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EXTREME SPORT AND INFORMATION: INITIAL FINDINGS OF TECHNICAL CAVE DIVER'S INFORMATION-SEEKING BEHAVIOURS

Abstract

Using the participatory, arts-based information world mapping (IWM) method, this study investigated the information-seeking behaviors of cave divers before, during, and after cave dives. Cave diving is considered an extreme sport, in which technical divers trained in overhead environments penetrate flooded cave systems. 20 participants were interviewed using the IWM technique and semi-structured open-ended questions. Verbatim clean transcriptions and participant maps were coded using thematic content analysis. Participant data suggests cave divers may be intentionally restrictive in their information-sharing behaviors, choosing vetted contacts willing to reciprocate information exchanges.

Introduction

The label of "extreme sport" has been equated with high risk; further, individuals engaging in extreme sport have been characterized as reckless risk-takers. However, Cohen, Baluch, and Duffy (2018) have argued for a more nuanced understanding of the individuals engaging in sport requiring a higher element of risk. Within research on information behavior, sports are typically lumped in with leisure pursuits, including those categorized as "serious leisure" (Stebbins, 2009), sport aligned with lifestyle or adventure. There has been little research on information-focused activities of extreme sport enthusiasts, especially those involving high-risk behaviors where accurate information can mean the difference between life and death.

Cave diving is a type of technical diving, in which trained divers use specialized equipment to penetrate and explore overhead environments (i.e., flooded caves). Because divers cannot directly reach the surface during a dive, the activity is typically characterized as an extreme sport and highly dangerous. Engaging in the sport requires certification in many jurisdictions and obtaining accurate information is critical before and during dives. Drawing on Beaton's experience as a *TDI Full Cave* certified cave diver, this paper outlines preliminary findings on the information-seeking behaviors of hobbyist and exploration technical cave divers.
. Using the information world mapping methodology developed by Greyson et al. (2017), this study investigated the "information grounds" held by cave divers: where they go to seek or exchange information about cave diving outside of designated training.

Background Literature

Information-seeking behavior is concerned with human engagement and challenges faced in interacting with information. Amateur sport aligns with theories of serious leisure. Stebbins (2009) defines serious leisure as the term given to niche activities, "which involve significant personal effort based on specially acquired knowledge, training, experience or skill" (p. 625). Contemporary Human Information Interaction (HII) scholars, including Kari and Hartel, have advocated for research in serious leisure to increase, "…because of the importance of these pleasurable activities to everyday life experience" (as cited in Robinson & Yerbury, 2015, p. 591). Understanding the information-seeking behaviour of those involved in extreme sports such as cave diving can provide an additional dimension to understanding the sports itself and extend research on HII and sport.

Sport and Information Behavior Research

The information behavior of individuals engaging in sport and active leisure pursuits have been studied. Hungenberg, Ouyang, and Gray (2019) surveyed participants who competed in "adventure tourism" events (white-water rafting, surfing, and sportfishing), finding individuals seek information from the internet, print/media resources, and through interpersonal relationships. A case study by Bergstrom and Neo (2020) examined hikers' information-seeking behaviors of a popular (yet illegal) hike in Hawai'i, the Ha'ikū Stairs. A thematic analysis of 111 survey responses found that hikers sought information online, using blogs, social media, and reviews. In a study on ultramarathon runners, Gorichanaz (2017) found that race report documentation helps athletes choose, prepare, and pre-experience races before a marathon, as well as communicate their post-ultrarunning experiences. In a scoping review, Yamashita (2022) found that "sports tourists" increasingly rely on social media to find information that mitigates risk associated with activities such as hiking, bison-watching, skiing, snowboarding, and trekking. Although the activities studies are varied, they do point to the importance of interpersonal relationships and social media to support their pursuits.

Extreme Sport and Cave Diving

Extreme or high-risk sports are defined by Breivik (1999) as, "all sports where you have to reckon with the possibility of serious injury or death as an inherent part of the activity." Laviolette (2007) explains an appeal of high-risk sports derives from "individually confronting risk" (p. 2) by pitting an individual against a risky environment and overcoming fear. Cave diving involves trained technical divers penetrating underwater cave systems in an overhead environment, where immediately ending the dive is impossible (making it riskier than recreational diving). Considered one of the most dangerous "extreme sports," cave diving is nevertheless enjoyed internationally by professionals and amateurs (Menduno, 2000; Todhunter, 2010).

Methodology

This research used qualitative, one-on-one semi-structured interviews and the arts-based information world mapping (IWM) technique. The IWM technique helped guide the conversation with participants, as they visualized and illustrated depictions of their information practices and "can aid in the illustration of participants' perspectives by allowing an audience to not just hear their words, but also experience the world the way they see it" (Given et al., 2011, p. 4). Combining elements of pre-existing arts-based methods, the holistic IWM technique

enhances the interview experience for participants from varied cultural and academic backgrounds (Greyson et al., 2017).

Data Collection & Analysis

Recruitment materials were posted to the public Facebook group "Cave Diving." Data was collected from twenty (20) voluntary participants using Microsoft Teams to host online interviews. Participants were technical cave divers 18+ years of age who successfully completed the Technical Diving Institute's Full Cave certification, or equivalent. Participants hailed from Australia, Canada, Denmark, Germany, Mexico, Switzerland, and The United States. Six (6) participants were female-presenting, while fourteen (14) were male-presenting. This gender imbalance is reflective of the sport (Bennett, 2023). Specific age demographics were not requested, but participants varied in age from approximately early 30s to 62 years old. Four (4) participants were self-proclaimed 'exploration' divers, actively working towards the surveying of unexplored caves. Sixteen (16) participants were hobbyist cave divers.

Both the interview transcripts and information world maps served as primary sources of data for conventional thematic content analysis, following Braun and Clarke's (2006) recommend phases. When assigning themes, recurring information was considered, noting similarities. During the first read-through, overlapping salient themes became clearly visible. The next stage of coding involved searching for themes that remained unmarked; this enabled "less obvious themes" to emerge in the second pass (Ryan & Bernard, 2003, p. 93). Through careful examination and constant comparison, themes were developed directly and inductively.

Results

Analysis revealed six overarching themes that are outlined in detail below.

Intentional, Targeted Information-Seeking

When planning a dive, cave divers' information-seeking behaviors are deliberate, and answers are sought for specific queries. For example, a cave diver may have an information need based on a cave location, water conditions, or piece of equipment specifications. Google was consistently mentioned as the predominant source of online information gathering, with the caveat of having to 'dig' deeper to find useful, relevant information:

> "I need to emphasize this, 'cause it's the first thing to do for me most of the time: just Google what information is there about a particular cave, specific place or region. There is already a tricky part because there is a lot of old information or misinformation. You really need to filter out a lot of the stuff." - P4

An important direct source of targeted information-gathering comes from cave maps, which are extremely helpful in the planning of safe dives. For example, in certain cave sites in the Yucatan Peninsula, Mexico, it can be difficult to access maps (if they even exist). This lack of information can impede – and deter – the planning of a dive at that location. The lack of a key information resource (e.g., the cave map) may cause divers to look elsewhere for different sites, where maps do exist. Other direct information sources include local dive shops, cave conferences, government publications, instructional/course materials, and accident analyses.

Person-to-Person Information Exchanges

In the cave diving community, information is not exchanged freely, and careful considerations are made as to who may be included. Relationships are built on confidence, trust, respect, a shared mindset, honesty, and willingness for reciprocity when sharing information. The "give and take" of information is instrumental in the collaborative process. Information was seen as being siloed to specific cave diving communities, not only geographically (e.g., Florida versus Mexico), but also within the "niche," "secret society," "small community" of cave divers. Many participants emphasized the importance of "vetting" an individual before exchanging information:

> "At this level of cave diving, you're generally going to be vetting anyone that you come in contact with. It will become very apparent very quickly through verbal and nonverbal vetting, whether or not that's someone that I would feel comfortable at least doing some initial exploratory, see-how-the-dynamic-works type dive." - P11

Vetting is a process of determining whether an individual can be trusted to exchange information. At times, vetting occurs instantaneously. Verbal and nonverbal vetting may occur through inspecting:

- The handling and maintenance of one's gear/equipment
- Level of risk aversion/risk tolerance
- Comments made on forum and social media (e.g., Facebook) posts
- Confirmation of cave diving credentials, agency, and/or instructor
- Number of successful cave dives/experience level
- Shared dive experience within a cave (e.g., 'try dives')
- Word of mouth about one's reputation
- "Zero to hero" training (i.e., completing all levels of training in a condensed period)

Cave divers may be extremely choosy regarding dive partners, at times preferring to dive alone. As there are subtle differences between training organizations, participants expressed the desire to dive with a vetted community member, to ensure proper information sharing occurred within the cave. Risk analysis was quoted as an important 'first step' in buddy diving, to see how much risk tolerance a new buddy might have in comparison to one's own comfort level:

> "If I haven't dove with a person before, I'm way more conservative about how far we go in and what we do. If you and I were doing a dive right now, I wouldn't want to do jumps. I would want to stay mainline. I would communicate that." - P15

Clear communication and information-sharing between dive partners is of the utmost importance. During a cave dive, person-to-person information exchanges are limited to the use of hand and light signals or writing in a specialized notebook. One exception are rebreather divers, who may communicate through "the loop," adding upspeak/inflections into otherwise indecipherable murmurs. Participants expressed the need for pre-dive briefings to be on the same page, as well as sharing a conservative dive profile.

Experiential Information Gathering

In addition to direct sources cave divers rely on, there was also a theme of 'experiential information gathering.' Participants voiced a spirit of "progressive penetration" of the cave, with dives that were not necessarily goal oriented (besides those done for surveying or photogrammetry purposes). Participants expressed a style of "on the fly" information gathering, such as "figuring things out" at the dive site or driving around the countryside searching for caves. In contrast to the targeted information-seeking behaviors displayed before the cave dive (when searching for specific data), participants expressed that informal or unsolicited information could be exchanged through interactions with other vetted divers at the site, or guests staying at shared accommodations.

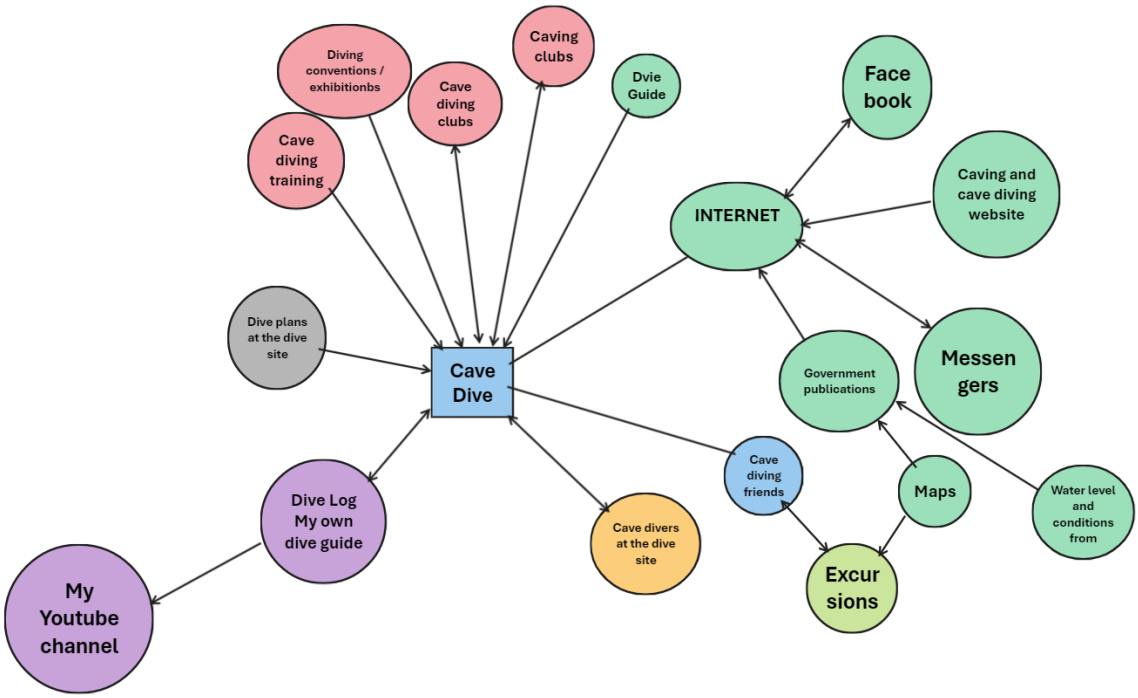

Figure 1. P10's IWM.

Embodied Information Gathering

Many cave divers engage in informal information gathering during the dive, from experiencing and being within the cave itself. Embodied information gathering was seen through interactions with the cave guideline (permanent line), markers such as REMs (referencing exit markers), "confidence" cookies, arrows, and cave formations. Many participants highlighted the importance of "reading the cave" and "backreferencing" cave formations, even assigning names to unique formations (e.g., a "popcorn floor" or "croissant" stalagmite).

A recurring theme was the importance of keeping one's head completely in the cave, referring to it as a "meditative," "deeply relaxing," and "yogic" experience. Due to the demanding nature of cave diving, if a diver takes themselves outside of this embodied information gathering mindset, problems may arise. Participant 17 elaborates:

> "When you're actually in a cave, if you're not in the moment, you're potentially in deep trouble. For that... [time] you're in that cave, you are doing that thing because

> if you're not, you're potentially putting yourself and everyone else at risk. It's very focused for the time that you're doing it." - P17

The Avoidance of Becoming "Information Overwhelmed"

Participants expressed the need for a calm, collected mindset prior to entering the cave, to avoid becoming emotionally, psychologically, or informationally overwhelmed. This theme is tied to an embodied information gathering mindset; a person should not enter a cave inattentive to their surroundings. Rather than being hyper-focused or goal-oriented on reaching a section of cave, participants expressed the need to dive within one's limits and approach the cave systematically:

> "In general, I don't take a lot of information on the dive. If navigation is really complex, I might write it down, but in general I'm not doing very complex navigation in a place I've never been before. I kind of think if you need to rely on information that's written down, you maybe shouldn't be doing the dive." - P2

Themes emerged of an emphasis of relying either on memory or on written notes for information during a cave dive, as seen in a local versus a non-local mindset, respectively. For the local diver, memory should serve as enough of an information-storing tool, adding just one new thing to each dive. For the non-local diver, there's a sense of urgency, as resources (e.g., time and money) are limited within a brief period. In these cases, wetnotes and slates are heavily relied upon to avoid becoming overwhelmed by new information within the cave.

Information as a Safety-Oriented Practice

For cave divers, information is a tool to follow best practices for safety, commonly known as 'accident analysis.' Cave fatalities are analyzed, in the hopes that future accidents can be avoided. This information-seeking is noteworthy, as people usually avoid information that can cause them to feel uncomfortable, especially when related to one's health or wellness (Narayan et al., 2011). However, for cave divers, accident analyses serve as an important tool for information gathering. Risk analysis and tolerance were consistently mentioned as paramount factors when planning, executing, and debriefing a safe cave dive. Divers often self-reflected as being hyper-vigilant and safety-oriented:

> "I don't do it for high risk. I do it for low risk, and it's extremely meditative for me. Everyone has to evaluate their own risk-reward decisions profile, and what you're comfortable with doing. I don't think in all my years of diving I've ever done something for the excitement of it. Not once. Doesn't even enter my mind." - P11

Discussion

As cave divers encounter gaps in their searches, they consult proven 'tried, tested, and true' sources to act as Dervin's information "bridges" (1998). Cave divers value their time, taking pride in efficient information-gathering as an actionable process. Most information-gathering comes from online sources such as podcasts, collected data, specialized forums, and websites. Social media, including YouTube, Instagram, and Facebook, are popular virtual spaces for information gathering. These sources all serve to act as Dervin's "bridges" (1998) to overcome specific information gaps.

Examining the types of information resources cave divers use during a cave dive, there emerged a distinction between a local versus non-local mindset. A local mindset includes cave divers who live within a community (e.g., Floridian cave divers who dive multiple times per week). A non-local mindset includes tourists who travel to a community for cave diving. For locals, memory serves as the primary information resource during a dive. These findings validate previous literature on adventure tourism: experienced individuals will rely on "internal memory search methods" as information resources (Hungenberg et al., 2019, p. 75). For non-locals, there was a heavier reliance on wetnotes, stick maps, and pre-existing information resources found within a cave (e.g., directional markers, arrows, permanent guideline). Team communications, light and hand signals, were highlighted as universally important information resources during a cave dive.

A noteworthy trend of embodied information-gathering emerged from the data. During a cave dive, information is gathered by doing. By immersing themselves in the cave and remaining open and receptive to encountering new passageways or areas, divers gather information in an embodied fashion. This information gathered during a dive reflects the experiences of one's body in a physical space, thereby creating muscle memories. Experience within a specific cave site helps divers to not only better understand their surroundings, but also to informally gather information from caves which may then be exchanged with vetted contacts.

Considering where cave divers go to seek or exchange information about safe cave diving practices, Chatman's Small Worlds Theory (1999) serves as a useful framework when analyzing person-to-person information exchanges. In a "small world," people exist in multiple social contexts that influence their information-seeking behaviors (Chatman, 1999). Cave divers share virtual "information grounds" (e.g., Facebook groups), as well as physical spaces, such as dive shops and shared guest accommodations, like Habitat 99 or ProTec. 'Vetting' an individual determines whether they are trustworthy to engage in information exchanges. This concept aligns with Chatman's (1999) "small world," as the personal perception of others within a community can change the ways in which people interact and share information amongst themselves. A person's reputation within a small "siloed" world (e.g., Floridian cave divers) influences whether others within the same community will engage in information exchanges. These findings align with Hertzum's (2016) content analysis review, which found that individuals will consult other people within their community for information, only of whom they hold in high regard.

Cave divers may choose to intentionally restrict information-sharing to within their siloed, "niche" communities. Cave divers have private methods of circulating information about 'unofficial' cave sites, intentionally restricting information for both conservation and safety concerns. Contrasting Bergstrom and Neo's (2020) case study analysis of the Ha'ikū Stairs in Hawai'i, this study's findings indicate cave divers will actively avoid posting such information online, especially on platforms accessible by the public or recreational SCUBA divers. Information is shared in such a way that it remains private and restricted versus publicized. There is a sense that such information should remain within – and be protected by – the small, vetted community.

Conclusion & Future Considerations

Cave diving is an information-intensive activity. As there is a prominent gap in the HII literature surrounding extreme sport, studying cave diving and information-seeking provides recognition

of the critical role information plays. Preliminary research results found that cave divers use targeted, action-oriented information-seeking behaviors, engaging in collaborative exchanges with trustworthy, vetted community members. Cave divers are highly engaged in various kinds of information-seeking behaviors where participation in the sport demands a high degree of engagement with several information sources, and where information plays a highly critical role within the sport itself. Information is integral to the sport of cave diving. Of note was the theme of embodied information—a theme that we may take up in greater detail in the future. Further research should incorporate quantitative surveys to create a mixed-methods approach, comparing the information-seeking behaviors of professional cave divers to see whether differences emerge between populations, as well as looking at the role of professional association and certification, and training and information.

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