountered regardless during navigation at each skill level.”

Dimensions of flow were present in both the quantitative survey and qualitative interview data. However, the act of navigation removes the possibility of staying in a consistent flow state. The survey data provide the basic assumptions that perceived competence and flow state are correlated. However, the qualitative data examine the part of this hypothesis that states that navigation lacks the conditions for continuous involvement. It includes moments of stopping, taking bearings, and trusting the tools. The qualitative data show that two major flow components contribute to the fluctuating involvement in flow state, *sense of control* and *unambiguous feedback.*

First, as defined by Jackson and Marsh (1996), the *sense or paradox of control* articulates that the participant should have the conscious potential for control. However, the unpredictable nature of the backcountry terrain *is* the variable of the challenge. Interview participants describe the terrain in the Adirondacks as dense, deep, low visibility, and heavily vegetated. Spruce fir trees are abundant with occasional streams, mountain ranges, and local features that may help orient an individual. Some of the key takeaways from the *sense of control* dimension of expert navigators is their ability to pause, slow down, and stay calm. Table 17 includes sample quotes from those that encountered the drive for control in the backcountry. There were 23 positive descriptions, eight negative descriptions, and 11 descriptions of both. This dimension includes an aspect of both positive *and* negative descriptions. In some cases, participants would describe the feeling of leaning into the idea of lack of control. Table 17 shows a sample quote of this concept to deal with the fear or uneasiness of lack of control.

Table 17
Sample Sense of Control Quotes from Interview Participants

Sense of Control	
Trying to stay calm, knowing that if I retrace my steps, or just knowing that I have all the tools I need through my training and education to get myself out of there.	
stay calm +	People say that if you get lost in the woods, just sit down. That is correct. That is very wise advice. So, I just sat for a minute and said, instead of losing confidence because you're disoriented, get back on the damn line where you thought it was, and follow the compass bearing. And I did that, and it worked out great.
trust +	If I have a specific spot and time to like study it at home and really go through that route on the map and plan bearings and plan – that's when I feel really in control. I feel like I know exactly, and I can be confident and trust that I can get to where I want to go.
fear -	I started to holler for help, which is a futile endeavor on the slopes of McNaughton, 8 miles from the trailhead.
dealing with the fear +/-	My version of being in the wilderness doesn't depend on me having the kind of security lots of people would have. Like, knowing what's next, knowing where I am. I just know that I can be there and live in the woods perpetually, and I feel like I belong there.

The other dimension that heavily impacted experts' ability to stay in flow is the lack of *unambiguous feedback*. As the *sense of control*, feedback in backcountry terrain is limited. With heavily vegetated woods or no visible vantage points, experts rely entirely on the trust of their tools and skills. This concept is further explained in the discussion chapter. Table 18 shows sample quotes from the dimension of *unambiguous feedback*. This dimension received the most negative descriptions from interview participants, with 21 negatives and 11 positives. Prominent landmarks helped experts feel immediate feedback on their navigation progress. Otherwise, their confidence fluctuated between obvious land markers. This data suggest the opposite of the survey data. Survey participants had a higher correlation between *unambiguous feedback* and flow state. This difference may be the varying nature of the experiences of different skill levels of navigation. Formalized courses provide immediate feedback through flags or locations due to route design, and bushwhacking is more ambiguous.

Table 18
Sample Unambiguous Feedback Quotes from Interview Participants

Unambiguous Feedback	
If I hit a certain landmark, I'm on the right track, or I know it's kind of like my safety net. So yeah, try to keep it simple.	
obvious landmarks+	When there are obvious landmarks, visibility is good. So, you're not dealing with clouded in dark situations. You have views whether it's through the trees, and then pinpoint the mountains, for example, drainages, this stream for sure. There are different land features that you know for sure. You can have a pretty darn good sense of where you're at.
lost confidence -	At one point, as everybody who's ever done this can tell you, I lost confidence. Like, hm, I feel like I've been bearing too far north. It turns out I was actually very close to on the line. But I wasn't sure, so I went off the line, and I tried to bear the way I thought might correct it. I was really deep in the thick stuff in the middle of nowhere. I had no idea where I was at all.
exact location unknown -	When I can't resolve that, I'm looking for some way to confirm it. There is no admittable way, reasonably easy way to confirm it. So, you can just be disoriented for a while, and sometimes you have to – even with all the experience I have – swallow.
questioning self -	I felt this looming sense of dread building, "are we doing the right thing? Are we doing the right thing?" Of course, if you use the compass correctly, the answer is yes, you are. But even with a professional bushwhacker who has done it for multiple decades, I was still thinking something was going awry even though we were on target the entire time.

Hypothesis Three

Hypothesis three is as follows: "The intensity or depth of flow state increases with the complexity of the challenge. Therefore, experts will encounter more elements of flow in a backcountry experience than the beginner, novice, or intermediate navigators do in organized courses."

The qualitative data suggest that participants are not in a continuous flow state. However, experts show results of the beneficial effects of flow despite not being in a continuous state. Jackson and Marsh (1996) define the *autotelic experience* as finding an intrinsically rewarding element in the activity. Csikszentmihalyi (1999) describes this as doing something for its own sake. This dimension represents the enjoyable aspect of being in flow state. Table 19 shows example descriptions of accounts of the *autotelic experience* in expert navigation. Those who did not experience autotelic navigation pursued other objectives other than hiking, such as climbing, search and rescue, or hunting. There were overall 20 positive descriptions and five negative descriptions of this dimension.

Table 19
Sample Autotelic Experience Quotes from Interview Participants

Autotelic Experience	
Satisfaction. Great satisfaction. At this point, it's been true for a while, but it just gets stronger every year. At this point, I feel like I could do anything back there. If somebody said, "you've got to spend three months back there," I'd be like, "ok." I could do it. I could do whatever. I belong there.	
empowerment +	It feels really empowering to go out into the woods and off-trail.
accomplishment +	You're trying to – you're just navigating, and you're looking for a 20-foot cliff in a five-mile radius, and you find it! That's a hugely rewarding portion of it. Anytime I can pull that rabbit out of my hat, I feel really good about it.
means and end -	It's not navigating for the sake of navigating. It's usually a specific destination I have in mind. It's cool to set off and see this place.
other objectives -	Finding things, yes. It doesn't relate to your study, but there were two searches, and the organized search portion ended. The leadership in the ranger force decided that they didn't find the people, and they exhausted their efforts. And I stayed on the search, searching myself, either off duty or if I had a chance while working, and I found the person. That happened to me twice… but I was also, broadly speaking, putting myself, trying to put myself in the mind of someone or the pattern of someone lost or off-trail. In the case of these two men, I was trying to just follow terrain features of where their feet would take them, where their minds would take them.

The following sub-section of this chapter includes other notable qualitative findings. These findings expand on the last hypothesis on the expert level's depth of flow state experiences. These findings are an essential part of the discussion.

Other Qualitative Findings

This final section includes emerging themes found in the qualitative data that fit under the scope of flow theory. The last questions asked in interviews targeted the dimension of the *autotelic experience*. As discussed, many navigators experienced this sensation unless driven by another motive. Navigators answered, “what is the most rewarding part of backcountry navigation?” and a simple, broad question to cap off the interview: “why do you navigate?” Of the responses, there were 22 descriptions highlighting descriptions of a theme known as the “wilderness experience.” A quote from a participant captures the essence of this theme:

> I love the wilderness. I want to be in it. I want to inhabit it. I don’t need a destination. I don’t need specific physical or positional touchdowns to make me feel comfortable. I don’t want to know where I am all the time. I don’t want to have to deal with any remnants of civilization. I feel young. I feel strong. I feel – and I’m not religious at all – but I feel spiritually connected to this land. I feel immense peace. I feel abiding respect for nature left to her own devices. I feel motivated to spend the rest of my life protecting this place. I feel joy. And I don’t know, maybe most of all, I feel alive. Joy is very subjective. Bushwhacking in the middle of nowhere, in really bad weather for multiple days, whatever it is, it could be very uncomfortable. That’s about feeling alive.
>
> In a sense, that’s hard to put into words – and it’s not mostly *about* me – at least for me, it’s not. For me, it’s about that place. It’s about honoring it. It’s about being humble in it. Reverent, in it. The land that we’ve got, it’s undeveloped, there’s a lean-to that some guys built, the owner before us who was really the first person to ever be there, as so far as we know. It’s completely undeveloped. There are places where the moss is three feet deep. There are huge trees. You can feel the age. You can feel that this land has just lived and existed since the ice age. It never burned in any fire. The fires missed it; it’s miraculous. It was never logged.

> It’s just sat there since the glaciers scoured the place; it’s been growing. That’s what being in the wilderness can give you. Feelings like that (Participant 7, personal communication, August 9, 2021).

This participant exemplifies the descriptions of other interview participants, including subthemes of solitude, wildlife encounters, peace, silence, remoteness, grandeur, and the idea of walking somewhere that no human has walked before. Six descriptions translated their navigation experience to meaning in their lives, such as:

> What are we but the sum of our experiences and the places we’ve been? I think you can connect with anyone [on geography], and it can bridge friendships, and I would say that it makes me feel happy. Knowing where I am and where I want to go (Participant 2, personal communication, July 28, 2021).

> The key to being secure and strong and really inhabiting the wilderness is not to avoid getting lost. It’s to accept it. And to know how to deal with it. So, I get lost all the time (Participant 7, personal communication, August 9, 2021).

These quotes exemplify how the benefits of flow state linger in everyday life. Others attributed their successes to feeling empowered, at peace, and humbled. There additionally were three separate accounts of people comparing navigation to reading or playing music. These accounts were retrospective to the experience of assigning meaning through practice and experience. The descriptions account for the lingering effects of flow state that Csikszentmihalyi (1990) describes in Flow. This flow dimension is not represented by the nine-dimensions Flow State Scale from Jackson and Marsh (1996). However, it is important to include this element for further discussion of the implications of this study.

Chapter 5

DISCUSSION

This study is a foundation for developing the research on outdoor recreational navigation and its implications. The purpose of this research was to explore the mental benefits that may result from the activity of outdoor navigation. Flow theory is a social construct that involves total immersion in an activity and experience (Csikszentmihalyi, 1990). The implications of the flow state result in mental benefits such as happiness, creativity, and motivation (Csikszentmihalyi, 1990). This study uses a multi-method approach to establish the simple correlation between flow theory and outdoor navigation. Furthermore, this study has examined how the perceived competence of individuals navigating affects their ability to enter a flow state during the activity. *Perceived competence* is how individuals assess their ability to perform a task (Iso-Ahola et al., 1989). Survey data from participants in navigation courses at SUNY Cortland's Raquette Lake Outdoor Education Practicum or the Adirondack Mountain Club examine the fundamental correlation between flow state and outdoor navigation for beginner, intermediate, and advanced navigators. Semi-structured interviews were conducted with expert navigators to understand the complexity of their backcountry experiences. The following sections are included: (1) summary of procedures; (2) summary of findings; (3) conclusions; (4) discussion and implications; (5) recommendations.

Summary of Procedures

Survey participants were chosen based on the criteria of their skill levels. Beginner, intermediate, and advanced navigators were selected from the formal navigation courses at SUNY Cortland's Raquette Lake and the Map and Compass Fundamentals and Advanced Map and Compass Bushwhack at the Adirondack Mountain Club. These navigation courses eliminate much of the risk of backcountry navigation with procedures and safety protocols. The nature of the courses allows participants to test their navigation skills in a controlled environment. Following their navigation course experience, the instructors administered the survey. Participants completed the navigation survey included in Appendix B. The survey utilizes an adapted version of a rock-climbing perceived competence scale developed by Iso-Ahola et al. (1989) that measured general, and navigation course-*specific perceived competence*. Jackson and Marsh's (1996) Flow State Scale assessed the nine dimensions of flow, including *challenge-skill balance, action-awareness merging, clear goals, unambiguous feedback, total concentration, sense of control, loss of self-consciousness, time transformation*, and *autotelic experience.* Raquette Lake participants completed their surveys on paper immediately after the course. Adirondack Mountain Club Participants completed their surveys digitally within the week following their navigation course. The survey data were secured and transported to the researcher. The data were coded in SPSS, run for Cronbach's reliability, descriptive, and Pearson's correlational tests.

Semi-structured interviews were conducted using snowball sampling with expert navigators in the Adirondack Region. Interviews began with the members of the Education Department at the Adirondack Mountain Club, who are responsible for teaching the various map and compass courses offered. The researcher conducted the interviews using the interview guide included in Appendix C. Data reached saturation after the names of expert navigators were repeated, and others were non-responsive to interview requests. The interviews were recorded and transcribed manually. Transcriptions were coded using open and structural coding under the nine dimensions defined by Jackson and Marsh (1996). Each code was marked as either positive, negative, or both. The codes were counted and analyzed for subthemes within each dimension. In the second analysis, pattern coding fully developed the sub-themes within the nine dimensions. Thematic coding was used for qualitative data beyond the scope of the nine dimensions of flow. The trustworthiness of the qualitative data were established based on the researcher's credibility. Methods of member checks, the researcher's positionality statement, multiple rounds of coding, and triangulation within the study helped establish this credibility. Member checks were performed by email with no conflicts with the data.

Summary of Findings

Fifty participants from Raquette Lake and the Adirondack Mountain Club completed the navigation survey. There were 41 participants from Raquette Lake's OEP Course, six from an Advanced Map and Compass Bushwhack with the Adirondack Mountain Club, and three from the Map and Compass Fundamentals with the Adirondack Mountain Club. A total of 11 expert navigators were interviewed through the process of snowball sampling. This section summarizes the profile of participants, an overview of variables, and the relationship between variables.

Profile of Participants

Survey participants represented the sample of beginner, intermediate, and advanced navigators. As shown in Figure 4, 72% of survey participants had between zero and two years of navigation experience. Additionally, 62% of participants took zero to one trip that required navigation each year. Figures 5, 6, and 7 represent the age, gender, and ethnicity of survey participants.

Figure 4
Survey Participants by Years of Experience

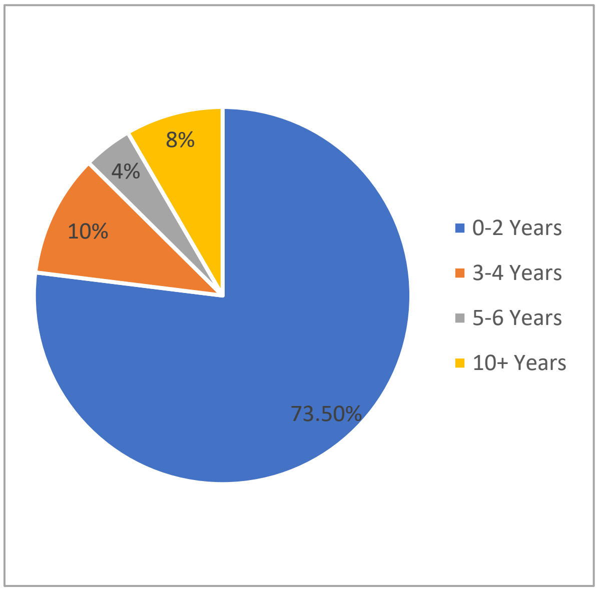


Figure 5
Survey Participants by Age

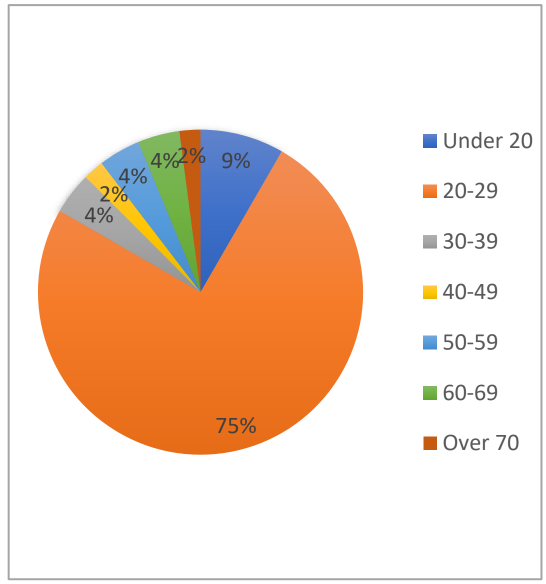


Figure 6
Survey Participants by Gender Frequencies

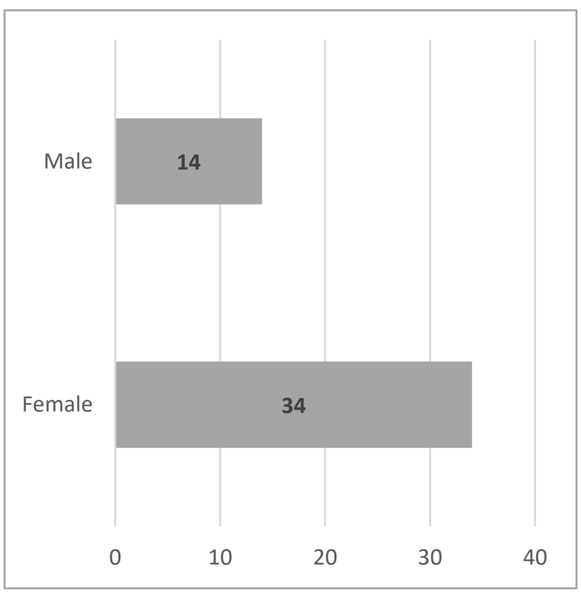
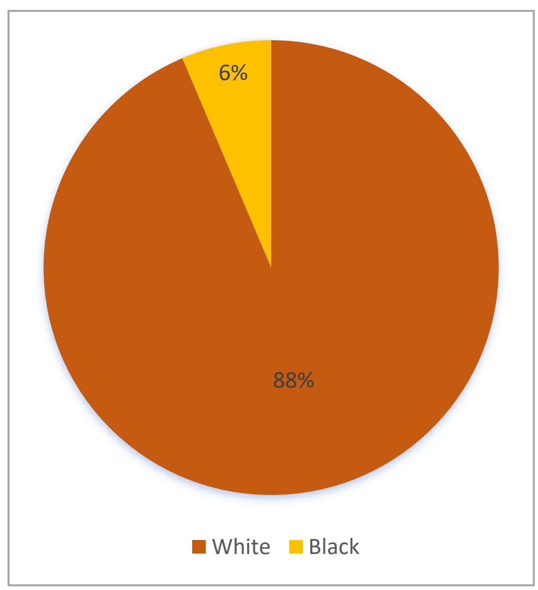


Figure 7
Survey Participants by Ethnicity



Interview participants had more than ten years of experience with navigation ranging from ten to 55 years. The various roles in their navigation included hunters, guides, climbers, rangers, and hikers. All 11 interview participants were white. One participant identified as female, and ten participants identified as male.

Overview of Variables

This study analyzed the variables of *general and specific perceived competence* and flow state among beginner, intermediate, advanced, and expert navigators. Survey participants perceived their *general competence* on the lower end, with 84% of individuals ranking their skill level as beginner or intermediate. Their skill level rankings were generally higher, with 42% of participants ranking their skill levels as poor or fair. Survey data show that participants felt most comfortable leading others on well-marked and maintained trails, with 48% of individuals indicating so. Fifty-eight percent of participants felt most comfortable on marked trails, either maintained or unmaintained. Their *general and specific perceived competence* scores were converted to z-scores to equally weigh the items, and the mean for *specific perceived competence* ($\bar{x}$ = .0323) was higher than *general perceived competence* ($\bar{x}$ = -.0143). The interviewees' responses indicated a high *general perceived competence*, and their *specific perceived competence* fluctuated based on the scenario they were describing.

Flow state was measured under the scope of the nine dimensions as defined by Jackson and Marsh (1996). The means of survey participants were highest on the dimensions of *concentration on the task, unambiguous feedback*, and *autotelic experience.* The lowest means scores were in *time transformation, action and awareness merging*, and *challenge-skill balance*. The average mean for all flow scores combined was 3.6 on a five-point scale. The data were coded into the same nine dimensions for interview participants and counted for positive, negative, and combination descriptions. Interview participants described instances of *challenge-skill balance* through a positive lens most often. They described *unambiguous feedback* through a negative lens most often. Each dimension received ten or more descriptions from all participants combined. The positive descriptions outweighed the negative descriptions for every category other than *unambiguous feedback.* All other dimensions received less than ten negative descriptions.

Relationship Between Variables

The *perceived competence scores* and flow state scores were analyzed for significant correlations. The Pearson's Correlation coefficients for survey data showed that each dimension correlated with both *specific and general perceived competence* other than the dimension of *time transformation*. These correlations were two-tailed and statistically significant at either a 0.01 or 0.05 level. The correlation between the flow dimensions and *specific perceived competence* was higher than the correlation between the flow dimensions and *general perceived competence*.

The highest correlation for *specific perceived competence* was for *clear goals* (r(49)= .672, p < .001) as represented by Figure 8. The highest correlation for *general perceived competence* was *unambiguous feedback* (r(49) -. 587, p < .001), as represented by Figure 9. *Time transformation* is the lowest correlation for both *specific and general perceived competence* and was not statistically significant (r(49) =.200, p = .168; r(49) =.089, p= .542). . Of the scores with statistical significance, *autotelic experience* had the lowest correlation (r(49) = .413, p = .003) for *specific perceived competence,* and *loss of self-consciousness* was the lowest (r(49) = .461, p= .001) for *general perceived competence*. The nature of the demographics may explain these dimensions. Over half of the participants were college students enrolled in a course for credit. Their peers and the requirements of the course may affect these lowest dimensions.

There were descriptions of flow for each dimension found in the qualitative data analysis. The *general perceived competence* of expert navigators was high. All participants said they felt comfortable navigating off-trail and leading others to do so. As noted, their experience in navigation ranged from ten to 55 years, and they utilized it for a variety of different purposes. Of the nine dimensions, three stood out as affecting the *specific perceived competence* of navigators, including *the sense of control, unambiguous feedback,* and *autotelic experience.*

Figure 8
Correlation Between Specific Perceived Competence and Clear Goals

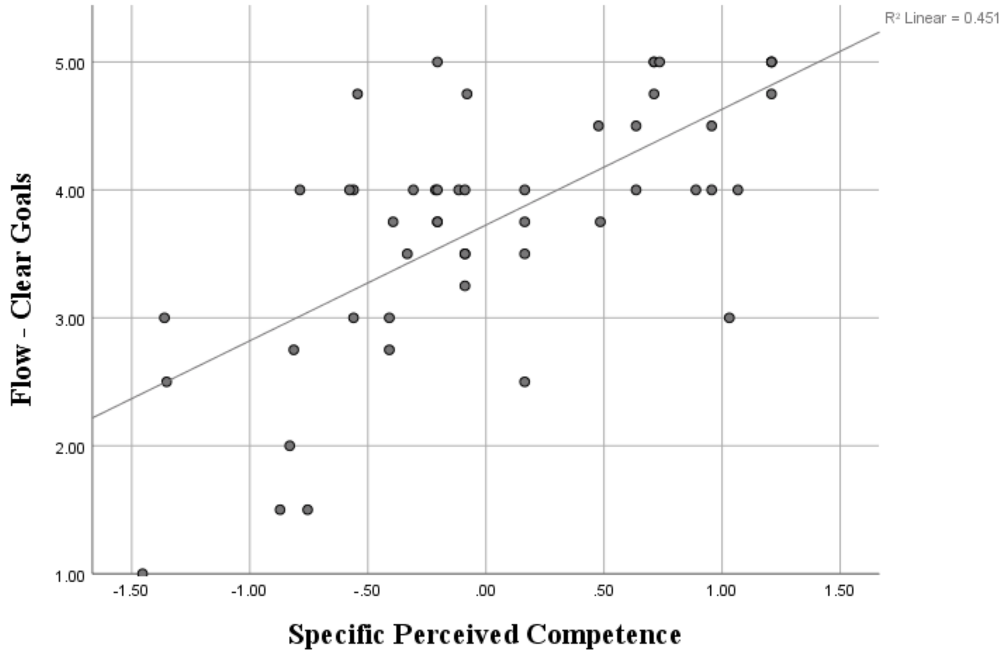
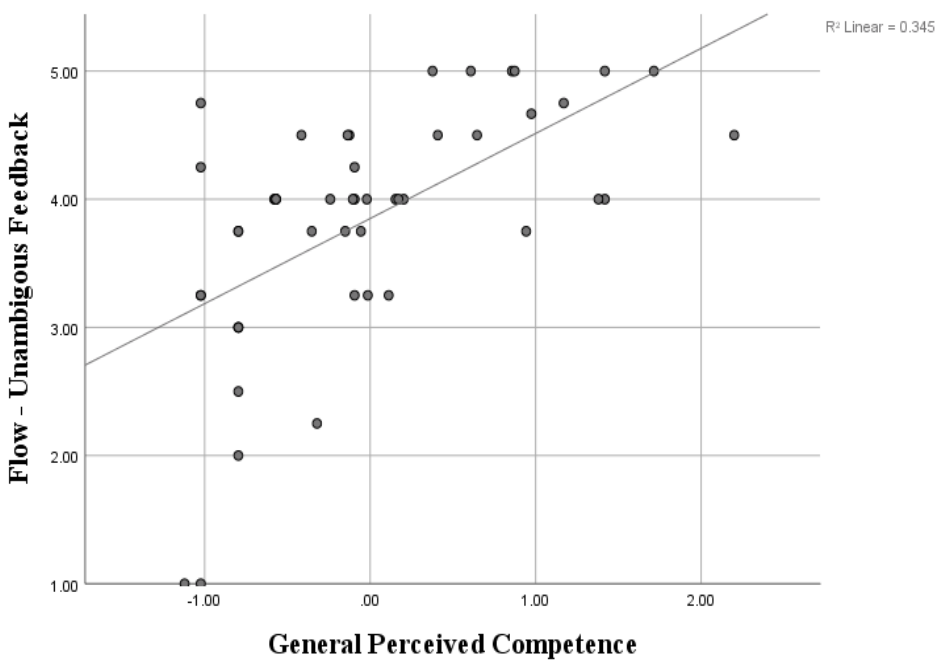


Figure 9
Correlation Between General Perceived Competence and Unambiguous Feedback



The findings of each flow dimension indicate a similarity between this study and the factor assessment in developing the Flow State Scale by Jackson and Marsh (1996). Their study found that the dimensions of *transformation of time* and *loss of self-consciousness* had the lowest factor loadings when testing the scale with confirmatory factor analysis. Authors suggest that these two dimensions may have less universal importance than the other dimensions (Jackson & Marsh, 1996). Furthermore, since their scale tested athletes, the nature of the sport requires timekeeping and presentation of the self. These may be factors in the survey data, as the courses were time-sensitive and completed in group settings. Interview data, however, show that these dimensions are more present than survey data. Although expert navigators must be conscious of time, their experiences in the backcountry are more autonomous and unstructured than those in the formal navigation courses.

Iso-Ahola et al. (1986) found that for rock climbers, *specific perceived competence* relative to the day's climb had more of an impact on self-esteem than *general perceived competence*. Self-esteem is one of the outcomes of involvement in flow state (Csikszentmihalyi, 1990). This study on navigators shows that *specific perceived competence* of the course on the day of had more of a significant correlation to flow state than their *general perceived competence* of overall skill level. Findings in the study by Iso-Ahola et al. (1986) suggest that beginner rock climbers can have just as high self-esteem as expert rock climbers. The findings for navigation imply a similar phenomenon between beginner, intermediate, advanced, and expert navigators. Although experts had higher *general perceived competence* than the beginner, intermediate, and advanced navigators, the specific experience was more relevant to their ability to enter flow state. Under this assumption, there is cause to reject the null hypotheses of this study.

Conclusions

Based on the findings and limitations of this study, there is a correlation between flow state and the perceived competence of individuals participating in the activity of outdoor navigation.

H_1 states that perceived competence will affect beginner, intermediate, and advanced navigators' ability to encounter flow. The survey data show a higher correlation between the flow dimensions and specific perceived competence in participants. Those with higher specific perceived competence are more likely to encounter flow.

H_2 states that the dimensions of flow will be encountered at each skill level despite the lack of certain conditions of flow, including continuous involvement in the specific activity. Beginner, intermediate, advanced, and expert navigators encountered the nine dimensions of flow to a degree within this study.

H_3 states that the intensity or depth of flow state will increase with the complexity of the challenge. Data from expert navigators show that they have encounters with the dimensions of flow that scored the lowest, including *the transformation of time, loss of self-consciousness,* and *autotelic experience*. The qualitative data provided an opportunity to observe how and when experts were entering flow state. However, the quantitative data limits the insight of beginner, intermediate, and advanced navigators to a simple correlational conclusion. If early skill-level navigators were not encountering specific flow dimensions, there might be a cause to reject the null hypothesis. However, all flow dimensions were encountered among the beginner, intermediate, and advanced navigators. Therefore, the information on the depth of these experiences is not accurately represented by the quantitative data compared to the qualitative analysis. Within the scope of this study, there is not enough cause to reject the third null hypothesis.

These findings indicate that hypotheses one and two reject the null hypothesis, as there was a succinct correlation between perceived competence and flow at each skill level. However, the limitations of this study indicate that the null hypothesis for hypothesis three is accepted. There must be further qualitative research on how beginner, intermediate, and advanced navigators experience the activity.

Discussion and Implications

This study aimed to establish the correlational relationship between outdoor navigation and flow theory by observing the variables of the perceived competence of navigators and the nine significant dimensions of flow state. This connection was tested at each level of navigation from beginner, intermediate, advanced, and expert. The scope of the population was within the Adirondack Region of New York State, chosen for its dense, forested ecosystem that presents unique outdoor navigation challenges. Multiple major conclusions are implied from the findings that are further discussed within the following subsections.

Outdoor Navigation

This study contributes to the limited research on uncontrolled, backcountry navigation. As discussed in chapter two, research on navigation directs toward cities, buildings, or virtual environments (Li, Klippel, 2016; Slone, Burles, Robinson, Levy, & Iaria, 2014; Dalton et al., 2019). There is limited research on the cognitive processes of navigation that exist in an outdoor environment (Hill, 2013). This study is unlike existing research as it establishes outdoor navigation first and foremost as a recreational activity. The findings of this research indicate a simple positive correlation between flow state and *specific perceived competence* of navigation. This correlation was present at each skill level. Flow theory, as discussed, is known to be produced abundantly from recreational activities and results in feelings of happiness, joy, and self-worth (Csikszentmihalyi, 1990). The establishment of this basic correlation confirms navigation to have value as a recreational activity and suggests that there may be cognitive benefits for the navigators.

Navigation is often used as a means to an end. It helps to participate in adventure recreation activities such as backcountry skiing, rock climbing, and canoeing (Iso-Ahola et al., 1989). At the beginner levels of navigation, well-established trails and GPS apps eliminate the need for other navigation skills (Hergan & Umek, 2016). These skills are crucial for outdoor recreation and can save people's lives. Search and rescue operations dispatch for lost hikers (Sadeghi, 2015). However, research on the benefits of outdoor navigation beyond survival skills highlights the value that it holds. Therefore, the results of this study can be used to recruit and encourage enrollment in navigation courses and education on navigation skills for organizations like the Adirondack Mountain Club or other environmental organizations. Increased navigation education may help reduce the number of people requiring a search and rescue operation and thus decrease the allocation of funds spent on those missions. Then, additional resources for Search and Rescue can be used to improve infrastructure, training, tools, and other emergency scenarios. Flow theory is just a first step to developing the research on this topic.

Flow Dimensions

This study examined flow through the nine dimensions of the Flow State Scale from Jackson and Marsh (1996) for quantitative and qualitative data. Exploring the nine dimensions individually allows insight into how navigators may experience flow. The activity of navigation is non-continuous and involves brief, sporadic moments of involvement. The results of this study have established that skill level does not impact the ability of the navigator to enter flow state. Rather, it is dependent on the specific scenario the individual is encountering. However, the results show a difference between beginner through advanced navigations and expert navigators and the dimensions that stood out as most influenced.

The means scores of the beginner, intermediate, and advanced navigators were the highest for the flow dimension, *concentration on the task,* and *unambiguous feedback*. These scores may be higher for survey participants because they participated in a controlled course. The instructors' designated flags clearly laid out the goals of the course. However, *unambiguous feedback* from experts was the lowest-scoring description of the nine dimensions. Experts describe how the act of backcountry navigation often does not provide the feedback desired. It involves the brief moment of checking a bearing and trusting their skills and knowledge. Though the goals are clear, the feedback is not.

Survey participants had the lowest mean scores on the flow dimension in *the transformation of time*. Time for the navigation courses was limited and set by instructors. This limitation may explain why this dimension scored so much lower than others. Previous studies also note that the time dimension is not a universal element of flow (Jackson & Marsh, 1996). *Time transformation* was noted by eight of eleven expert interview participants. The *transformation of time* may result from the flexible and uncontrolled involvement of self-guided navigation. Experts plan and execute their involvement, which typically lasts longer than the one-day navigation courses used in the quantitative data collection.

The second-lowest scoring negative dimension for experts was the *challenge-skill balance.* This dimension is the epitome of flow state. *Challenge-skill balance* is also the highest-scoring positive dimension for experts. This dynamic implies a fluctuation of perceived skill versus actual skill. These two dimensions are important to note to understand the following subsection on a concept the researcher for this study coins as "*delayed flow.*" The second highest dimension for experts is the *sense of control.* This condition may be due to the skills of experts and their ability to remain calm in challenging situations to give what Csikszentmihalyi (1990) suggests as the *paradox of control*. Even if they have little control over the scenario, their abilities reflect competency.

Understanding how each of these dimensions contributes to flow state among navigators offers insight into non-continuous activities and flow theory. The following subsection discusses this implication further. Suggestions for research on this phenomenon are in the recommendations section of this chapter.

Delayed Flow

Flow theory has been extensively researched, but there is still much to examine within it. The qualitative data analysis of flow state within navigation provide insight into how individuals' actual skills and perceived competence influence their experience. The flow dimensions of unambiguous feedback, sense of control, challenge-skill balance, and autotelic experience are essential to this discussion. The final important implication to discuss is the extensity of involvement in flow state that may exist for non-continuous activities such as navigation.

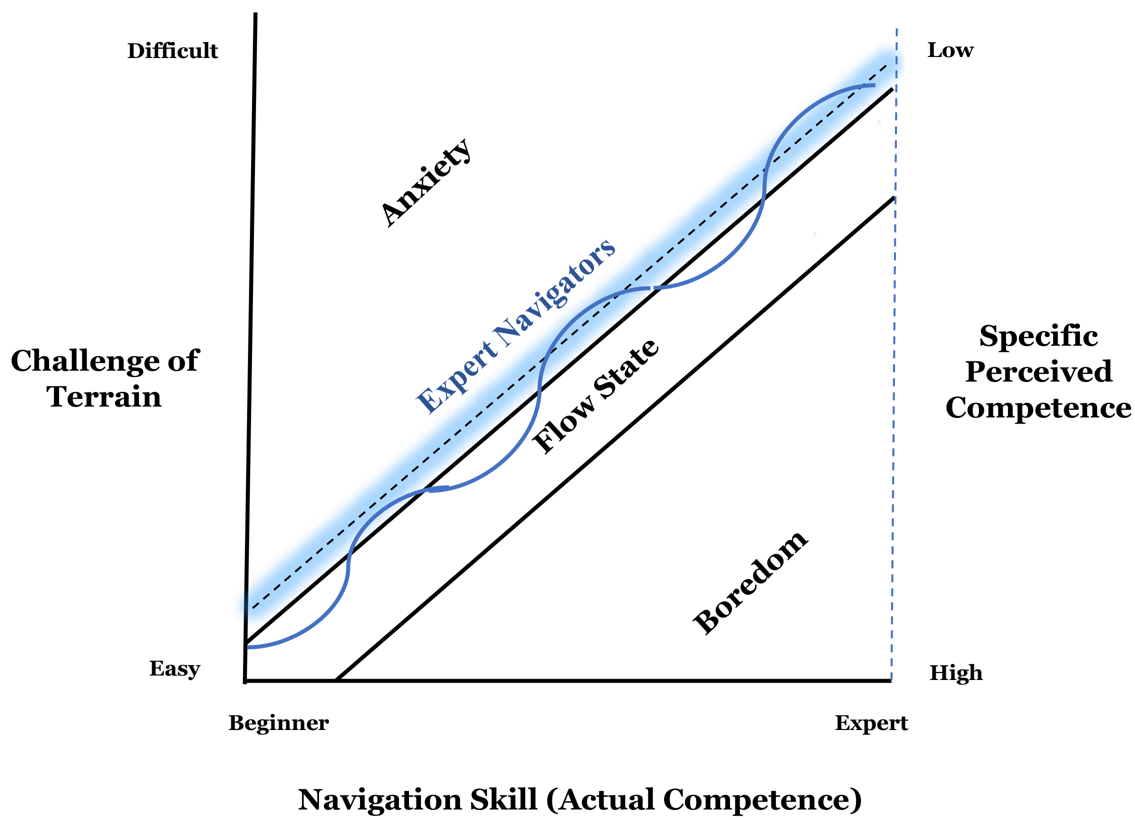
The descriptions from experts indicate a similar trend to the quantitative survey data. *Specific perceived competence* affects how an individual experiences the state of flow. *General perceived competence* plays some role, but not as directly. For this discussion, *specific perceived competence* is relative to the recalled navigation memories of experts. *General perceived competence* refers to their general ability to undertake such challenges.

When asked what experts' most memorable navigation experience is, all but one participant recalled an instance where they were disoriented. These experiences remove the navigators from flow state, mainly resulting in feelings of fear, discomfort, or sometimes embarrassment. These feelings represent the psychic entropy state of mind as defined by Csikszentmihalyi (1990), which includes negative feelings on the opposite end of the flow channel. The nature of backcountry navigation makes experts vulnerable to entering the anxiety end of the flow diagram rather than the boredom end.

The qualitative analysis shows that experts are not in a continuous state of flow during navigation. This conclusion makes sense as navigation is both a continuous and non-continuous activity. Although experts may be moving, there are only moments of decision-making and feedback. The feedback of the backcountry is the terrain. These indicators are landmarks or destinations that the navigator was shooting for the direction of travel. Therefore, the feedback is ambiguous or the opposite of the condition for flow. However, participants received *unambiguous feedback* suddenly upon arrival at the destination or target. The time between the decision-making process (taking a bearing or looking at the map) and arrival at the target removes the conditions for flow.

The same concept applies to the *sense of control*. Control exists when experts are in familiar terrain, near a navigational handrail, or successfully arrive at their target. When there is little feedback, the sense of control decreases. Some navigators described instances where they have felt fear, questioned themselves, and even began to holler for help. Many of the expert navigators could relinquish control and lean into the idea of letting it go. They can calm down, trust their bearings, and continue even without a feeling of control in the scenario. This ability puts navigators on a line just outside of flow state. Here, they may drift in and out of flow as they complete the activity. This phenomenon is represented in Figure 10.

Figure 10: ***Basic Flow State Diagram with Specific Perceived Competence***



Represents the time on a navigation trip

Represents the line of positive anxiety (just outside of flow state)

Figure 9 includes the basic flow diagram represented in Csikszentmihalyi's (1990) original flow theory. This diagram captures the dynamic between navigators' actual skills and perceived skills, which affect the ability to enter flow state. When challenge and skill balance, an individual, in theory, enters the state of flow. However, this diagram includes the variables of actual competence and specific perceived competence as two separate variables. The solid, blue, curved line represents the expert over time during a navigation experience. Experts enter a flow state upon receiving the feedback that is denied between the decision-making moment and arrival. When feedback is received, they may enter flow until it is time to make another directional movement or decision. The light blue dotted line represents the other state of mind that experts drift between during those moments between feedback. This feeling is not quite anxiety, as the original flow diagram suggests, but a state of positive anxiety.

Experts' skills are challenged, which occasionally affects their specific perceived competence. This variable is on another y-axis independent of their actual skills. Evidently, experts can take on challenging terrain based on their comfort and years of experience. The terrain impacts their specific perceived competence but not their general perceived competence. Though they may be aware of their existing skills (general perceived competence) being able to meet the challenge, the lack of feedback that the nature of the backcountry provides may result in brief moments of dropped perceived specific *competence*. However, as discussed, their ability to stay calm to maintain control results from their actual skills. Further research on this phenomenon needs to be conducted to fully understand how the psyche behaves in such situations.

The other concept that this diagram represents is the idea of *“delayed flow*.” This concept is represented partially by Csikszentmihalyi’s (1990) flow theory as the effects of flow that carry into day-to-day life. This feeling is primarily found upon arrival at the destination or getting out of the terrain and back to the location where they began the bushwhack, where feelings of accomplishment, pride, euphoria, and satisfaction reign true among participants. Despite not being in a constant flow state, they still reap the benefits of being in the state. Moreso, it may be noted that these feelings are more intense and retrospective as they rush on all once for a feeling of “*delayed flow*.”

These findings may imply that there is more to understand about activities that induce flow and how it affects the lives of individuals after the experience. It should be noted that although the terrain may affect the *specific perceived competence* in a way that is challenging, it also may contribute to the positive feelings associated with flow. Qualitative data found significant trends toward the wilderness experience, as discussed in chapter 4. When asked about the most rewarding parts of navigation or why participants will continue to navigate, the wilderness experience came up often. Feelings of solitude, peace, simplicity, grandeur, and humility emerged. Participants commented on the feeling of what happens when no human has stepped in a place before. This feeling is unique to the topic of navigation and backcountry recreation.

Between the recreational value of navigation, the dimensions of flow and how they are experienced during activities, the development of a new flow diagram, and how the wilderness experience impacts the perspectives of navigators, research in this field has significant room for improvement. The following section aims to expand on the recommendations within and beyond the scope of this study.

Recommendations

This study may serve as an avenue in research on outdoor navigation. The results have established a positive connection between the perceived competence of navigators and flow state. This conclusion serves as a foundation for future research on the benefits of outdoor navigation. This section aims to provide recommendations for the direction of that research.

Instrumentation

First, it is important to note the recommendations of this study, specifically if it were to be replicated. This study relied on the Flow State Scale developed by Jackson and Marsh (1990). This instrument was devised primarily for the athletic context. This study helped develop that instrument by applying it in a sub-specific context of navigators. This instrument could use further development within contexts like navigation. Typically, the flow state is measured using the Experience Sampling Method (Csikszentmihalyi, 1990). This method could be used on navigation rather than post-experience surveys. Postsurveys intended to eliminate impacting the sporadic nature of navigation. However, this method would only allow testing for flow and not for perceived competence.

Additionally, as discussed by Jackson and Marsh (1996), flow is a social construct. Quantitative measures can only go so far. Therefore, it is recommended that qualitative methods be used to develop the research on outdoor navigation and flow. Survey participants were able to provide an email for a follow-up interview after their navigation experience. These interviews were not used within this study, but it is recommended they be utilized to further understand the context of their answers. This approach may also provide insight into how navigators with different skill levels experience outdoor navigation.

Related Theories

Since flow is a broad topic that encompasses many dimensions of psychology, related theories and concepts can be explored in the field of outdoor navigation. These ideas include the theory of intrinsic motivation, the concept of the wilderness experience, and studies of demographics in navigation.

The theory of intrinsic motivation includes involvement in an activity without external rewards (Santos-Longhurst, 2019). This theory relates to flow theory, including the dimension of the autotelic experience. However, the autotelic experience is generally categorized as doing something for its own sake or enjoyment (Csikszentmihalyi, 1990). In this study, the motivations behind navigators were varied and not completely autotelic.

The reasons for the motivations of survey participants are not heavily represented in this study. However, those participating in the course at Raquette Lake were participating in it for college credit to complete the course. Insight on motivation from experts is well represented in this study, however. Experts navigated for many different purposes, such as hunting, rock-climbing, and participating in search and rescue operations for work. There were trends in the data that show that flow dimensions were less present in those participating in navigation for ulterior motivations other than for the sake of the bushwhack. However, those participants still encountered dimensions of flow. There needs to be more research on the motives of navigators and how that may impact how they experience their time in the backcountry. This theory may also tie into the concept of the wilderness experience. Exploring how the wilderness experience can influence outdoor navigators may provide insight into the benefits it holds.

The demographic population of outdoor navigators is another topic that could benefit from additional research. In the beginner courses, there were more women than men. At the expert level, there was only one-woman participant out of eleven. Two other women were recommended but did not participate. This dynamic suggests that there may be a disconnect from beginner to higher skill levels. Additionally, participants in this study identified strictly as male or female. There is limited research on the relationship between genders and navigation with limited populations. The same concept applies to the ethnicity of participants. Over 80% of participants in this study were white. According to the U.S. census, the population of the Adirondack Region is 92% white (Silvarole, 2020). Though this study does not explore the demographic relation of navigators to their experiences, it would be valuable to implement navigation research in more diverse areas and under the scope of social identity.

The Activity of Navigation

Outdoor navigation is an activity that can be done for its own sake or to achieve other goals in the backcountry. It can be done anywhere in the world and any type of environment. It is used recreationally and practically. Few activities are similar to the stop-and-go processes used for navigation. Activities like golf, bowling, or hunting are similar activities that can be studied through the lens of delayed or non-continuous flow state. This phenomenon should be further explored to create a functional diagram representing flow variations.

Navigation is inherently unique. It can be done innately or intentionally, like breathing. The more that is understood about outdoor navigation and the cognitive benefits that it may have on people, the more value can be placed on the skills, education, and importance of the activity itself. This study may serve as a foundation for jumpstarting this research.

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Appendix A
Informed Consent Statements

Beginning of Survey Informed Consent Statement:

You are being asked to complete a survey about your navigation skills and experience. The purpose of this study is to examine the relationship between flow theory and outdoor navigation. This survey will take you approximately 10-15 minutes to complete. Your participation is completely voluntary, and your answers will be anonymous. You can discontinue the survey at any time, choose not to participate, or skip a particular question with no consequences to you. By completing the survey, you have given your informed consent to participate.

This study is being conducted for a master's thesis in the Recreation, Parks, and Leisure Studies department at SUNY Cortland. The research will be used to examine the benefits of outdoor navigation which may be used for education and advocacy. If you have any questions about this survey or this research, please contact the researcher at _____. Thank you for your time and thoughtful responses.

Beginning of Interview Guide Informed Consent Statement:

Your identity will be kept anonymous and only known to me. If I have your permission, I would like to tape this interview to make an accurate transcript. I will erase the tapes once the transcription is complete. Do I have your permission to record this?*

The purpose of this study is to understand the relationship between flow theory and outdoor navigation. Flow is defined by Mihaly Csikszentmihalyi as the mental state of being completely immersed in the activity. It is offhandedly known as "being in the zone". At each skill level, I am testing flow theory to see if it applies to the activity of navigation with surveys and interviews. At the expert level of navigation, experiences become more complex and unique due to the challenging terrain. The purpose of interviewing people like you, with long-term experience in navigation, is to understand the mental state you are in during challenging navigation. The benefits of this study will contribute to research on the positive mental effects of navigation. The research may contribute to advocacy for hiker preparedness and education in navigation.

Your participation in this research is completely voluntary. You will be asked to answer some questions about your experiences in the backcountry – Specifically in the Adirondack Region. Some of the questions may be challenging to answer. Some may bring back unsettling memories of your experiences. If you want to skip a question or discontinue talking about something, please let me know. We will move on and not go back to it. We can stop at any time if you wish with no consequences to you.

Do you have any questions about me, my research, or our interview before we begin?

* = *wait for reply of participant*

Appendix B
Navigation Survey Materials

Survey Script for Instructors to Read to Participants

You are being asked to complete a survey about your navigation skills and experience. The purpose of this study is to examine the relationship between flow theory and outdoor navigation. The survey is five pages long, but it will only take you about 10-15 minutes to complete.

This study is being conducted for a master's thesis in the Recreation, Parks, and Leisure Studies department at SUNY Cortland. The research will be used to examine the benefits of outdoor navigation which may be used for education and advocacy in the field.

Any questions about this survey or this research may be directed towards the graduate student, Daria Stacy, at the email included at the beginning of this survey.

Your participation is completely voluntary, and your answers will be anonymous unless you choose to include your email at the end of the survey.

You can discontinue the survey at any time, choose not to participate, or skip a particular question with no consequences to you. By completing the survey, you have given your informed consent to participate.

Thank you for your time, consideration, and thoughtful responses.

Navigation Survey for Participants

General Navigation Experience:

This section is intended to measure your general perceived competence in the activity of outdoor navigation. Please check the box with the response that best represents your own perceptions of your navigational abilities.

1. How many years of experience do you have in navigation? ________ **years**

2. How many outdoor hiking trips do you take in a typical year that require navigation skills? _________**trips**

Please use the following descriptions to answer questions 3-6.

Well-marked and maintained trails	**Beginner navigation** – Recurrent markers, junction and intersection signs, and clear, well established paths that are present on maps. Map and compass are recommended, but trails may be navigable without assistance.
Marked and unmaintained trails	**Intermediate navigation** – Trails may be marked with cairns, blazes, or occasional junction signs. Paths are present on maps, but some navigation is required due to overgrowth or distance between markers. Some map and compass skills may be required.
Herd paths: Unmarked and unmaintained trails	**Advanced navigation** – Officially unmarked and unmaintained trails that may not appear on a map. High use of herd paths often presents a visible path for most or all the routes. Other herd paths may be deceiving and lead off main trail. Some terrain reading and map and compass skills are required.
Bushwhacks: Unmarked and unmaintained trails	**Expert navigation** – Trails are unmarked, unmaintained, and low use may provide little to no visibility of trail due to overgrowth. Hiker must plot their route and use navigation skills almost every step of the way. Map and compass, extensive terrain reading, proper wilderness emergency survival gear, and other navigation skills are required.

3. What skill level do you rate yourself as a navigator? (Select one)

☐ Beginner/Novice
☐ Intermediate
☐ Advanced
☐ Expert
☐ Not the expert I used to be

4. How would you rate your navigation skills? (Select one)

☐ Poor ☐ Fair ☐ Average ☐ Good ☐ Very good

5. What is the highest terrain of difficulty you **generally** feel comfortable navigating? (Select one)

☐ Well-marked and maintained trails
☐ Marked and unmaintained trails
☐ Herd Paths: Unmarked and unmaintained trails
☐ Bushwhacks: Unmarked and unmaintained trails

6. What is the highest terrain of difficulty you generally feel comfortable navigating **while leading others** with less navigational skills than you**?** (Select one)

☐ Well-marked and maintained trails
☐ Marked and unmaintained trails
☐ Herd Paths: Unmarked and unmaintained trails
☐ Bushwhacks: Unmarked and unmaintained trails

7. **Circle** the number that best represents your feelings of your most **recent** navigation experience.

In my recent navigation experience…	Strongly disagree	Disagree	Agree	Strongly agree
I feel like I navigated well.	1	2	3	4
I did not navigate as well as I expected to.	1	2	3	4
My skill was high as ever.	1	2	3	4
I was disappointed with my navigating.	1	2	3	4

Iso-Ahola, La Verde, & Graefe. (1989). Perceived competence as a mediator of the relationship between high-risk sports participation and self-esteem. *Journal of Leisure Research*, *21*(1), 32–39. https://doi.org/10.1080/00222216.1989.11969788

Flow State Scale from Jackson and Marsh (1996)
(Included in survey)

Recent Navigation Experience:

The following section is intended to measure the thoughts and feelings you may have experienced during your recent navigational event. Think about how you felt during your navigation experience and circle each question using the ratings below. There are 36 items. Please circle the number that best matches your recent navigation experience.

Rating Scale:

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

1.	I was challenged, but I believed my skills would allow me to meet the challenge.	1	2	3	4	5
2.	I made the correct movements without thinking about trying to do so.	1	2	3	4	5
3.	I knew clearly what I wanted to do.	1	2	3	4	5
4.	It was really clear to me that I was doing well.	1	2	3	4	5
5.	My attention was focused entirely on what I was doing.	1	2	3	4	5
6.	I felt in control of what I was doing.	1	2	3	4	5
7.	I was not concerned with what others may be thinking of me.	1	2	3	4	5
8.	Time seemed to alter (either slowed down or speeded up).	1	2	3	4	5
9.	I really enjoyed the experience.	1	2	3	4	5
10.	My abilities matched the high challenge of the situation.	1	2	3	4	5
11.	Things just seemed to be happening automatically.	1	2	3	4	5
12.	I had a strong sense of what I wanted to do.	1	2	3	4	5
13.	I was aware of how well I was performing.	1	2	3	4	5
14.	It was no effort to keep my mind on what was happening.	1	2	3	4	5
15.	I felt like I could control what I was doing.	1	2	3	4	5

16.	I was not worried about my performance during the event.	1	2	3	4	5
17.	The way time passed seemed to be different from normal.	1	2	3	4	5
18.	I loved the feeling of that performance and want to capture it again.	1	2	3	4	5
19.	I felt I was competent enough to meet the high demands of the situation.	1	2	3	4	5
20.	I performed automatically.	1	2	3	4	5
21.	I knew what I wanted to achieve.	1	2	3	4	5
22.	I had a good idea while I was performing about how well I was doing.	1	2	3	4	5
23.	I had total concentration.	1	2	3	4	5
24.	I had a feeling of total control.	1	2	3	4	5
25.	I was not concerned with how I was presenting myself.	1	2	3	4	5
26.	It felt like time stopped while I was performing.	1	2	3	4	5
27.	The experience left me feeling great.	1	2	3	4	5
28.	The challenge and my skills were at an equally high level.	1	2	3	4	5
29.	I did things spontaneously and automatically without having to think.	1	2	3	4	5
30.	My goals were clearly defined.	1	2	3	4	5
31.	I could tell by the way I was performing how well I was doing.	1	2	3	4	5
32.	I was completely focused on the task at hand.	1	2	3	4	5
33.	I felt in total control of my body.	1	2	3	4	5
34.	I was not worried about what others may have been thinking of me.	1	2	3	4	5
35.	At times, it almost seemed like things were happening in slow motion.	1	2	3	4	5
36.	I found the experience extremely rewarding.	1	2	3	4	5

Jackson, S. & Marsh, H. (1996). Development and validation of a scale to measure optimal experience: The flow state scale. Journal of Sport & Exercise Psychology, 18, 17-34.

About you:

1. What is your gender?

☐ Female
☐ Male
☐ Non-Binary
☐ Transgender
☐ Other. Please specify ___________

2. What is your age?

☐ Under 20
☐ 20-29
☐ 30-39
☐ 40-49
☐ 50-59
☐ 60-69
☐ Over 70

3. What is your ethnicity?

☐ White or European American
☐ Black or African American
☐ American Indian or Alaska Native
☐ Asian
☐ Native Hawaiian or Other Pacific Islander
☐ Hispanic or Latino
☐ Other. Please specify____________________

4. Would you be willing to participate in a follow up interview on this topic?
☐ Yes
☐ No

If you answered **yes** to the question above, **please provide an email address below**. By including your email address, you have given your informed consent to the information that may allow researchers to directly identify you. You may choose not to participate at any time with no consequences. Only the research team will have access to this information and will not be shared with others outside of this study. Your identity will be kept private.

Email address: ____

Items Per Scale

Survey Codes:	
Challenge Skill Balance	
Q1	I was challenged, but I believed my skills would allow me to meet the challenge.
Q10	My abilities matched the high challenge of the situation.
Q19	I felt I was competent enough to meet the high demands of the situation.
Q28	The challenge and my skills were at an equally high level.
Action Awareness Merging	
Q2	I made the correct movements without thinking about trying to do so.
Q11	Things just seemed to be happening automatically.
Q20	I performed automatically.
Q29	I did things spontaneously and automatically without having to think.
Clear goals	
Q3	I knew clearly what I wanted to do.
Q12	I had a strong sense of what I wanted to do.
Q22	I had a good idea while I was performing about how well I was doing.
Q31	I could tell by the way I was performing how well I was doing.
Unambiguous Feedback	
Q4	It was really clear to me that I was doing well.
Q13	I was aware of how well I was performing.
Q21	I knew what I wanted to achieve.
Q30	My goals were clearly defined.
Concentration on Task at Hand	
Q5	My attention was focused entirely on what I was doing.
Q14	It was no effort to keep my mind on what was happening.
Q23	I had total concentration.
Q32	I was completely focused on the task at hand.
Paradox of Control	
Q6	I felt in control of what I was doing.
Q15	I felt like I could control what I was doing.
Q24	I had a feeling of total control.
Q33	I felt in total control of my body.
Loss of self-consciousness	
Q7	I was not concerned with what others may be thinking of me.
Q16	I was not worried about my performance during the event
Q25	I was not concerned with how I was presenting myself.
Q34	I was not worried about what others may have been thinking of me.
Transformation of time	
Q8	Time seemed to alter (either slowed down or speeded up).
Q17	The way time passed seemed to be different from normal.
Q26	It felt like time stopped while I was performing.

Q35	At times, it almost seemed like things were happening in slow motion.
Autotelic Experience	
Q9	I really enjoyed the experience.
Q18	I loved the feeling of that performance and want to capture it again.
Q27	The experience left me feeling great.
Q36	I found the experience extremely rewarding.
General Navigation Experience (General Perceived Competence)	
Q3	What skill level do you rate yourself as a navigator?
Q4	How would you rate your navigation skills?
Q5	What is the highest terrain of difficulty you generally feel comfortable navigating?
Q6	What is the highest terrain of difficulty you generally feel comfortable navigating while leading others with less navigational skills than you?
Specific Navigation Experience (Specific Perceived Competence)	
Q7+	I feel like I navigated well.
Q7-	I did not navigate as well as I expected it to.
Q7+	My skill was as high as ever.
Q7-	I was disappointed with my navigating
About you	
Q1	How many years of experience do you have in navigation?
Q2	How many outdoor hiking trips do you take in a typical year that require navigation skills?
Q1	What is your gender?
Q2	What is your age?
Q3	What is your ethnicity?
Q4	Would you be willing to participate in a follow up interview on this topic?

Cronbach's Reliability Tests

Perceived Competence Scales

Variable	Mean	SD	Item-Total Correlation	α if Item Deleted
General Perceived Competence α = .837 (*a*=.91)				
What skill level do you rate yourself as a navigator?	1.57	.860	.694	.790
How would you rate your navigation skills?	2.78	1.094	.660	.798
What is the highest terrain of difficulty you generally feel comfortable navigating?	2.20	1.167	.734	.765
What is the highest terrain of difficulty you generally feel comfortable navigating while leading others with less navigational skills than you?	1.83	.973	.614	.816
Specific Perceived Competence α = .679 (*a*=.76)				
I feel like I navigated well.	3.14	.795	.464	.621
I did not navigate as well as I expected to.	2.59	1.041	.491	.594
My skill was as high as ever.	2.66	.987	.399	.654
I was disappointed with my navigating.	2.84	1.098	.513	.579

Items with a * indicate a higher Cronbach's alpha if removed from Scale. Alphas in parenthesis indicate the Cronbach's alpha from the original study by either Iso-Ahola et al. (1989) or Jackson and Marsh (1996).

Flow State Scale Cronbach's Reliability Tests (Jackson & Marsh, 1996)

Variable	Mean	SD	Item Total Correlation	α if Item Deleted
Challenge Skill Balance α =.847 (*a* = .80)				
Q1*	3.81	1.035	.478	.882
Q10	3.55	1.248	.827	.737
Q19	3.85	1.161	.645	.822
Q28	3.43	1.175	.805	.750
Action Awareness Merging α = .861 **(**α =.84)				
Q2	3.19	1.154	.685	.832
Q11	2.98	1.242	.656	.844
Q20	3.15	1.233	.762	.799
Q29	2.94	1.233	7.28	.814
Clear goals α = .892 **(**α =.84)				
Q3	3.79	.977	.717	.878
Q12*	3.89	.961	.646	.901
Q22	3.87	1.115	.827	.836
Q31	3.81	1.096	.870	.818
Unambiguous Feedback α = .834 **(**α =.85)				
Q4	3.54	1.069	.693	.778
Q13	3.74	1.063	.660	.793
Q21	4.26	.929	.651	.797
Q30	4.11	.971	.659	.793
Total Concentration α = .880 (α = .82)				
Q5	4.23	.840	.807	.827
Q14*	3.91	1.213	.640	.914
Q23	4.06	.895	.731	.851
Q32	4.26	.846	.879	.801
Paradox of Control α = .926 (α =.86)				
Q6	3.89	.983	.863	.892
Q15	4.00	.909	.866	.894
Q24	3.57	1.118	.859	.894
Q33*	4.13	1.055	.743	.932
Loss of self-consciousness α = .802 (α =.81)				
Q7	4.06	1.131	.698	.712
Q16*	3.32	1.105	.463	.821
Q25	3.87	1.115	.591	.764
Q34	4.00	1.216	.724	.695
Transformation of time α = .673 (α =.82)				
Q8	3.57	1.241	.517	.566
Q17	3.57	1.109	.375	.657
Q26	2.41	1.275	.530	.556
Q35	2.57	1.294	.408	.641
Autotelic Experience α = .951 (α = .81)				
Q9	4.09	1.151	.904	.932
Q18*	3.48	1.278	.824	.954
Q27	3.83	1.338	.916	.926
Q36	3.85	1.282	.894	.933

Appendix C
Interview Materials

Interview Guide

The purpose of this interview guide is to provide questions to direct the conversation to cover both navigation experiences and the level of flow state that may have occurred during those. Interviewer should let the conversation emerge naturally and use the questions below to guide the interview based on what is said. Interviewer should aim to cover each focus area regardless of order it emerges in. Highlighted questions were asked during every interview for each participant.

Focus Area	Questions
About you	How long have you been navigating for? Where did you learn to navigate? What formal or informal education did you receive in navigation? Do you navigate in groups? Do you all have equal navigation skills? Do you feel comfortable leading people with less navigational skills on a backcountry route? Do you ever navigate alone?
Navigation Experience and Competence	What was your most memorable navigation experience? What gear do you carry when embarking on a challenging navigation course? How long does it take to plan a challenging navigation work? What are your strengths and weaknesses in navigation?
Challenge – Skill Balance	Have you ever found yourself in a situation while navigating where you worried your skills were inadequate for the challenge at hand? Have you ever been lost in the backcountry? What were your feelings in that moment? Do you consider yourself to be on autopilot in your decisions when you navigate challenging terrain?

Action – Awareness Merging	Are you always aware of how well you are navigating? What is your thought process when making a navigation decision? Do you ever second guess your decisions while navigating a challenging terrain?
Clear Goals	How do you know that you are on the right route? How do you maintain confidence in your decision making while navigating?
Concentration on Task at Hand	Do you feel total concentration on navigation while bushwhacking? Does your mind ever drift elsewhere?
Sense of Control	When do you feel most in control of the navigation experience? When do you feel least in control of the navigation experience? Can you recall a time where you felt complete control over the navigation challenge?
Loss of Self-Consciousness	Do you feel yourself get lost into navigation? Do you ever lose touch with the outside world while you're navigating?
Transformation of Time	Does time seem ever to alter while you are navigating? Does it speed up or slow down? Can you recall a navigation experience where time seemed to change?
Autotelic Experience	How do you feel when you successfully navigated a challenging route? What are the most rewarding parts of backcountry navigation? What is the navigation experience you are most proud of or satisfied with? How did it make you feel when you accomplished it? Why do you navigate?

Interview Criteria for Codes

The interview criteria for coding were based on the question that was asked per the interview guide divisions. If a participant talked about another dimension, it was highlighted as so. The definitions for each of the nine dimensions as defined by Jackson and Marsh (1996) is as follows:

Flow Dimension	Jackson and Marsh (1996) Definition
Challenge-Skill Balance	The balance between challenge of situation and skill, operating at a high level. Authors include a description from a track and field athlete – "was challenging, but also seemed automatic" (p. 18).
Action-Awareness Merging	Deep involvement so that the task becomes automatic and awareness of self dissolves from the performed actions. Authors include statements like "in the groove" (p. 18).
Clear Goals	The person has a strong sense of what to do with clearly defined goals of the activity which are set prior to or during the experience.
Unambiguous Feedback	The activity provides immediate and clear feedback to the participant which affirms their success towards their goal.
Total Concentration	The process of staying completely focused on the task at hand. This dimension is frequently mentioned in Csikszentmihalyi's flow theory (1990).
Sense of Control	When the individual senses they are in control, without actively pushing it. This dimension includes the *potential* for control in difficult situations. Authors include statements like "you can't imagine anything going wrong" (p. 19).
Loss of Self-Consciousness	Individuals lose their concern for their sense of self and how they typically present themselves within society. Authors the description of "doing things instinctively and confidently" (p. 19).
Time Transformation	The idea that time slows down, speeds up, or becomes irrelevant. Authors note that some situations require time tracking to succeed and therefore suggest it may not be as universal as other dimensions of flow.
Autotelic Experience	An intrinsically rewarding experience that results from flow state. Autotelic means to be done for its own sake. Authors include statements like "really enjoyed the experience" (p. 20).