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**AUTHOR**

Devonport, T. J.; Meijen, Carla; Lloyd, J.

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Tracey J. Devonport

University of Wolverhampton, T.Devonport@wlv.ac.uk

Carla Meijen

St Mary's University, carla.meijen@stmarys.ac.uk

Juliette Lloyd

Independent Sport Psychologist, lloydjuliette@hotmail.com

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## Walking on Thin Ice: Exploring Demands and Means of Coping During an Extreme Expedition

### Cover Page Footnote

We would like to acknowledge the two research participants for providing insight into their experiences on this unique expedition. It was their hope that future expeditioners could vicariously learn from their experience, and thus future generations would be inspired, and be informed in undertaking extreme expeditions.

# Walking on Thin Ice: Exploring Demands and Means of Coping During an Extreme Expedition

Tracey J. Devonport<sup>1</sup>, Carla Meijen<sup>2</sup>, and Juliette Lloyd<sup>3</sup>

<sup>1</sup>University of Wolverhampton

<sup>2</sup>St Mary's University

<sup>3</sup>Independent Sport Psychologist

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## Abstract

The present exploratory study was undertaken with two experienced explorers in order to examine daily events, perceived demands, coping strategies, and mood during a unique 636–675 km “double solo” crossing of Lake Baikal, a frozen lake in Siberia. A 59-year-old female explorer and a 49-year-old male explorer completed a daily survey and written diary during the expedition to collect situational data. Two semi-structured interviews were also completed, one within 24 hours and a second within four months of their return. These interviews sought to identify demands and coping efforts perceived as being most pertinent during their expedition. Guided by the work of Skinner et al. (2003), families of coping were organized around three human concerns (autonomy, relatedness, and competence) and two targets of coping (self or context). Findings illustrate two very different expedition experiences as evidenced by demands faced and coping strategies utilized, which influenced perceptions of workload and emotions experienced. Each explorer brought idiosyncrasies, which, when combined with different expedition experiences, bore influence on coping behaviors (focused on the self or context) and outcomes relative to the concerns of autonomy, relatedness, and competency. In discussing the findings, recommendations are offered for those preparing to undertake expeditions in extreme environments.

*Keywords:* coping strategies, emotion regulation, stressors, emotion, extreme environment

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## Introduction

The present study examines how two explorers experienced a 752 km “double solo” crossing of Lake Baikal, in southern Siberia. Lake Baikal is the deepest (1,642m) and largest freshwater lake by volume in the world. During winter and spring, the surface freezes from early January to early May–June, with an ice thickness of 0.5–1.4 m. Over the last 50 years, the average surface temperature has risen by almost 1.5°C meaning that the lake is covered by ice for a shorter period. This makes the crossing of Lake Baikal ever more precarious as a result of the increasingly extreme environment.

Extreme environments such as this “double solo” crossing (where the explorers started on opposite sides of the lake and crossed in the middle) present physical, psychological, and interpersonal demands that require significant human adaptation for survival and performance (Manzey & Lorenz, 1998). The focus of much published work examining experiences in extreme environments is on coping (Bartone et al., 2018; Devonport et al., 2011; Kjærgaard et al., 2015; Tortello et al., 2021) and emotion regulation (Pedlar et al., 2007; Wagstaff & Weston, 2014). This is no surprise, because extreme environments present a range of demands, such as extreme environmental conditions, social isolation, and poor access to, or poorly functioning, resources. Coping strategies previously highlighted as effective in extreme environments include actively solving problems as they occur (MacNeil & Brcic, 2017), reframing and reappraising a situation (Leon et al., 2011a; Smith et al., 2017), humor (Brcic et al., 2018), and task immersion (Rothblum et al., 1998). Strategies identified as less effective include catastrophizing and ruminating (Wagstaff & Weston, 2014) and overreliance on social support and emotional sharing (Leon et al., 2011b; Sandal et al., 2006). Coping flexibility is, however, likely required to manage the stressors faced in extreme environments (Devonport et al., 2011; Kjaergaard et al., 2015).

Solo expeditions in extreme environments present contexts with the potential for high perceived workloads over extended periods of time not only because of the inherent demands of extreme environments, but also as there is no possibility of workload distribution. As such there is value in exploring how perceived workload plays a role in mood and coping strategies used. Perceived workload reflects the perceived amount of work an individual has to complete/or has completed, and the perceived difficulty of this relative to subjective standards (Bowling & Kirkendall, 2012). As described by the conservation of resources theory (Hobfoll, 1998; Hobfoll et al., 2018), individuals perceiving a high or excessive workload

will experience unpleasant emotions associated with a high effort processing mode, because these individuals recognize a need to deploy extra resources, such as time and energy, to resolve workload demands. By contrast, pleasant emotion is associated with a heuristic low effort processing mode (Schwarz, 1990). In other words, pleasant emotion informs the individual that everything is alright and high effort is not necessary, whereas unpleasant emotion informs the individual of a troubled person–environment relationship and calls for the expenditure of high effort. This illustrates how emotions are used as information informing the allocation of resources, and are context-dependent (Gendolla & Krüsken, 2002).

Under conditions of high perceived workload, restoring or acquiring new resources becomes difficult because efforts are focused on deploying resources in trying to manage the workload (Hobfoll, 1988). Should perceptions of high workloads persist, the individual may run out of resources and experience emotional exhaustion (Bowling & Kirkendall, 2012). As the perceived availability of resources underpins the selection and efficacy of coping strategies, coping becomes a further important consideration relative to perceived workload.

Using the NASA Task Load Index (TLX; Hart & Staveland, 1988) to examine perceived workload, Matthews and Campbell (1998) found avoidance-focused coping to be related to poor performance ratings and lack of effort, emotion-focused coping related to mental demand and frustration, and task-focused coping related to increased effort. Overall workload correlated most strongly with emotion-focused coping. Also using the TLX, Szalma (2002) found that no coping strategy significantly predicted overall workload. However, increases in task-focused coping predicted decreased performance workload.

More recently, Tang et al. (2021) examined coping strategies used by clinical nurses in response to perceived workload during the early stages of the COVID-19 pandemic. The frustration item of the NASA TLX was negatively associated with the nurses' positive coping strategies, but other items, especially physical, temporal, and mental demands of workload, had no significant influence on coping strategies. Collectively, these findings suggest that task-focused coping is more effective in ameliorating stress and workload effects associated with task performance compared to avoidance- or emotion-focused strategies. However, as noted above, coping use and effectiveness are subject to having the resources available, such as energy, to support the coping action (Hobfoll, 1998; Hobfoll et al., 2018).

### *Coping Theory*

Whilst it is useful to know that task-focused coping is helpful in managing workload, it is important to develop understandings beyond the functional classification of

coping toward insight into the type of strategy used in relation to the context. Acknowledging the importance of explicitly identifying the theoretical framework that structures data collection and analysis (Yin, 2003), the present case study was guided by the work of Skinner et al. (2003). Skinner et al. (2003, p. 248) are critical of the commonly used single-function classification system (e.g., problem-focused versus emotion-focused) arguing that any given way of coping is likely to serve many functions. They are also critical of topological distinctions (e.g., approach versus avoidance) noting that all ways of coping are multidimensional.

In addressing these criticisms, Skinner et al. (2003) organized twelve families of coping (problem solving, information seeking, helplessness, escape, self-reliance, support seeking, delegation, isolation, accommodation, negotiation, submission, opposition) around three human concerns (autonomy, relatedness, and competence), two levels of distress (threat versus challenge), and two targets of coping (self or context). We adapted this framework to facilitate an investigation of ways of coping focused on the self or context/environment that are triggered by primary appraisals relative to autonomy, relatedness, and competence. The framework was adapted by not seeking to present appraisals as two distinct levels of distress (threat *or* challenge). Rather, we recognize that threat and challenge appraisals are not mutually exclusive, or dichotomous, and thus it is possible for an individual to appraise an event in more than one way at the same time (Devonport, 2012; Meijen et al., 2020).

The current exploratory study seeks to monitor perceived workload and mood, identify challenging situations, and establish the coping strategies used to manage challenges as used by two expeditioners undertaking a crossing of Lake Baikal. To address these aims, we used a short-form daily survey to examine day-to-day changes in perceived workload and mood, and a written daily diary to identify expedition challenges and associated coping. Post-expedition semi-structured interviews allowed further interrogation of perceived demands and coping experiences during the expedition. The first interview was completed within 24 hours of return from the expedition when the experience was still “raw,” in order to produce more accurate reflections. The methods of data collection and sampling strategy used help inform our understanding of what may trigger critical situations during expeditions, what influences the selection of coping strategies, and ultimately will be useful to better prepare individuals who are intending to embark on expeditions in extreme environments.

## **Materials and Methods**

### *Participants and Background to Expedition*

Two explorers participated in the study. Explorer 1 (E1) was a 59-year-old female, with 22 years of polar experience

including two successful expeditions to the geographic South Pole and two to the geographic North Pole. Explorer 2 (E2) was a 49-year-old male with 19 years of experience with expeditions including a 550 km walk to the magnetic North Pole. Both participants provided informed consent prior to taking part in this study. The expedition was a “double-solo” expedition undertaken in part to raise funds for charity. The explorers set out from opposite ends of the lake aiming to cross paths at the halfway point. The expedition was to be self-supported, meaning the explorers were expected to pull everything they required on sledges without resupply and monitored their own progress.

### *Instruments*

Due to the extreme and demanding nature of the expedition, participants were consulted in agreeing measures to be completed during the expedition. This is important since there is a need to prioritize day-to-day tasks for making good expedition progress, and maintaining shelter, warmth, and calorie intake. It was agreed that shortened measures were to be used in the daily diary for two key reasons. (1) to prevent the participants from becoming overloaded and (2) to enhance item responding. The latter is important because people have limited cognitive resources, especially when fatigued (Nezlek, 2020), and particularly in cold environments (Taylor et al., 2016), and may not have the capacity to respond to all items carefully where there are too many items.

This study was approved by the second author’s university faculty ethics committee. Participants completed a daily survey, at the end of each day, to prompt deeper reflection on, and obtain an overview of, workload, mood states, and coping that would inform interviews upon conclusion of the expedition. Workload was assessed using an adapted version of the NASA TLX (Hart & Staveland, 1988). This validated measure has previously been used to examine perceived workload and coping (Matthews & Campbell, 1998; Szalma, 2002). The NASA TLX measures overall subjective workload with six subscales which are (1) mental demand (How much mental and perceptual activity was required?), (2) physical demand (How much physical activity was required?), (3) temporal demand (How much time pressure did you feel due to the rate or pace today?), (4) frustration level (How secure, gratified, content, relaxed, discouraged, stressed did you feel today?), (5) effort (How hard did you have to work (mentally or physically) to accomplish your level of performances today?), and (6) performance (How successful do you think you were in accomplishing the goals for today?). Participants were asked to reflect on the past 24 hours and using the daily monitoring sheet rate their subjective workload on a scale of 0–20 for each of the subscales; these were anchored by good (1) to poor (20) for performance, and low (1) to high (20) for all other subscales. The original scale includes a weighting

procedure, but participants perceived this as cumbersome. Therefore, subscale ratings were used to offer insight into perceived workload (Hart, 2006).

An adapted version of the Brunel Mood Scale (BRUMS; Terry et al., 1999) was used where participants were asked to rate how they felt that day. The eight-item scale comprised anger, confused, depression, fatigue, tension, and vigor taken from the BRUMS (Terry et al., 2003), and calmness and happiness included from the UWIST Mood Adjective Checklist (Matthews et al., 1990). These adaptations enabled examination of three pleasant (calmness, happiness, and vigor) and five unpleasant (anger, confusion, depression, fatigue, and tension) emotions, and have been used in previous research (Friesen et al., 2019). Participants were asked to what extent they felt each of the eight emotions over the past 24 hours. All items were rated on a 5-point scale anchored by “not at all” (0) and “extremely” (4).

Participants also completed a daily diary. The following guidance was provided: “In your written diary, please note the demands experienced for each day. Identify the ways in which you looked to cope with these demands. *Please note: You may use several coping strategies in an attempt to manage a single demand.*” Capturing demands and associated means of coping day-to-day is of importance as research suggests that with the passage of time, people do not, and perhaps cannot, provide accurate accounts of how they coped with demands (Ptacek et al., 1994; Smith et al., 1999).

Two interviews were conducted with the participants. The focus of the first interview, completed within 24 hours of return from the expedition, was on preparation for the expedition, their experiences during the expedition in relation to demands (“What were the main challenges you dealt with during the expedition?”), and how they dealt with these demands. Participants were also asked about expedition highlights and lowlights to gain a further insight into what they felt was important to them. A follow-up interview was completed within four months of their return. This was informed by daily diary entries and drew upon themes identified from the first interview. The duration of interviews varied from 36 to 83 minutes.

### *Data Analysis*

Based on our collective research and applied experiences, we understood expeditions in extreme environments to be a complex, context-specific phenomenon that had different meaning for those involved. Also, consistent with a constructivist approach, we recognized that we would play an active part in constructing the interpretation of gathered data, and reflected upon the way in which our theoretical, experiential, and intellectual involvement influenced interaction with the focus of investigation (Alvesson & Skoldberg, 2000). Such reflection entails “thinking about

the conditions for what one is doing [and] investigating the way in which the theoretical, cultural and political context of individual and intellectual involvement affects interaction with whatever is being researched” (Alvesson & Sköldbberg, 2000, p. 245). Articulating our assumptions and experiences through reflective meetings and e-mail exchanges, which took place prior to and during data analysis, helped achieve this transparency (Mills et al., 2006).

Furthermore, in order to support richness, depth, and complexity of data gathered from participants relative to the phenomenon of interest, we utilized daily perceived workload and mood measures, with the resulting data (as presented in Figures 1–4) used to support deeper reflection whilst on the expedition, and to highlight changes over time. To provide an insight into the relation between the workload and mood variables, and support the interview data, a correlation analysis was conducted, where the day of completing the diary entry was controlled for. The correlation analysis was conducted separately for each participant so as to be able to capture their unique experiences.

Underpinned by the researchers’ philosophical assumptions of constructivism, these data were also used to aid recall with each participant, particularly during the second interview to help focus on the meaning of experiences and events as constructed by the two participating individuals (Charmaz, 2006). Guided by the work of Braun and Clarke (2006), deductive thematic analysis was undertaken in the following stages:

- 1) Familiarization with the data whereby interview and diary transcripts were read and re-read by the authors.
- 2) Generating initial codes. The twelve families of coping were used to organize numerous instances of coping into meaningful units described by Skinner et al. (2003) as action types. Skinner et al. make a cogent argument for coping families, acting as they do as intermediate categories lying between individual instances of coping action (as reported by the participants themselves) and higher-order conceptual units reflecting “adaptive functions” (Skinner et al., 2003, p. 217). Demands encountered during the expedition were coded in accordance with self (physical or mental) or context/environment.
- 3) Deductively organized themes. A review of the dataset took place to ensure data were thematically organized relative to the three “concerns” or basic needs for relatedness, competence, and autonomy.
- 4) Producing the written report involved contextualizing the analysis in relation to theory and selecting illustrative quotes to best reflect each theme.

*Trustworthiness*

After independently coding the data, discussions took place between the three authors with the intent of acting as

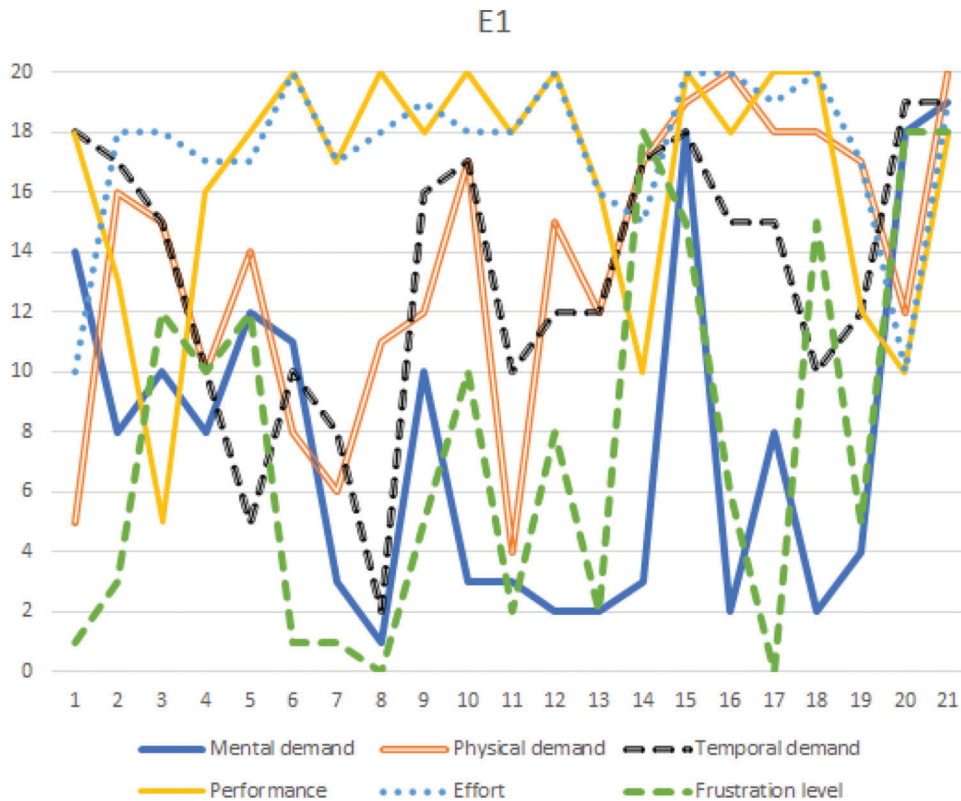


Figure 1. Daily workload perceived by explorer 1 (E1).

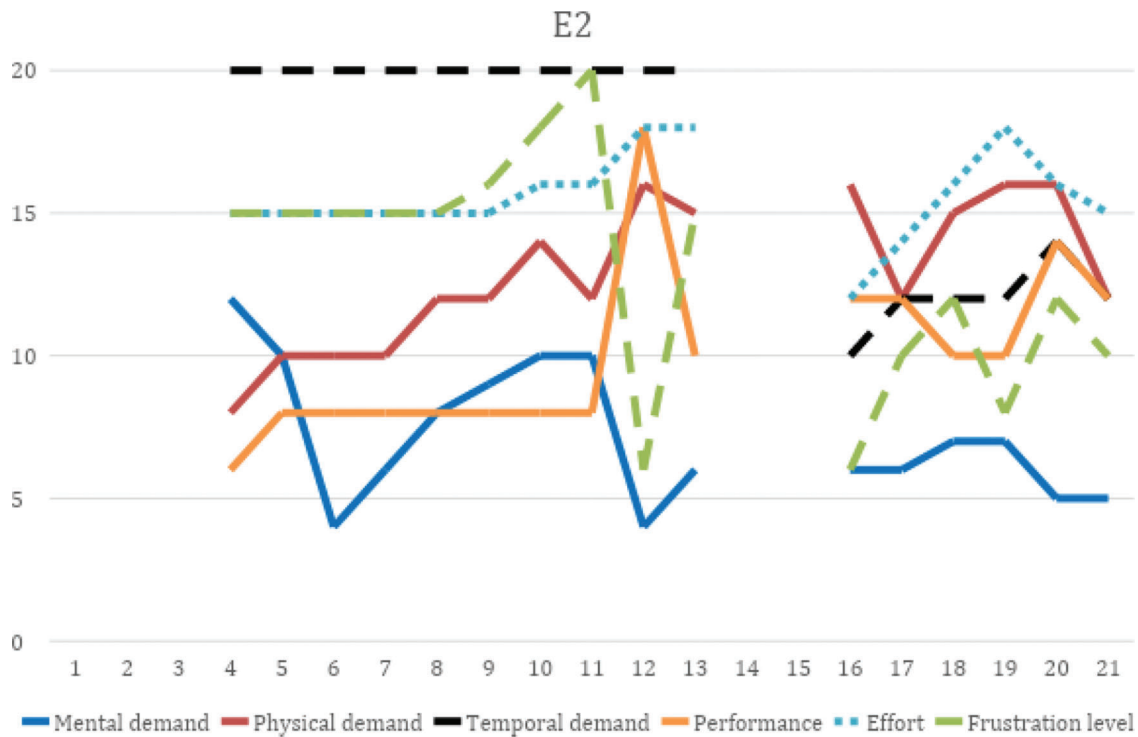


Figure 2. Daily workload perceived by explorer 2 (E2).

critical friends, whose role was not to “agree” or achieve consensus but rather to encourage reflexivity by challenging each other’s construction of knowledge (Cowan & Taylor, 2016, p. 508). In particular, critical reflections focused on the deductive application of Skinner and colleagues’ (2003) work in guiding analysis. This helped to construct interpretations of the data that were accepted as plausible despite possible agreements and disagreements (Smith & McGannon, 2018). This reflective approach is consistent with the principles of constructivism (Alvesson & Skoldberg, 2000).

## Results

Daily survey data were used to evaluate and support participant reflection on subjective workload and mood. Figure 1 indicates that E1’s perceptions of effort (remained 15 or above after day 2 with the exception of day 20) and performance (rated 16 or above other than on days 3, 14, and 20) were relatively stable over the expedition. Physical demands were variable, becoming more consistently high from day 14. Mental and temporal demands, along with frustration levels were variable throughout the expedition, with each rated highly (between 18 and 20) on conclusion of the expedition (day 21). This concurs with diary data highlighting the mental and physical fortitude required to continue moving through very deep snow once at the destination point in view of difficulties in communicating with the support team and “imprecise instructions” for pickup in order to “get back to civilization.”

As shown in Figure 2, E2 perceived physical demands as increasing over the course of the expedition, likely exacerbated by the inadequate calorie intake qualitatively described. A daily perception of poor perceived performance (rated 6–8) along with encountering the “very worst icefields,” a late start, and early finish due to a “huge lead” caused high levels of frustration (20) on day 11. Day 12 followed with high perceived performance (18) and thus low frustration. There were no data for days 1–3 or 14 and 15 with no obvious reason for absent data at this time.

When examining mood over the expedition (Figure 3), E1 experienced intermittent fatigue throughout. The first six-days of the expedition were also marked by experiences of anger, confusion, depression, and tension. Daily diary entries across these six days refer to “problems with the stoves,” and “growing concerns with unrealistic mileage targets.” Thereafter, but for confusion on day 9 (attributable to uncertainties about a planned mid-expedition meeting with E2) and experiences of fatigue, mood remained largely pleasant until days 14–16 (characterized by experiences of depression, tension, and anger). This was attributable to concerns following a “failed crossover meeting” with E2 along with the challenges of pulling her sledge through deep, fresh snow. Fatigue remained high from day 18, and days 20 and 21 were marked by anger and depression attributable to “comms struggles causing negative feelings.” Pleasant emotions were present throughout the expedition, although reduced scores for energy, happy, and calm are evidenced on days 14 and 21, with perceptions of calm lowest on days 2, 9, and 10.



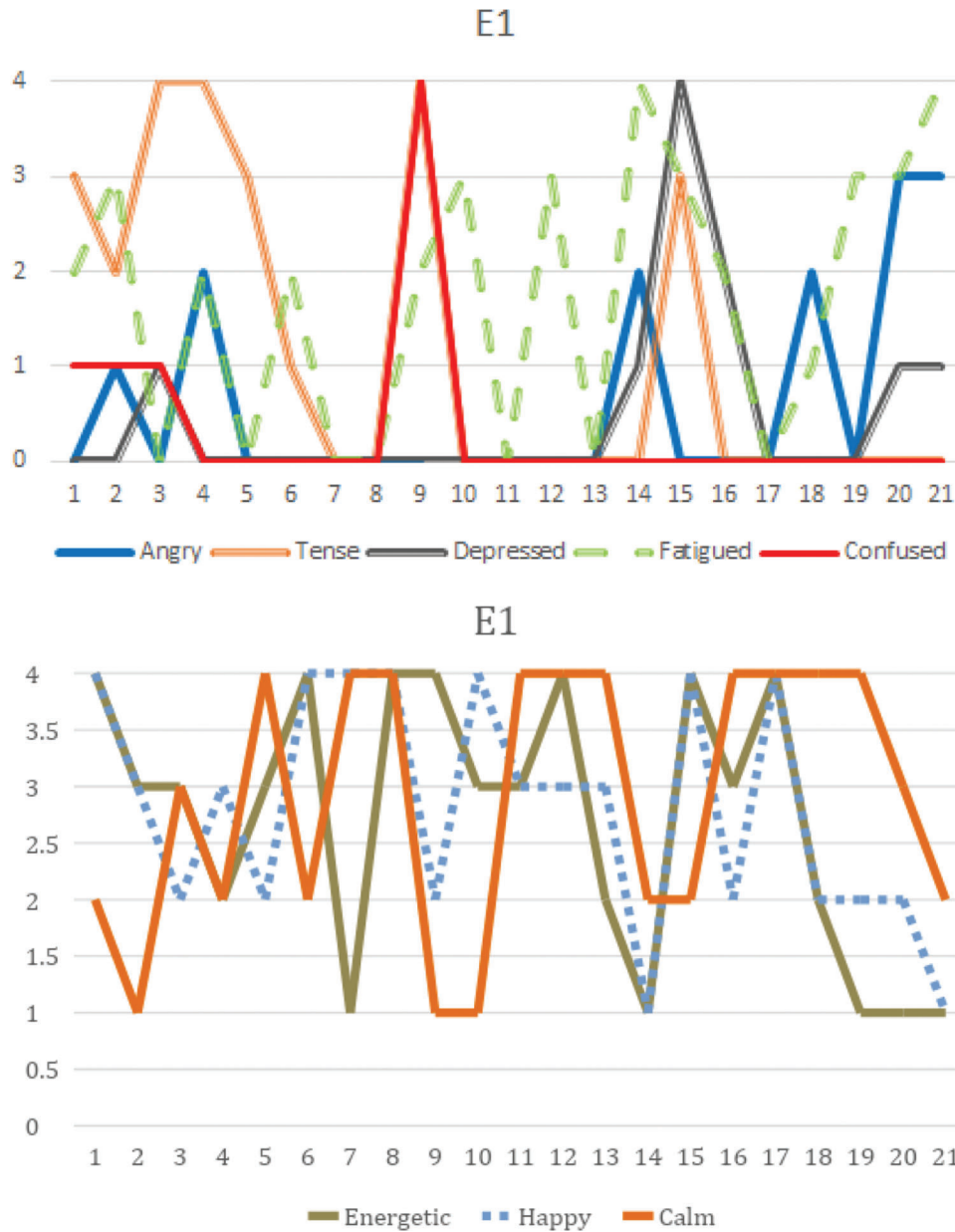


Figure 3. Unpleasant and pleasant mood perceived by explorer 1 (E1).

A correlation analysis, controlling for time, indicated that mental, temporal, and performance demands were aspects of workload that influenced mood states for E1. Mental demands showed a positive correlation with temporal demands ( $r(17) = 0.56, p = 0.01$ ), frustration ( $r(17) = 0.46, p = 0.046$ ), and tension ( $r(17) = 0.60, p = 0.006$ ) and a negative correlation with calm ( $r = -0.59, p = 0.008$ ). For temporal demands there was a positive correlation with fatigue ( $r(17) = 0.61, p = 0.006$ ) and a negative correlation with calm ( $r(17) = -0.72, p < 0.001$ ). Performance demands showed a positive correlation with energetic ( $r(17) = 0.59, p = 0.008$ ) and happy ( $r(17) = 0.57, p = 0.01$ ).

E2's experience was marked by ever present perceptions of fatigue (see Figure 4) and depressed mood on all but five

days, often accompanied by tension. Anger and confusion were largely absent (but for day 17, and days 4 and 5 respectively). Day 12 presents as the most pleasant day whereby happy, calm, and energetic were notably higher than any other day. This was attributable to a day of good progress, "amazing scenery," and social contact. His day 18 diary entry describes how he "felt depressed," and "feeling very emotional," with fears of expedition failure. On day 19 having fallen through the ice three times he reluctantly decided to end the expedition and "cried with frustration and the crushing feeling of failure." Having been assisted and given the opportunity to eat food and recover, he resumed the expedition. However, thin ice led to concerns that he "may not cheat death another time," and he made the decision to extract himself from the



Figure 4. Unpleasant and pleasant mood perceived by explorer 2 (E2).

expedition on day 21. The emotional turmoil described in daily diary entries is not reflected in the self-rated mood scores provided, where the mood scores for happy and calm were consistently low with the exception of day 12 as outlined above.

A correlation analysis, controlling for time, showed that mental, physical, and temporal demands were the main aspects of workload that influenced mood states for E2. Mental demands showed a positive correlation with tension ( $r(16) = 0.69, p = 0.002$ ) and confusion ( $r(16) = 0.49, p = 0.038$ ). For physical demand there was a positive correlation with performance ( $r(16) = 0.47, p = 0.049$ ),

effort ( $r(16) = 0.54, p = 0.022$ ), and fatigue ( $r(16) = 0.54, p = 0.021$ ). For temporal demand there was a negative correlation with angry ( $r(16) = -0.48, p = 0.046$ ) and confused ( $r(16) = -0.50, p = 0.036$ ). For performance demands there was a positive correlation with energetic ( $r(16) = 0.68, p = 0.002$ ). For effort demands, there was a positive correlation with angry ( $r(16) = 0.52, p = 0.027$ ) and depression ( $r(16) = 0.49, p = 0.041$ ). As there were missing data in the daily diary completions for E2, it is important that caution is exercised in interpreting these data. For both explorers the findings are considered relative to the interview data.

### Expedition Demands

Demands encountered over the duration of the expedition were classified as physical, mental, and environmental. The following descriptive account captures the key differences in demands encountered by each explorer.

E1 completed the 674 km expedition, starting from the most southern end of the lake, in 21 days, the fastest unsupported expedition, without resupply, by a female explorer. Many of the demands encountered by E1 were anticipated. She had prepared for the environmental demands of strong Siberian winds, variable ice and snow conditions, open leads, and extreme cold which she had appreciated would create mental and physical demands. Drawing on previous expedition experience she was conscious of not fighting challenging environmental conditions, or regarding them as hostile, but recognizing them as part of nature.

Physical demands included insufficient sleep, extreme cold, energy dips, hip pain following falls on the ice, pain in her feet from boots, vomiting having inhaled stove fuel fumes, and the physical demands of regular kit change. Mental demands derived from feelings of being judged as incompetent, accommodating challenging mileage targets, lack of response to scheduled communications, concerns over lack of concentration, decision making (when to travel and when to stay put, route decisions), and managing resources (stove fuel, food, satellite phone).

E2 starting from the northern end of the lake finished his 636 km expedition in 21 days, 39 km from the planned end point. E2 reflected:

*We'd agreed that I would do the harder route which was the North to South, and part of the difficulty with this route is the fact that the ice thaws as you go South. [E1] started in the South when the southern ice was more stable.*

Poor ice stability proved to be life threatening for E2. Malfunctioning stoves (from day one) resulted in an inability to cook and melt ice, necessitating the gathering of water when and where possible from the lake. This led to two water immersions on day 19:

*I saw an area of the ice which looked wet and that always indicates the fact the water is coming to the surface, I needed drinking water, I went towards it cautiously, I filled two water bottles and backed away from the open hole. Immediately I stood up I went through the ice ... it transpired that the whole area was precarious.*

The lack of a functioning stove produced additional physical demands:

*For the entirety of my journey I was carrying two stoves in weight that I couldn't use, all my dehydrated food that I couldn't eat, two fuel bottles and 10 litres of petrol that*

*I couldn't use. Whereas [E1's] weight on her sledge was diminishing day-by-day, mine was near constant, my calorific intake was half of what it should have been and the fatigue levels for me were ridiculous.*

Other physical demands included a 19 kg reduction in body weight and increased sensitivity to the cold, fatigue, and pain when walking due to blisters and trench foot and sore back and hips. Discussions of mental demands were dominated by resource losses (e.g., stove, energy).

### Coping

A range of coping strategies targeting the self and context/environment were employed by both explorers. These are deductively organized under three themes in accordance with "concerns" or basic needs for relatedness, competence, and autonomy.

### Relatedness

Relatedness refers to the need to feel connected to other people and a sense of belonging in a particular context (Furrer & Skinner, 2003). The extent to which an individual feels they belong in a particular context is associated with the quality of their engagement in the activities of that context (Skinner et al., 2008).

When exploring coping action tendencies regarding relatedness to the environment, E1 described her use of the coping family accommodation (acceptance) which appeared to support relatedness: "*you don't fight, you don't regard it [the environment] as hostile. It's part of the nature of the entity which is how I thought of it. That you are with.*" Whilst initially evidencing accommodation, E2 encountered chronic physical and environmental challenges as a result of increasing ice fragility as he moved south. As these persisted, the coping families of submission (rumination) and helplessness (cognitive exhaustion, confusion) became apparent and he extracted himself from (isolation, withdrawal) the expedition early in the interests of his own physical wellbeing.

For both participants, action coping tendencies regarding relatedness to each other focused on problem solving (strategizing, planning, instrumental action), support seeking (contact seeking, instrumental aid), and information seeking (asking others) in the buildup to expedition departure. They were respectful and appreciative of each other noting gratitude for dyadic coping efforts. The participants collaborated when preparing for the expedition, such as sharing kit lists, planning days, and going for long walks together. Although they appreciated the shared journey, opportunity to exchange ideas, and support for each other, they did not always agree:

*E1 tried to get me to do some training and I just said no. I am not doing it, you know, she wants to go pull tractor*

tyres. Great. Off you go. I'm not doing it. I don't think what E1 does is wrong, we're just different beasts, and there's a lot to an expedition.

In a further illustration of difference, E1 described a preference for isolation immediately prior to expedition departure, but noted this was not possible due to the presence of E2, resulting in elevated stress levels:

*Most of my expeditions have been solo and so I haven't been working closely with someone right up [emphasized] to the launch point erm, when you do go through certain phases and actually me personally and my character I need space and quiet and tranquility. I think you know I wasn't getting that so it was highly corrosive.*

Thwarting her preferred coping tendencies immediately prior to departure of isolation (social withdrawal, avoiding others) and self-reliance (behavior regulation) resulted in submission (rumination, intrusive thoughts) and helplessness (confusion, cognitive interference). E1 explained that her preferred coping action tendencies were intended to limit distractions or "clutter" that might undermine the quality of preparation and also engagement with the environment and context. For her this meant that she severely restricted communication with others, including her family and dear ones.

Despite being a solo expedition, the participants remained psychologically connected to each other throughout, conscious that they were working towards a shared goal. E2 explained "E1 and I were going for a double as well so I didn't want to let E1 down." E1 noted concerns for the welfare of E2:

*At times I was worried about E2 because comms had broken down at his end and, I wasn't worried at all about not being able to do the symbolic meeting, in fact, I didn't really want to meet him, because it would have been a huge intrusion on where I was, but I couldn't work out what was happening to him at his end and that was a little like a black cloud in my head.*

Both explorers evidenced support seeking (comfort seeking) during the expedition, for example, when encountering other living beings on the ice, both people and animals, or indeed speaking to inanimate objects such as their sledge. E1 also evidenced support seeking in terms of spiritual support, whereby she used the opportunities afforded by long periods of isolation to feel connected to her "spiritual guardians" [her ancestors] noting "you are actually very in tune with your guardians, with your protectors and I felt they were very happily there." She also reflected on the influence of undertaking the expedition for a charity in enhancing relatedness and noted that it

influenced her values: "what might have just been a sort of a questionable piety actually becomes meaningful and has its own currency."

### Competence

Competence refers to an individual's need to feel effective in their interactions with their social and physical environments (Elliot & Dweck, 2005). A coping action tendency evidenced throughout the expedition by both explorers relative to dealings with the physical, and where relevant social, environment was the use of problem solving (strategizing, planning, instrumental action) and information seeking (studying, observing). These action tendencies were often described relative to the evaluation and application of resources underpinning competence, such as equipment, physical fitness, and knowledge. Both explorers had planned for, and expressed competence in, their ability to work with the equipment they brought, although a lack of confidence in the equipment itself was expressed. This led E1 to take additional measures:

*I can fix a stove, they are like Land Rovers, but if a pump breaks as opposed to a seal or something, it's irreparable because there are plastic bits to it. That's why I take three, and I like to know I have three, and sure enough one of mine wasn't functioning.*

E2 experienced equipment failure from the outset noting that every time, "I had to change my perceptions, I had to change routines, I had to do a lot of I suppose analysis on my situation all the time." As the expedition progressed, he accumulated broken tent poles, a nonfunctioning stove (thus no warm food or water), and ripped boots noting "every single thing that could have given me solace, support, warmth and protection shelter, it was bugged." In response to another near immersion that would leave him with no dry clothes, his perceived ability to operate competently within the environment was reduced to such an extent that he considered the risk to life to be too great. "Had I not actually been through the ice, had I not been in the life-threatening situation before I might have thought 'no I'm just going to chance it' ... I was shit scared, it's not a good environment to be in." He appeared to reflect back on his recent immersion and in doing so he was "very very scared indeed." These intense unpleasant emotions reflected a troubled person-environment relationship, in this instance fears for his own life resulting from fragile ice conditions, and served as a cue that informed his coping actions. In describing the decision to conclude his expedition, and the events leading up to it, he evidenced the coping action tendencies of helplessness (cognitive exhaustion) and submission (rumination). These action tendencies informed decision making based on an evaluation of deteriorating/dangerous ice conditions and depleted resources (e.g., no dry clothes). He concluded his expedition 39 km

from the planned finish point and struggled to reconcile this decision: “because it had been such a big project in my head for years, and then to come to fruition, nearly succeed, and then have it snatched away through something I had no control over, upset me a lot.” However, upon reaching land, use of the coping family accommodation (cognitive restructuring, acceptance) helped reconcile his decision in view of conditions allowing him to be “happy with my achievement.”

The expedition experiences of E1 were much less fraught with adversity. Momentarily having completed the crossing she struggled with having reached her goal and then mobilizing the physical efforts required to get to the extraction point. Informed by an awareness of her unpleasant emotion state, E1 recognized the coping action tendency of delegation (self-pity, maladaptive help seeking) in herself. In looking to downregulate unpleasant emotions and refocusing her efforts from completing the expedition to getting to an extraction point, she noted that the cold was “her friend” in that it was “no good just moping around there I had to move.” Thus, delegation was quickly superseded with problem-solving in the form of instrumental action.

With regards a need to feel effective in interaction with others, E1 experienced self-doubt in the days and moments before starting out on the ice:

*When you're with somebody else or other people who appear to be very confident and in command it makes me feel yet more incapable ... I kind of felt that he thought that I was all over the place, and I actually asked him afterwards and said I think you thought that I could not even navigate ... and he said no, he never did think anything about me being disorganized.*

This self-doubt “stunts all my senses and I become fumbling or fumbling in every respect, not just mentally but it's like I can't see things, I can't hear things properly ... it really affects me deeply.” However, once on the ice E1 felt at one with herself and regained her sense of competence. Captured in this change of context is a shift from the coping action tendency of submission (rumination and intrusive thoughts) and helplessness (confusion, cognitive interference) to self-reliance (emotion regulation, behavior regulation). Fear of being judged appeared to threaten perceptions of competence which returned when operating independently in extreme environments. Further support for this contention comes from E1's day 2 diary entry: “felt a familiar calm take over when in potentially serious situation ... sadly cannot sum this up when feeling nervous in ‘civvie’ and non-life endangering sits.”

E2 often reflects on incidental meetings with others in his daily diary, and purposely made contact with others via messaging or phone calls on a number of occasions, often in a support-seeking capacity. He displayed confidence in

his dealings with others, helped by being able to speak a little Russian. For example, on day 9 he “approached [house] and a lady opened a window. I explained I was a tourist, spoke little Russian and asked for water.”

#### Autonomy

Autonomy is the psychological need to experience behavior emanating from and endorsed by the self (Ryan & Deci, 2000). Given the risks associated with solo expeditions in extreme environments, both explorers noted discomfort in releasing control of planning and decision making to each other. Action tendencies for the coping families of opposition (other-blame), delegation (self-pity, complaining), submission (rumination, intrusive thoughts), and negotiation (compromise) were described by both and both presented with a preference for high autonomy relative to others, but recognizing a need on a dual expedition for compromise. E1 reflected:

*He'd so painstakingly and very kindly marked out the route, I think “oh how awful” I think I probably was blaming him ... at the end of the day it's me, I just said there wasn't a leader so you know I could have looked at his routing more closely.*

Whilst she acknowledged the time E2 had invested in planning the route, her frustrations, and at times anger, reflected “concern at unrealistic mileage targets” he set. Targets that were not being met despite performing optimally. Similarly, E2 reflected on things they would have done differently had they had complete autonomy:

*There were tasks that were delegated to [E1] ... so, I relied upon [E1's] choice, as an expeditionist, and naturally now I'm now, I'm kind of thinking that the two or three things that I asked [E1] to do, I wouldn't have done the way that she did it, or I wouldn't have liked, I didn't want the product that she selected.*

Both explorers sought and appeared to thrive off autonomy in relation to their dealings with the environment. E2's expedition was marred by a non-functioning stove, resulting in reduced calorie intake and ice-water immersions. Being able to successfully problem solve, and thus maintain autonomy, was considered an expedition highlight:

*That's a lovely feeling to be able to do it, to be able to say yep I've got this problem, let's do some thinking in the tent ... but again you shouldn't be let loose in that kind of environment unless you've got that sort of spirit and knowhow.*

Both explorers engaged a range of coping strategies to support autonomy in dealings with their environment.

These aligned with the coping families of accommodation (commitment, compliance), negotiation (goal-setting, prioritizing), problem-solving (planning, strategizing), and self-reliance (self-talk, imagery). For example, setting goals helped the explorers to maintain persistence when faced with challenges throughout the expedition. This is described by E1:

*Your energy levels would fluctuate every day, rather than just going slowly because you got bad energy that day, if you set yourself a goal then you will find something inside and that then splits into micro cycles of where your next break is going to be going forward ... then I go, actually I'll go bit further forwards cause there's a really interesting pressure ridge over there and I'll get to that and you can find it, you do.*

## Discussion

This study monitored workload and mood, identified challenging situations and coping strategies used by two explorers. Taking into account criticisms of single-function classification systems (e.g., problem-focused versus emotion-focused) and topological distinctions (e.g., approach versus avoidance) the present study was guided by the coping framework of Skinner et al. (2003). Using this framework, coping families were identified that “represent higher order categories within which lower order ways of coping are nested and that they are, for the most part, multidimensional and multifunctional” (Skinner et al., 2003, p. 217). These families were identified as targeting the self and context/environment and deductively organized under three themes in accordance with basic needs for relatedness, competence, and autonomy. Whilst the expedition experiences of the two participants were remarkably different, in their interviews both evidenced flexible coping use drawing on a range of coping families (Skinner et al., 2003) in order to adapt to and/or overcome demands relative to these three basic needs. The only coping family not evidenced by either explorer was that of escape (cognitive avoidance, behavioral avoidance, denial, wishful thinking). This coping family is considered to reflect a threat to the context in respect of competence (Skinner et al., 2003). Solo expeditions in extreme environments present little opportunity for escape given that, by definition, the extreme nature of the environment and the need to maintain progress in order to attain expedition goals including the preservation of physical wellbeing.

Individuals can develop preferred coping styles when faced with specific anticipated events and ongoing situations (Smith et al., 1996), but an overreliance on preferred coping styles may be maladaptive. For example, E1 reflected on a preferred coping action tendency for isolation immediately pre-expedition departure; however, the

thwarting of this tendency resulted in submission (rumination, intrusive thoughts) and helplessness (confusion, cognitive interference), and was associated with unpleasant moods, cognitions, and behaviors. Although the expedition was a solo endeavor, it was a dual crossing organized together and undertaken at the same time. Furthermore, communications were required with support teams throughout the expedition. Not considering the dynamics between expedition members can influence the success of expeditions, whilst functional relationships can assist an expedition to meet its goals and may even contribute to the safety of participants (Cashel, 1994). A recommendation is that explorers share each other's coping preferences pre-expedition, and that, in addition, preferences for dyadic coping are discussed and negotiated, with opportunities created to rehearse these in advance of expeditions. Dyadic coping is regarded as a process in which three factors interact: the stress signals of one individual, the perception of these signals by another, and the reaction of this person to the stress signals (Bodenmann, 2005). To illustrate, had the explorers discussed the preference of E1 for the coping action of isolation in close proximity to expedition departure, they could have better recognized and responded to the stress signals of each other and produced a smoother expedition start.

Coping preferences are nevertheless helpful to consider, especially in situations where one encounters known or anticipated demands (Aspinwall & Taylor, 1997). This was mostly the case for E1, who predominantly encountered anticipated demands and drew upon and effectively deployed resources facilitative of coping (e.g., previous experience, equipment) in managing these. As a result, she experienced pleasant emotions throughout the expedition, and days characterized by an absence of unpleasant emotion (other than fatigue). A different story unfolds when E1 experienced unanticipated demands (Dugdale et al., 2002). Two notable peaks in frustration co-occurred with increased mental and temporal demands with both occasions attributable to uncertainties. These were related to a possible resource loss (intended meeting to hand over a spare stove) and ambiguities regarding pickup arrangements on completion of the expedition. Both involved dealings with others, and whilst she perceived herself to be effective in interactions with the environment, this confidence did not hold up in social exchanges. Social exchanges could, for this explorer, present socio-evaluative threats characterized by feelings of being judged as incompetent (Poppelaars et al., 2019). Social-evaluative threats may undermine the need to feel connected to other people (Baumeister & Leary, 1995). In this instance, for E1, her coping was reflected by the coping family relatedness, where perceived threats to context activated the coping action for isolation and delimiting communication with others prior to and during the expedition. By contrast, when she was on the ice, the challenge to context

activated coping actions related to appreciation and feelings of spiritual connection and universalism noted in previous research (Kjærgaard et al., 2013; Suedfeld et al., 2010), which in turn enhanced feelings of competence and experiences of pleasant emotions. These findings lend support to previous research (Gendolla & Krüsken, 2002; Hobfoll, 1998; Hobfoll et al., 2018), which suggests that unpleasant emotions associate with a troubled person–environment relationship, whilst pleasant emotions act as cues that all is well, and in both instances, these emotions serve to inform coping actions.

Although dispositional coping can be adaptive in situations where the demands are anticipated and can be prepared for, coping flexibility may be required when coping with unexpected events, or following a loss of coping resources where one's preferred coping tendency may not be accessible or appropriate. E2 experienced a significant resource loss from day one, with malfunctioning stoves. Individuals who lack resources or experience resource loss are more likely to experience a loss spiral whereby a continuous loss cycle is entered (conservation of resources theory; Hobfoll, 1998; Hobfoll & Shirom, 2001). A loss spiral was evident whereby the loss of a functioning stove increased pressures to locate and collect water and reduced calorie intake, which was unexpected. This loss spiral contributed to reduced wellbeing as the expedition progressed as indicated by an increased sense of physical (weight loss, increased fatigue) and psychological (unpleasant mood) depletion (Hobfoll et al., 2018). This not only produced unexpected demands, but in accordance with previous research, a loss of resources can influence one's capacity to cope with anticipated demands (Hobfoll, 1998; Hobfoll et al., 2018). Because unexpected demands are typically perceived as more threatening than expected stressors, this can produce a delayed, hesitant, or ineffective coping response (Devonport et al., 2013; Dugdale et al., 2002). In order to support increased coping flexibility, particularly with unexpected demands, we encourage the practice of reflecting on one's coping dispositions to develop an awareness of when such dispositions may become impractical or debilitating.

We also advocate the practice of seeking to anticipate all plausible challenges/threats during planned expeditions in order to try and avert loss spirals. This involves activities such as thoroughly researching the planned extreme environmental challenge, speaking to others who have completed such challenges, and accumulating and testing the efficacy of coping resources intended to avert or attenuate anticipator stressors. For example, E1's two backup stoves meant that when one stove failed, she had the assurance of a further backup stove. As a cautionary note, however, whilst such planning and preparation may be helpful in preparing for expeditions, hypervigilance towards undesired "what-if" scenarios whilst on an expedition may interfere with attention to the present moment and cause undue stress (Bieleke & Wolff, 2017).

Although the present study captures experiences of a unique expedition bound by time, space, and context, the findings can be generalized to coping theory (Hobfoll, 1998) and coping concepts (Skinner et al., 2003), thus presenting analytical generalizations (Smith, 2018). As noted by Lewis et al. (2014, p. 351), "the value of qualitative research is in revealing the breadth and nature of the phenomena under study." In this regard, the findings also offer pragmatic generalizations in supporting the coping preparations of expeditioners preparing to enter extreme environments. In particular, knowing what one's preferred coping options are and rehearsing these in managing anticipated demands would be advantageous in the leadup to an expedition. Also developing an awareness of when preferred coping options are not helpful, especially in relation to managing unexpected demands, will enable more coping flexibility. In the present study, each explorer had their preferred coping options and when these were thwarted it had negative effects on mood. Therefore, openness to alternative coping options and working with others to develop these will be of benefit, particularly for those undertaking expeditions as part of a group. Finally, for explorers it is worth considering and planning their coping actions for when the end point of the expedition has been reached. In this instance, once the end point of the crossing was reached, the explorers still had to put in physical and mental efforts to get off the ice, and for one expeditioner in particular this was deflating. This process of coping planning could be facilitated using if–then planning (Bieleke et al., 2021). For example, "if" I feel downhearted at the prospect of having to find transport and get to my accommodation "I will" remind myself that this is a known part of the expedition.

This study presents the use of formal research methods in seeking to understand a unique human activity, for which there are no replicates or statistical inferences available. It is, however, not without limitations. The remote and challenging nature of extreme expeditions meant that adhering to data collection protocols was not always a priority. In the present study, E2 did not provide perceived workload and mood data for days 1–3 or 14 and 15. For both explorers, there was likely some temporal distancing from the point of experiencing significant events to the point of recall. Although daily diary completion de-limited the time to recall, it is conceivable that there was some decay or retroactive interference in terms of recalled workload, mood, stressors, and coping.

## Conclusions

To conclude, reflecting on their expedition, the two explorers described how they drew on a wide array of coping strategies aligned with eleven of the twelve coping families identified by Skinner et al. (2003). Findings illustrate action tendencies for coping families around the

three basic needs for relatedness, competence, and autonomy. The coping dispositions of participants were captured, particularly with regards to known or anticipated stressors. Although coping dispositions may be of benefit when well-rehearsed and appropriate for the context, findings illustrate how when thwarted and inflexible, unpleasant emotional, cognitive, and behavioral outcomes may result. As such, the importance of maintaining coping flexibility and accumulating resources supportive of coping flexibility is advocated. This is particularly important in extreme environments which are by nature unpredictable.

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