

Perceived Growth Following Endeavors to Isolated, Confined, and Extreme Environments:

Salutogenesis in the Aftermath of Antarctic Expeditions

by

Patrick Nicoll

B.A., Gonzaga University, 2014

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I acknowledge and respect the Lekwungen peoples on whose traditional territory the university stands and the Songhees, Esquimalt and WSÁNEĆ peoples whose historical relationships with the land continue to this day.

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**Supervisory Committee**

Dr. Colette M. Smart, Supervisor  
Department of Psychology

Dr. Erica Woodin, Departmental Member  
Department of Psychology

Dr. Nevin Harper, Non-unit Member  
Department of Child and Youth Care, University of Victoria

## Abstract

The environmental and psychosocial adversity inherent in remote polar locales has historically been framed in pathological terms. However, a burgeoning body of evidence suggests that stressful conditions across isolated, confined, and extreme (ICE) environments may elicit positive growth outcomes as well. The purpose of this cross-sectional, retrospective study was to assess the incidence and correlates of Post Expedition Growth (PEG) in returned Antarctic expeditioners. The prevalence of five specific personal growth indicators – ‘new opportunities,’ ‘relating to others,’ ‘personal strength,’ ‘spiritual change,’ and ‘appreciation of life’ – along with individual and group variables that have been associated with growth in trauma-exposed populations (i.e., coping, mindfulness, personality traits, personal value priorities, adverse childhood experiences, and expedition/experience specific variables) were examined using a mixed methods approach. Quantitative results indicate a moderate, positive association between proactive coping and appreciation of life, as well as between universalism (i.e., a sense of harmony or oneness with humanity and the natural world), new possibilities, and appreciation of life. Qualitative findings provide a more nuanced understanding of the five dimensions of PEG and underscore the emergence of a sixth dimension, an enhanced relationship with nature. Further research is needed to illuminate knowledge gaps in ICE environment research, and to help identify potential countermeasures for individuals and groups faced with comparable adversity factors in their immediate environments (i.e., within the current context of COVID-19). A deeper understanding of PEG in ICE environments – as well as promotive factors that strengthen positive outcomes – will serve to inform the development of countermeasures to mitigate health and wellbeing risks following exposure to isolation and confinement in extreme environments.

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## Introduction

### Isolated, Confined, and Extreme (ICE) Environments

Reflecting on the potential for growth in the face of profound suffering, neurologist and philosopher Viktor Frankl once wrote, “what is to give light must endure burning” (Frankl, 1985). While it is well documented that many struggle to return to pre-baseline levels of functioning following potentially traumatic, or otherwise difficult events, a burgeoning body of research indeed bears witness to the unique capacity of human beings to be resilient in the face of adversity (Bonanno, 2004) and even experience growth in its aftermath (Suedfeld, 2015; Tedeschi & Calhoun, 1996).

Isolated, confined, and extreme (ICE) environments comprise a broadening taxonomy of novel geographic backdrops where psychologists can study adaptive human responses to unprecedented environmental and social hardship (Bartone et al., 2018). Austral winter and summer-over stays at remote polar stations, and arduous expeditions that take place “on the ice,” have historically been the foci for such investigations (Suedfeld, 1998). Over the past couple of decades, the study of the effects of extreme polar expeditions have drawn international and government interest due to the compelling characteristic similarities they share with those of long-duration spaceflight – e.g., unpredictable life-threatening danger, perpetual darkness over the course of 6-month austral winters, limited medical support, and restricted travel (Sandal, 2000). Conveniently, the natural laboratories provided by ICEs allow organizations like NASA and The Canadian Space Agency to examine a number of psychosocial threats that astronauts may encounter during long-duration spaceflight missions, without having to leave earth (Sandal et al., 2006; Suedfeld & Weiss, 2000). Moreover, as ICE environments garner popularity as a topic of scientific study, research has diversified to examine psychosocial sequelae applied to

other intriguing ICE endeavors, such as solo sailing circumnavigations of the globe (Kjærgaard, Leon, et al., 2015a, 2015b), high-altitude mountaineering expeditions (N. Smith et al., 2017), and, recently, a sojourn through a hyper-arid desert environment (Smith et al., 2018). Included in these environments, we also invite the reader to consider the global context of COVID-19, which, for a subset of the global population (i.e., low SES, medically compromised, and elderly populations) bears similar characteristics to the way ICEs are described in the literature (i.e., life threatening danger, lack of sufficient medical resources, and longstanding bouts of social isolation). Though each of these environmental contexts is unique and may not share as much in common with higher latitude environments – or outer space – inherent in all are formidable stressors that test the strength and endurance of the human spirit, and which may in turn engender personal growth.

### **Inherent Risks of ICE Environments**

Historically, stressors associated with ICEs have been viewed in a predominantly pathogenic light (i.e. disease-producing), with significantly less regard for salutogenic (i.e. health-promoting) outcomes (Suedfeld, 2001, 2005). Thereby, the primary focus of ICE research to date has homed in on the identification of psychological risk factors and subsequent applications of preventative countermeasures (Suedfeld, 2001, 2005). In accord, an extensive body of literature affirms a multitude of negative impacts ICE environments can have on individuals.

Confined habitats coupled with isolation in extreme (and dangerous) environments may provide the basis for profound self-exploration and personal growth, but also deep loneliness and disconnect (Leon et al., 1989; Suedfeld et al., 2017). Social separation is often identified as a significant source of stress, particularly for those leaving positive and supportive families and/or

romantic partners behind (Moult et al., 2015). Moreover, isolation from loved ones for prolonged periods of time can lead to symptoms of adjustment and mood disorders, though the development of requisite symptoms to meet DSM diagnostic criteria is typically less than 5% (Palinkas et al., 1995). Impaired cognitive ability, boredom, anxiety, and fatigue are also symptoms commonly reported in ICE environments. In high latitude locations, these sorts of cognitive drawbacks frequently correspond to seasonal changes such as winter-over syndrome – characterized by bouts of depression and lapses in memory – and temporal changes, such as “T3” syndrome, which occurs in the third quarter of Antarctic expeditions and comprises symptoms of depression and cognitive impairment (Palinkas & Suedfeld, 2008).

There are also several physical drawbacks to spending time in ICE environments. These sorts of challenges vary in type and extremity across settings. For instance, risks in low earth orbit – such as microgravity on-board the International Space Station – tend to differ substantially from those experienced by submariners or mountaineers. While research has yet to integrate and compare findings on similarities and differences of physical stressors across ICE environments, a great deal of attention has been paid to life in polar ICE regions where inclement weather, altitude sickness, 24-hour light and dark cycles, and physical confinement, among other things, are identified as potentially hazardous sources of stress on expeditions (Sandal et al., 2006).

## **Salutogenesis**

**Salutogenesis: Definition and Example.** Though the majority of research has pointed to the drawbacks of extended stays in ICE environments, mounting evidence suggests that exposure to such stressful conditions may also elicit positive outcomes (Kjærgaard, Leon, et al., 2015a; Kjærgaard et al., 2013; Ritsher et al., 2007; Smith et al., 2018; N. Smith et al., 2017). Devised by

sociologist Aaron Antonovsky (1979, 1996), salutogenesis served as one of the main precursors to the positive psychology movement that gained substantial traction in the late 1990s (Joseph & Sagy, 2017). Similar to what underpins positive psychology, salutogenesis champions a strength-based approach antithetical to the traditional pathogenic model of human health and behaviour (Vinje et al., 2016), offering an optimistic lens through which to view stress in a variety of unique contexts. A seminal example of salutogenesis in the context of ICE environments was demonstrated in Palinkas' (1991) study where increases in psychological and physiological health were observed in a large group of U.S. Navy crewmen who spent an austral winter in Antarctica. The large group of crewmen exhibited significant increases in self-reliance upon their return home, and for the remainder of their military contracts (5-13 years) had 20% fewer hospital admissions than an unexposed control group. Following this study, as well as recommendations and critiques from prominent researchers, the study of positive growth outcomes have slowly gained traction in the field of ICE research.

**Resilience and Salutogenesis: Important Distinctions.** Resilience, the definition of which is still frequently debated (Southwick et al., 2014), is often described as an individual's ability to bounce back from difficult challenges (Bonanno, 2004). Salutogenesis, on the other hand, can be seen as different from coping through or bouncing back from transient dysregulation due to stressful or otherwise traumatizing experiences (Ong et al., 2006). Instead, it refers to the generation of perceived self-enhancement that manifests as a result of working through the adversity. In this sense, salutogenesis may be seen as a form of building perceived resilience (i.e., increases in perceived personal strength), or an indication of positive coping. However, it may also be viewed as entirely separate from these constructs as it refers to health

promotion whereas resilience and coping are more aligned with the pathogenic paradigm of health protection.

**Post Expedition Growth (PEG).** Applied to ICE environments, the salutogenic model encourages researchers to reimagine stressors inherent in extreme environments as potential catalysts for *post-expedition* improvement in psychological functioning. For the purposes of this study, PEG will be classified in accordance with Tedeschi & Calhoun's (1996) posttraumatic growth paradigm which posits that traumatic or otherwise stressful experiences can lead to increased perceptions of personal strength, appreciation of life, possibilities for the future, relating to others, and spiritual awareness. Much of the present literature on growth across these five dimensions comes from research on individuals who experienced adversity in a variety of different contexts, including, chronic illness (Zeligman et al., 2018), cancer (Jim & Jacobsen, 2008), natural disasters, war (Feder et al., 2008), and bereavement (Calhoun et al., 2010). Personal strength deals with perceived increases in self-reliance and self-confidence. Appreciation of life includes an increased appreciation for life in general as well as the "smaller" aspects of life that may have been taken for granted prior to the challenges faced. New possibilities relates to new opportunities or life paths that were unforeseen before the stressful experience occurred. Relating to others taps into positive changes in the capacity for empathy and connecting with others. Finally, spiritual change refers to an enhanced understanding of both spiritual and existential matters (Tedeschi & Calhoun, 2004).

*Correlates of PTG:* Post-expedition growth literature is sparse (N. Smith et al., 2017). What literature exists does not shed much light on which predisposing factors may be contributing to growth outcomes in ICEs. Research on PTG, however, is more substantial and could provide relative insight into contributing factors for growth following adversity. A

previous meta-analysis on 102 studies of individuals who had lived through trauma reported that coping by way of positive reappraisal and optimism were strong predictors of moderate to high levels of growth in its aftermath (Prati & Pietrantonio, 2009). Other studies have acknowledged relationships between certain “Big 5” personality traits (i.e., conscientiousness, agreeableness, openness, extroversion, and neuroticism) and increases in growth (Tedeschi & Calhoun, 1996). Specifically, extroversion, agreeableness, and openness were all found to have positive correlations with increased perceptions of growth following trauma. While results from these studies may not be generalizable across populations, it is feasible that certain coping styles, as well as personality factors, types of environment, group composition, and other contextual elements could play integral roles in how growth manifests in other circumstances – such as ICE environments.

## Systematic Review of PEG

### Objectives

To gain a more fundamental understanding of PEG and its determinants in ICE environments, a systematic search of relevant literature was conducted. The principle aim of this review was to examine ICE literature that assessed PEG specifically, and salutogenesis broadly. Literature was assumed to be limited in this area. Therefore, the search was designed to be as inclusive as possible and sought to incorporate findings from a variety of unique ICE environments, such as polar and mountaineering expeditions, sailing circumnavigations, submarine and subterranean environments, and other space-analog habitats. Additionally, as they are frequently linked to posttraumatic growth, coping behaviors were also looked to as potential determinants of PEG. Personality and other predictive factors, where evident, were also assessed.

### Methods

The search protocol for this systematic review was developed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009).

**Search Strategy.** After a preliminary search and review of relevant research, selection of keywords was determined based on salient characteristics of and common settings for ICEs, as well as database-specific terms for post-expedition change/growth (e.g., “Posttraumatic growth” and “Personal growth”). Due to its prevalence in the final list of included articles, post-expedition changes in “personal values” ultimately became a construct of interest but was not included in the initial search. The final search was conducted using the following keywords: "Adjustment" OR "Change" OR "Adaptation" OR "Adaptability" OR "Coping behavior" OR "Personal growth" OR "Posttraumatic growth" ) AND ( "Submarine" OR "Submersible" OR

"Extreme Environment\*" OR "Unusual Environments" OR "Antarctic\*" OR "Polar" OR "North Pole" OR "Confined Environment" OR "Mountaineer\*" OR "Isolated Confined and Extreme" OR "Hyperbaric Chamber" OR "Space Analog" OR "Analog environment" OR "Underwater Environment."

Searches of PsycINFO, PsycARTICLES, and PubMed databases were performed in January 2020 by the first author and cross-checked by a second author to enhance reliability. Article citations were then uploaded to The Covidence Online software program for title and abstract review by four different study authors. Eligibility criteria were: (1) peer-reviewed empirical studies that (2) measured post-expedition psychological growth or positive changes in individuals (3) over the age of 18 years old who (4) had spent more than one month in an ICE environment. Spaceflight environments were not included in eligibility criteria, as the focus of the current study centered on space-analog (i.e., ICE) environments on earth, whereas spaceflight includes too many idiosyncratic variables when compared to the types of isolated environments considered in this study. A manual search of relevant articles was also performed, as database searches using specific keywords and phrases are often mislabeled or marked by study design and missed in the electronic search process (Armstrong et al., 2005). The manual search targeted articles referenced in research that met eligibility criteria, as well as articles known to examine the specific constructs of interest for this study (including, ironically, spaceflight).

**Appraisal Tool for Cross-Sectional Studies (AXIS).** The AXIS tool was used to assess the quality of studies included in the review that qualified as cross-sectional, cross-sectional/prospective, and cross-sectional/case studies. Three graduate students were assigned to score 20 questions related to the study aim and design, sample size justification, target population, validity and reliability, methods, conflict of interest, and potential ethical concerns.

Scorers were optioned to respond “yes”, “no” or “can’t tell” to each item (Downes et al., 2016). Given that a portion of the studies reviewed were either single case studies or studies of small sample sizes (i.e., expeditions < 12 people), were determined to be not applicable (i.e., “cannot tell”) and were removed from consideration of overall study quality. After all articles were rated, each article was then classified as “strong” (15 criteria met), “moderate” (10-15 met), “weak-moderate” (5-10 met) or “weak” (0-5 criteria met) based on the number of “yes” responses received. When there was a disagreement between raters on a study or item a third rater was called in to assist the first author in making a final decision.

**Assessment and Operationalization of Post-expedition Growth.** As demonstrated by Palinkas’ (1991) aforementioned study on navy crewmen, salutogenic outcomes following ICE expeditions have the potential to be assessed in a number of unique ways (i.e., pre-post expedition improvements in both physical and psychological health). This study, however, attempts to assess positive psychological changes post-expedition with an emphasis on PEG, a construct derivative of Tedeschi & Calhoun’s (1996) paradigm of Post-Traumatic Growth that uses the Post Traumatic Growth Inventory (PTGI) to measure growth within five specific dimensions. As it was expected that a search of PEG would yield a small number of studies, literature that used other means – such as post-expedition qualitative interviews; and positive pre-post expedition psychological changes (e.g., distinctive improvements in positive affect) – was included for review in the analysis.

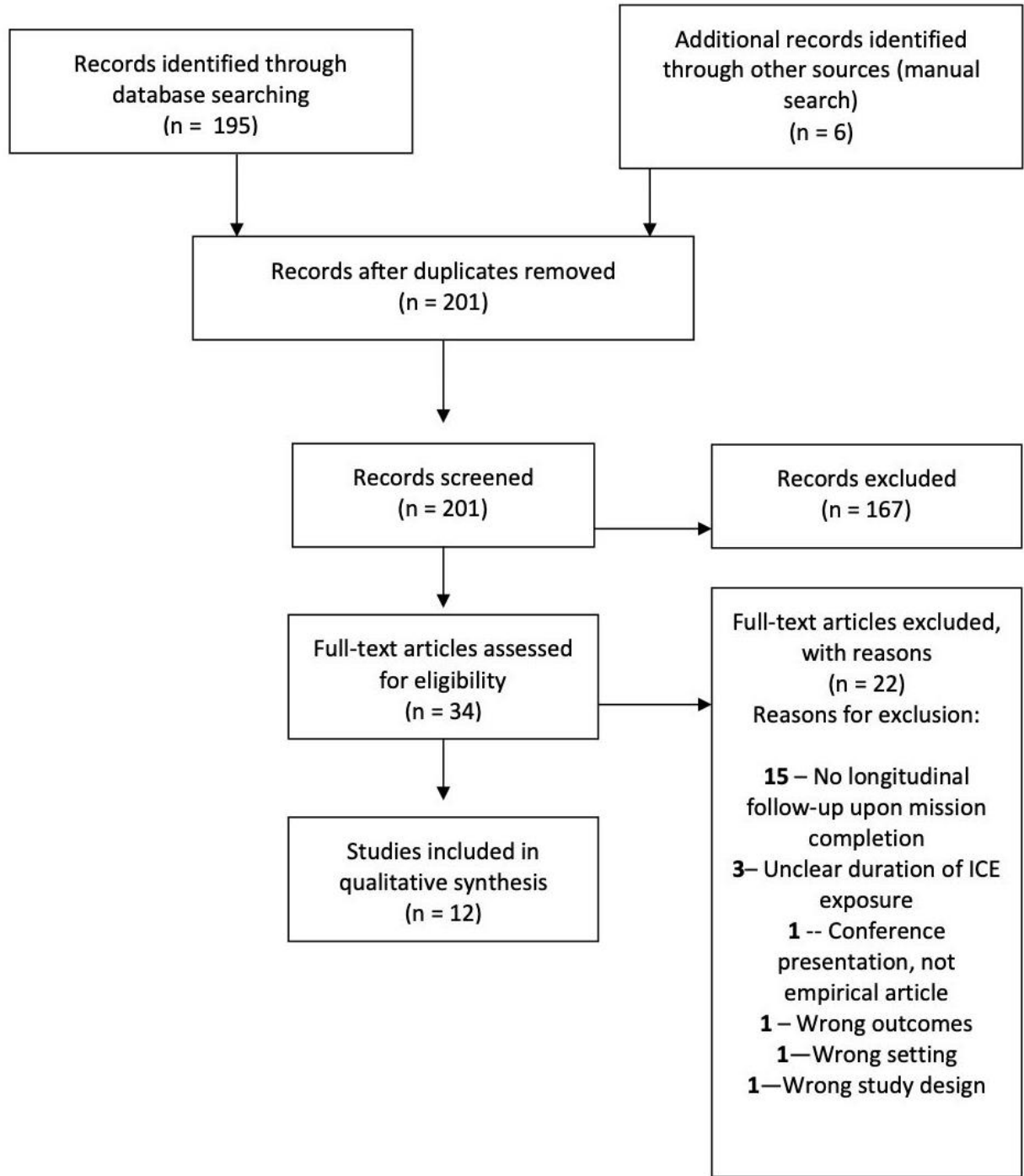
### **Results: Systematic Review**

After initial screening for duplication and ineligible studies ( $n=139$ ),  $n=28$  were deemed eligible for review. Additional manual retrieval of known studies brought the total of  $n=34$  studies considered for inclusion. Each of these 34 articles was then assigned to two raters (PMN

and CMS) who evaluated the suitability of each one for inclusion. Predominantly, studies that (1) lacked post-expedition follow-up (15/34) or (2) had unclear parameters for duration of ICE exposure (3/34) were excluded. Where a discrepancy occurred in the decision for inclusion, a third rater (JIA or KS) was called in to make a definitive decision. Ultimately, 12 studies were deemed appropriate for inclusion in our study (see Figure 1 for diagram of the search process).

**Figure 1**

*PRISMA Flowchart*



**Study Quality Ratings.** Results from the axis quality assessment conducted on the 12 eligible studies included in the review are shown in Figure 2. Ultimately, all studies were deemed to be of moderate (67%) to strong (33%) study quality. Specifically, the analysis demonstrates that all but two studies (Leon et al., 1989; Suedfeld et al., 2017) had clear objectives that centered around those who frequent ICE settings: military patrol teams, polar and sea explorers, mountaineers, and other expeditioners.

Though sample sizes were generally small across studies, the majority were considered to be justified in terms of reflecting the composition of a team (i.e., 4-12 individuals) operating in a typical ICE environment. That said, due to the uncontrolled nature of the environments in which these teams were living and working, it was determined that a larger sample (i.e., multiple teams of similar composition operating in comparable environments) would have been ideal and lead to more reliable findings. The two studies with the most robust samples were the Moulton et al. (2015) study, which also utilized a rigorous longitudinal design (and should be the gold standard for research of this nature), and the Blight and Norris (2018) study.

Four studies (Kjærgaard, Leon, et al., 2015b; Leon et al., 1989; Leon et al., 2011; Moulton et al., 2015; Suedfeld et al., 2017) failed to address the methodology used for determining statistical significance. Three studies (Kjærgaard et al., 2013; Leon et al., 1989; Suedfeld et al., 2017), did not sufficiently describe the methods used, making them difficult to replicate.

All studies were found to report internally reliable and consistent data. That is, all but one study (Moulton et al., 2015) described basic data and presented results for all analyses described in the methods.

Five studies (Kahn & Leon, 1994; Kjærgaard, Leon, et al., 2015a; Kjærgaard et al., 2013; Leon et al., 1989; Leon et al., 2011; Suedfeld et al., 2017) failed to address study limitations and

the majority of studies also failed to address whether or not ethical permissions were granted prior to the onset of the study (though due to the interviewing components of many of these studies, ethical approval was presumed).

**Table 1**

*Total AXIS Quality Score*

<b>Total AXIS score (M)</b>	<b>Author(s)</b>	<b>n (%)</b>
15 AXIS Criteria Met (strong)	Blight and Norris (2018); Kjærgaard, Leon and Fink (2015); Kjærgaard, Leon, et al. (2015a); Smith et al. (2018)	4 (33%)
10-14 Criteria Met (moderate)	Kahn and Leon (1994); Kjærgaard et al. (2013); Leon et al. (2011); N. Smith et al. (2017); Suedfeld et al. (2017); Moulton et al. (2015); Leon et al. (1989); Kjærgaard, Leon, et al. (2015b)	8 (67%)

**Sample Demographics.** Overall, 723 ICE expeditioners were studied (see Table 2). Men comprised 77% of the total sample which consisted predominantly of individuals between the ages of 20 and 50 years. Cross-sectional retrospective and/or retrospective case study designs were the most frequently used methodology (75%), while a smaller portion of studies used prospective, longitudinal methods (25%) to assess the fluctuation of various psychological phenomena over time.

The 12 eligible studies (see Table 3) reflect a variety of unique ICE settings. Most (72.7%) post-expedition evaluations of growth occurred following prolonged (i.e., 1 + month/s) stays in polar environments. Just over half of these polar studies were conducted in northern hemisphere environments (e.g., Greenland and Canada), and half evaluated Antarctic expeditions. Additionally, 25% evaluated solo sojourns and 33% assessed small, two-person

teams of expeditioners. Of the studies included, only three (Blight & Norris, 2018; Moulton et al., 2015; N. Smith et al., 2017) had samples that exceeded  $n=12$  participant

**Table 2**

*Author, Sample Size, Study Design, Age, and Gender*

Authors (year)	Sample Size (n)	Study Design	Age: $M$ years <sup>a</sup> (SD <sup>b</sup> ); range <sup>c</sup> ; median <sup>d</sup>	Gender
Blight and Norris (2018)	225	*CSS	56-75 <sup>c</sup>	74.9% m 24.9% f
Kahn and Leon (1994)	4	CSS	38 <sup>a</sup>	100% f
Kjærgaard et al. (2013)	12	CSS	28.5 <sup>d</sup>	100% m
Kjærgaard, Leon and Fink (2015)	12	CSS	28.5 <sup>d</sup>	100% m
Kjærgaard, Leon, et al. (2015a)	1	*CS/*PL	29	100% m
Leon et al. (1989)	8	CSS	31 <sup>d</sup>	12% f 88% m
Moulton et al. (2015)	383	PL	30-39 <sup>c</sup>	72% m 28% f
Smith et al. (2018)	4	CSS	45 <sup>a</sup>	100% m
Suedfeld et al. (2017)	1	CS/CSS	45	100% m
Kjærgaard, Leon, et al. (2015b)	1	CS/PL	29	100% m
Leon et al. (2011)	2	CSS	33.5 <sup>a</sup>	100% m
N. Smith et al. (2017)	83	CSS	42.54 <sup>a</sup> (16.5 <sup>b</sup> )	87% m 13% f
<b>Total</b>	**723 (N)	CSS: 75% CSS/PL: 25% CS/PL or CSS: 25%		77% m (544) 23% f (179)

*\*Note:* **CSS** = Cross-sectional; **PL** = Prospective, Longitudinal; **CS** = Case Study. \*\*Kjærgaard, Leon, & Venables (2015) and Kjærgaard, Leon, & Venables (2014) used the same subject, and Kjærgaard Leon, Venables, & Fink (2013) and Kjærgaard, Leon, & Fink (2015) used the same subjects.

**Table 3***Location of ICE Environment and Data Collection Methods Used*

<b>Author</b>	<b>ICE Environment</b>	<b>Measures</b>	<b>Post-Expedition Data Collection Adjustment Period</b>
Blight and Norris (2018) <sup>1</sup>	Antarctic Expedition	PECI-R	Unspecified post-expedition
Kahn and Leon (1994) <sup>2</sup>	Antarctic Expedition	MMPI-2; MPQ; PANAS; Debriefing Interview	1 day
Kjærgaard et al. (2013) <sup>3</sup>	Team Arctic Expedition (Greenland)	NEO-PI; TriPM; PVQ; PTGI; Deb. Int.	3 weeks
Kjærgaard, Leon and Fink (2015) <sup>4</sup>	Team Arctic Expedition (Greenland)	PANAS; Coping Checklist; Deb. Int.	3 weeks
Kjærgaard, Leon, et al. (2015a) <sup>5</sup>	Solo Sailboat Circumnavigation	LOC; PTGI; NEO-PI-R; Tri-PM; PVQ; MPQ; Deb. Int.	1 mo.; 6 mo.; 1 year
Leon et al. (1989) <sup>6</sup>	Team Arctic Expedition Ellsmere Island, Canada	WCQ; POMS; Deb. Int.	2-3 weeks
Moult et al. (2015) <sup>7</sup>	Antarctic Expedition	CiOQ; FFSS; COPE; FWI; WHOQOL- BREF	2 mo. & 12 mo.
Smith et al. (2018) <sup>8</sup>	Team Hyper-arid Expedition (Empty Quarter)	UCL; PANAS	1 mo. & 4 mo.
Suedfeld et al. (2017) <sup>9</sup>	Solo Antarctic Expedition	TCA coded for PTGI, PVQ; Deb. Int.	1.5 mo.
Kjærgaard, Leon, et al. (2015b) <sup>10</sup>	Solo Sailboat Circumnavigation	PANAS; LOC; PTGI; Deb. Int.	1 mo.; 6 mo.; 1 year
Leon et al. (2011) <sup>11</sup>	Team Arctic Expedition	PVQ; PTGI; NEO; MPQ; UCL; Deb. Int.	1 mo.

N. Smith et al. (2017)<sup>12</sup>

Mountaineer Expeditions

PTGI: SVS;  
BRS; BFI;  
PSS;Assessment  
varied between  
participants

---

*\*Note: PEGI-R = Post Experience Change Inventory – Revised; MMPI-2 = Minnesota Multiphasic Personality Inventory 2; MPQ = Multidimensional Personality Questionnaire; PANAS = Positive and Negative Affect Schedule; PVQ = Portrait Values Questionnaire; PTGI = Post Traumatic Growth Inventory; LOC = Levenson Locus of Control Scale; NEO-PI-R = NEO Personality Inventory – Revised; TRI-PM = Triarchic Psychopathy Measure; WCQ = Ways of Coping Questionnaire ; POMS = Profile of Mood States; CIOQ = Changes in Outlook Questionnaire; FFSS = Family Functioning Styles Scale ; COPE = Coping Inventory; FWI = Family Work Interference Scale; WHOQOL-BRIEF = World Health Organization Quality of Life Scale - Brief; UCL = Utrecht Coping List ; SVS = Subjective Vitality Scale; BFI = Big Five Inventory ; PSS = Perceived Stress Scale.*

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**Quantitative Measurement of Post-expedition Growth.** Growth measurements were typically assessed at one- to two-months post-expedition. Over half of the studies assessed personal growth using modified versions of the PTG-I (e.g., Post Experience Change Inventory-Revised; Blight and Norris (2018)), including one study that used thematic content analysis (TCA) coded for the PTGI indicators of growth (Suedfeld et al., 2017). In studies conducted prior to the advent of the PTGI, debriefing interviews were used to ask participants about post-expedition changes and what they learned about themselves from their experiences (Kahn & Leon, 1994; Leon et al., 1989) but were not explicitly directed toward answering questions about PEG per se, as the construct was not yet operationalized. Similarly, across studies, salutogenesis was measured in more ways than administration of the PTGI. For example, Smith et al. (2018) assessed changes in coping style (i.e., reduction in avoidance behavior), reduction in depressive symptoms, and increases in positive affect pre- to post expedition as positive outcomes. Moul et al. (2015) and (Smith et al., 2018) also measured salutogenic changes as a function of change in psychological affect pre- to post-expedition but did not utilize iterations of the PTGI to measure growth

Results of this niche area of ICE literature indicate that PEG indeed occurs at a moderate level following endeavors in a variety of unique ICE settings. Specifically, perceived increases in the dimensions of “personal strength” and “new possibilities” – traditional facets of Tedeschi and

Calhoun's (1996) posttraumatic growth inventory (PTGI) – were observed in six studies, including those following an individual who recently completed a solo sailing circumnavigation of the globe (Kjærgaard, Leon, et al., 2015a, 2015b), studies of group and solo expeditions in Antarctica (Blight & Norris, 2018; Suedfeld et al., 2017), and patrol team operations in northern Greenland (Kjærgaard, Leon, & Fink, 2015; Kjærgaard et al., 2013). On the other hand, the least changed dimension of PEG across studies was spiritual change. A lack of change in spirituality was noted in the majority of studies that used variations of the PTGI scale, with the exception of Leon et al. (2011), where change within this dimension increased significantly post-expedition for one of two expeditioners on a two-month journey to the north pole. Additionally, Blight and Norris (2018), a study assessing PEG in a large sample of Antarctic expeditioners, found that those between the ages of 76 and 100 years perceived significantly greater spiritual change ( $p = .047$ ;  $d = .540$ ) than younger individuals between the ages of 18 and 35 years.

**Qualitative Measurements of Growth.** Seven studies used debriefing interviews that were conducted post-expedition and centered around team cohesion, coping styles, group achievements as well as personal gains, and lessons learned from experiences in ICEs. Across studies, no consensus was reached regarding when studies should ideally be conducted following expeditions; duration of time between departure from Antarctica and post-expedition interviews ranged from one day to several months. Further, only three studies (Kjærgaard, Leon, et al., 2015a, 2015b; Moulton et al., 2015) were prospective in nature, and utilized follow-up interviews to assess longitudinal changes at varying time points post-expedition.

In qualitative studies that asked about post-expedition changes or lessons learned, PEG was approximated from responses that demonstrated perceptions of self-enhancement or growth. This is important, especially for the studies that preceded the operationalization of PEG (or

PTG), because it demonstrates that qualitative methodologies can be used for detecting growth when quantitative options for such measurements were not used, or were unavailable. For example, in reflecting on a successful north-pole sojourn, an expeditioner from Leon et al. (1989) revealed perceived increases in self-reliance, an outcome that links to the PTG dimension of personal strength (Osei-Bonsu et al., 2012; Taku et al., 2008; Tedeschi & Calhoun, 1996):

“I think I learned a lot...that inner journey that we all take. Something that you can’t really capture in everyday life. Certain circumstances that give you that feeling of self-reliance...” (Leon et al., 1989, p. 175).

Other qualitative studies found evidence for perceived increases in openness to new experiences (e.g., “I learned a lot about myself...being more open-minded, tolerant” (Kjærgaard et al., 2013, p. 659)), relating to others (e.g., “Before it was all about me; now I am together with my girlfriend...I’ve found good answers to how I want to live my life. I had to sail around the world for nine months to find out I am a social person” (Kjærgaard, Leon, et al., 2015a, p. 201) as well as a newfound appreciation for life. Similarly, congruent with quantitative findings on growth, less definitive evidence of spiritual changes was reported from expeditioners’ narrative accounts.

**Temporal Effects of ICE Environments on PEG.** Research that considered the temporal effects of ICE exposure on personal growth have found that longer durations spent in these environments are more likely to contribute to salutogenic outcomes. A recent cross-sectional study of ex-Antarctic expeditioners conducted by Blight and Norris (2018) found that those who had spent longer periods in Antarctica (i.e., 19 months to 3 years) reported significantly higher levels of perceived strength and appreciation of life than less experienced (1-6 months) expeditioners. This observation parallels Suedfeld’s (2012) findings on PEG in Russian cosmonauts which demonstrated that individuals who had spent more time in space (i.e., one year or more compared to less than one year) reported significantly more positive changes in

PEG. Contrary to these findings, Moulton et al. (2015), who examined the impact of relationship status on positive psychological changes post-expedition, found that increased duration of stay for single expeditioners led to significant increases in negative psychological changes measured at two-months post-expedition.

**Predictors of PEG.** There were few studies that assessed predictors of PEG. Moulton et al. (2015), a study that measured salutogenic changes but did not explicitly measure PEG per se, found that the use of humor and religious coping styles predicted improved psychological health post-expedition. In contrast, they also found that higher pre-departure levels of congruency within an expeditioner's family domain (e.g., support and togetherness) were predictive of negative psychological changes post-expedition. Other studies drew correlations between psychological factors and healthy adaptation during expeditions (i.e., linkages between personality, coping, and resilience), but did not examine such predictors of PEG – as distinct from coping or resilience – in their analyses. To our knowledge, Smith et al. (2017) is the only study to date that sought to assess promotive variables of PEG in ICE settings. Results from their study suggest that higher perceived stress and the big five personality traits of agreeableness and openness are predictive of personal growth post-expedition. These findings were unsurprising to the authors as stress is often conceptualized as a key catalyst of growth in the PTG literature, as are agreeableness, openness, and conscientiousness (Tedeschi & Calhoun, 1996; 2004). The authors also found that resilience did not predict personal growth outcomes following expeditions, a finding deserving of follow-up and one that speaks how to these constructs are distinct.

## **Discussion and Future Aims for PEG Research in ICEs**

Initial results from the systematic search revealed a high volume of literature focused on the occurrence of positive adaptation over the course of challenging expeditions in isolated environments. The body of work that addresses the correlates of these sorts of adaptive outcomes was similarly robust. In contrast, after screening for articles that met search criteria, very few were found that sought to measure the incidence and determinants of PEG specifically, or salutogenesis broadly, meaning how people adapt and grow once the actual ICE experience is complete. In some ways, this is an interesting and rather surprising finding. As mentioned earlier, ICE environments are an important research analog for long duration spaceflight missions. A key incentive for conducting psychological research in ICE environments is to address countermeasures for psychosocial threats astronauts might face in outer space, an area of seeming focus by governments and industry alike. Follow-up studies that assess PEG with a view towards addressing issues anticipated following long duration spaceflight could also make seminal contributions to identifying astronauts who are both (1) psychologically suited for a lengthy trip into deep space as well as (2) equipped to cope and, ideally, thrive despite the multitude of challenges they are likely to face upon return home to earth. Moreover, in addition to assessing long-term well-being, it would also be of interest to determine which individuals are expected to go on repeat expeditions to ICE environments. If an individual struggles to readjust after a lengthy expedition then occupational stress injuries, attrition rates, and, consequently, cost vs. benefit ratios, may be at higher risk of increase. Thus, post-expedition assessment of well-being and growth seems necessary for the health and safety of individuals returning from ICE environments.

**ICE Environments and Salutogenesis.** Despite the nascency of PEG research, the small number of articles that did meet the systematic search criteria highlight the promising potential for future research of salutogenic outcomes following experiences in highly stressful ICE environments. The ubiquitous nature of PEG across studies, even and especially from those that employed a mixed-method (i.e., inventories and debriefing interviews) approach to measuring growth, is compelling. In considering the diversity of challenges faced, from month-long treks to the north and south poles, to small teams operating during winter months in northern Greenland, it is remarkable that most expeditioners seem to have benefitted from surmounting the inclement nature of their surroundings – even in instances when the goal of the expeditions was not met (e.g., Kahn & Leon, 1994; Leon et al., 1989). Perceived improvements in personal strength and heightened appreciation of life were particularly prevalent amongst expeditioners in a variety of different contexts (Blight & Norris, 2018; Kjærgaard, Leon, & Fink, 2015; Leon et al., 1989; Suedfeld et al., 2017). Nonetheless, further contributions to the field of PEG research are needed, especially as ICEs may provide a “laboratory” for the field of psychology to further study how individuals can surpass resilience and experience growth in adversity’s aftermath.

In order to substantiate existing literature on ICE environments, it is necessary to continue the work of evaluating specific determinants of PEG, and, conversely, how risk factors might potentially inhibit growth. As the global population faces similar social circumstances amidst the current outbreak of COVID-19, this topic seems particularly compelling and may serve as a springboard for future study of how adaptation and subsequent growth may occur in the aftermath of adversity faced in current and evolving contexts of isolation and confinement.

### **Research Questions and Objectives**

- **What are the positive outcomes of individuals in the aftermath of ICE exposure? Is the occurrence of PEG common?**
- **What are the correlates of PEG following ICE exposure?**
- **What factors may be inhibiting PEG?**

The main purposes of this study are to elucidate the positive and negative outcomes of individuals following prolonged exposure to isolated and confined polar environments, and to take an exploratory approach in determining which factors may be predicting these salutogenic outcomes after polar expeditions. Conversely, the study will also examine factors suspected to diminish, or impede, personal growth following challenging experiences “on the ice.” For this reason, the Adverse Childhood Experiences (ACE) questionnaire will be utilized to determine whether participants with a history of traumatic childhood experiences may have a decreased capacity for growth. Last, due to the present context of COVID-19, homebound expeditioners are likely to continue to face prolonged exposure to isolated and confined conditions. Though unfortunate, this context provides us with the unique opportunity to assess the incidence of perceived growth in the aftermath of an extreme expedition and amidst a global pandemic.

### **Potential Correlates and Predictors of PEG**

To our knowledge, only one prior study has sought to examine the correlates of PEG (i.e., N. Smith et al. (2017)); thus, substantial research in this area has yet to be done. As such, our study will take an exploratory approach by attempting to identify a variety of correlates and predictor variables to enrich our understanding of what may catalyze or inhibit PEG outcomes. Based on theory and prior research, of particular interest in this study are the contributions of adverse childhood experiences, personality traits, proactive coping strategies, personal values, spirituality, mindfulness and the temporal effects of ICE exposure.

**ACEs.** Adverse childhood experiences (ACEs) are potentially traumatic events that range from instances of overt maltreatment (i.e., abuse and neglect), to those associated with being

exposed to unsafe or threatening environmental conditions (e.g., living with someone who suffers from mental illness or alcoholism). Prevalence rates of adults with at least one ACE are high, ranging from 25-70% in various U.S. community-based samples (Thomson & Jaque, 2018; Ujhelyi Nagy et al., 2019). Despite strong evidence that indicate ACEs can have a negative impact on psychological well-being in adulthood (Bryan, 2019; Giovanelli & Reynolds, 2021), a growing number of studies demonstrate that there are many adults who remain resilient (Bonanno, 2004), and even experience growth in the aftermath of childhood trauma and aversive experiences (Brooks et al., 2021; Sheridan & Carr, 2020).

To date, an assessment of how ACEs may be influencing growth outcomes in populations exposed to ICE conditions has yet to be done. Given the high prevalence of ACEs in adult community samples, and the capacity they have to either inhibit or catalyze growth, ACEs will be examined in our study both to determine the incidence of ACEs within our unique sample, as well as determine whether participants with ACEs are more or less apt to perceive growth post-expedition. While it seems that those with higher ACE burden might find it more challenging to surmount ICE challenges, another possible scenario may be that some individuals, such as those working on close-knit high-functioning teams, may find the social environment of Antarctica more supportive and amenable to growth than those with lower-ACE burden who are used to secure and supportive relationships.

**Personality Traits, Trait Resilience, and Trait Mindfulness.** Of the variables to be examined, resilience and the big five personality traits of agreeableness, openness to new experience, conscientiousness, neuroticism, and extraversion are the only personality factors that have been studied as correlates of PEG in the context of ICE environments. Smith et al. (2017) reported no significant correlations between resilience and growth, thus indicating the

independence of both constructs within ICE contexts. Smith et al. (2017) also assessed the big five personality traits as associates of growth and reported significant correlations between trait agreeableness, and to some extent openness, and PEG. In this study, we hope to examine trait resilience as a moderator in the relationship between ACEs and PEG, as prior research demonstrates that resilience, though not correlated with PTG, can positively influence the relationship between ACEs and perceived growth in adulthood (Tranter et al., 2020).

To our knowledge this is the first study to date that has sought to examine trait mindfulness as a correlate of PEG. The five mindfulness traits to be analyzed are observation, description, aware actions, non-judgment of inner experience, and non-reactivity. Historically, experiential avoidance is often identified as an etiological risk factor for the development of Post-Traumatic Stress Disorder (PTSD), as well as an inhibitor of PTG (Kashdan & Kane, 2011; Thompson et al., 2011). Conversely, trait mindfulness, and a more accepting orientation towards a traumatic or potentially traumatic experience can lead to positive psychological changes (Mitmansgruber et al., 2009; Vujanovic et al., 2009). In accord, evidence strongly uplifts the utility of mindfulness-based interventions and practice as effective treatment modalities for trauma-exposed individuals (Hopwood & Schutte, 2017). Comparatively fewer studies have examined the specific relationship between mindfulness traits and PTG, though preliminary work supports a positive association between facets of mindfulness and PTG (Hanley et al., 2015). To further existing research in this area, our study seeks to examine the role of mindfulness as a catalyst for PEG following prolonged experiences in Antarctica. Of particular interest are the mindfulness facets of non-reacting, non-judgment, and acting with awareness, as all three could serve to assist expeditioners in evaluating and valuing their experiences with greater frequency, and through a broader lens, thus correlating with higher levels of growth.

**Proactive Coping Strategies.** Greenglass et al. (1999, p. 4) describe a proactive person as one who constantly seeks improvement in their “life and environment” instead of “reacting to a past or anticipated adversity” (p. 4). Research demonstrates that posttraumatic stress and other negative symptoms of trauma do not preclude posttraumatic growth. In fact, the opposite seems to be true, where growth evolves out of proactively working through and learning to cope with the struggle (Bhushan & Kumar, 2012; Prati & Pietrantonio, 2009). As such, it would follow that proactive coping is protective, whereas avoidant coping would be deleterious in the process of generating growth post-expedition.

After reviewing the ICE literature, a small number of studies have identified the incidence of useful coping strategies, such as planful or other problem-focused coping strategies, for expeditioners in facing the challenges inherent in ICE environments (Kahn & Leon, 1994; Leon et al., 1989), yet none have sought to explore whether or not individuals employing these strategies are more or less likely to experience growth upon return home. To identify potential correlations between coping and PEG, the following seven dimensions of the proactive coping inventory will be explored, including the dimension that the measure is named after – proactive coping – as well as reflective coping, strategic planning, preventive coping, instrumental support seeking, emotional support seeking, and avoidance coping. Of particular interest in our study will be the contrasting dimensions of proactive and avoidance coping, and their comparative effects on different dimensions of PEG.

**Personal Values and Spiritual Change.** A study conducted by Suedfeld et al. (2010) reported a number of positive changes as a consequence of astronauts’ experiences living and working on the International Space Station. The variables that showed the most significant changes pre- to post-spaceflight were the personal value priorities of universalism and power (or

social recognition), as well as spirituality. The study, which utilized qualitative methods, found that post-spaceflight astronauts frequently commented and reflected on feeling united with nature, i.e., experiencing awe in response to the unforgettable beauty of viewing earth from outer space, and feeling connected to “God” or a higher power. To confirm and elaborate on these findings, correlations between the personal value priority of universalism and the various dimensions of PEG will be explored. Further, to measure spiritual change I will attempt to use a methodology that enables plurality in terms of how spirituality is defined and experienced by each participant. As research often points to the transcendental nature (i.e., awe-inspiring, unity with nature, feeling connected to something bigger than yourself) of ICE environments (Suedfeld et al., 2012; Yaden et al., 2016) I aim to capture these experiences within the qualitative portion of data collection, and consider them, where appropriate, as alternative indications of spiritual change that more or less represent 1) Feeling more connected to a higher power, and 2) Feeling more connected to nature.

**Temporal Effects of ICE Exposure.** The systematic review was inconclusive regarding temporal effects (i.e., short- vs. long-term ICE exposure) on PEG. Understanding the motivational factors driving the will to return to Antarctica for a second and third expedition may elucidate an understanding of the specific personality types, as well as the emotional and behavioural predispositions that may benefit from exposure to challenging environments and contribute to salutogenic outcomes post-expedition. While such further study could signify a requisite period of ICE exposure for PEG to occur, it could also expose the impact of individual differences, associations that were not made in studies that addressed duration of exposure. Further, a noted limitation of the Blight and Norris (2018) study was that it did not inquire about the period of latency following each participant’s last Antarctic expedition. Perhaps the global

experience of isolation during the COVID-19 pandemic will provide opportunities to more closely examine the relationship between duration of isolation, determinants, and outcomes of PEG, as well as the normative period of time and circumstances following or during exposure before growth occurs. Future research that provides more consistent tracking of growth over time, both during and following expeditions (or isolation and confinement), could provide insight into growth patterns and cycles. Given that most studies varied in terms of when post-expedition measurements were taken, more conscious control over these temporal factors should be exercised in order to develop a more fundamental understanding of when growth is (and is not) most apt to occur post-expedition. Thus, a systematic approach to measuring PEG (e.g., at 6 month increments for up to two years) is also warranted.

### **Hypotheses**

It is hypothesized that 1) participants will, on average, report small to moderate PEG and 2) that the incidence of growth will be greater for those who report higher levels of proactive coping strategies and less for those who report avoidant coping. Predicated on past research, we also hypothesize that 3) the Big 5 personality traits of agreeableness and openness will have a positive, moderate correlation with growth. In a similar vein, and coinciding with past research on astronauts (i.e., Brcic et al., 2011), we also suspect that the personal value priority of universalism will be positively correlated with growth, and, specifically, closely associated with the growth dimension of spiritual change. Further, in line with the findings from the Moulton et al. (2015) and Smith et al. (2017) study we suspect that 4) those who have endured longer periods of time in ICE environments (i.e., 5+ trips) will perceive growth less as the novelty of the experience may have worn down overtime. Accordingly, we suspect that 5) individuals with less experience in ICE environments will perceive growth to a greater degree. In regard to ACEs,

literature suggests that childhood adversity leads to mental health issues in adulthood, but resilience can act as a protective factor (Poole et al., 2017; Tranter et al., 2020). As such, we hypothesize that 6) resilience will moderate the relationship between early childhood adversity and PEG. As prior research has demonstrated the utility of mindfulness in promoting PTG, as well as adaptation in ICEs and other extreme environments (Pagnini et al., 2019), we also suspect that 7) certain facets of mindfulness, specifically the facets of non-reacting and awareness will be associated with higher levels of PEG.

Last, we will examine how Antarctica experiences may enhance expeditioners' ability to cope and experience growth in the midst of a global pandemic. Social and geographical isolation are hallmark characteristics of living and working in isolated environments such as Antarctica. Therefore, 8) we expect participants will express feeling more capable and suited to surmount the social challenges associated with COVID-19 because of their experiences "on the ICE." This final hypothesis will be explored qualitatively.

## Methodology

### Participants and Procedures

The study gained ethical approval from The University of Victoria Human Research Ethics Board. Participants were recruited from an online database of scientific research in Antarctica using an email that comprised a brief introduction to the study, limits of confidentiality and anonymity, a recruitment flyer, and a link to our survey. A letter of informed consent with information about the study was also included in the introduction to the survey (see Appendix A for recruitment materials and Appendix B for Letter of Information/Implied Consent).

At the end of the survey, participants were asked if they were willing to engage in a follow-up interview conducted via a secure (end-to-end encrypted) videoconferencing platform regarding their experiences in Antarctica. They were also optioned to participate in a follow-up survey in six months' time.

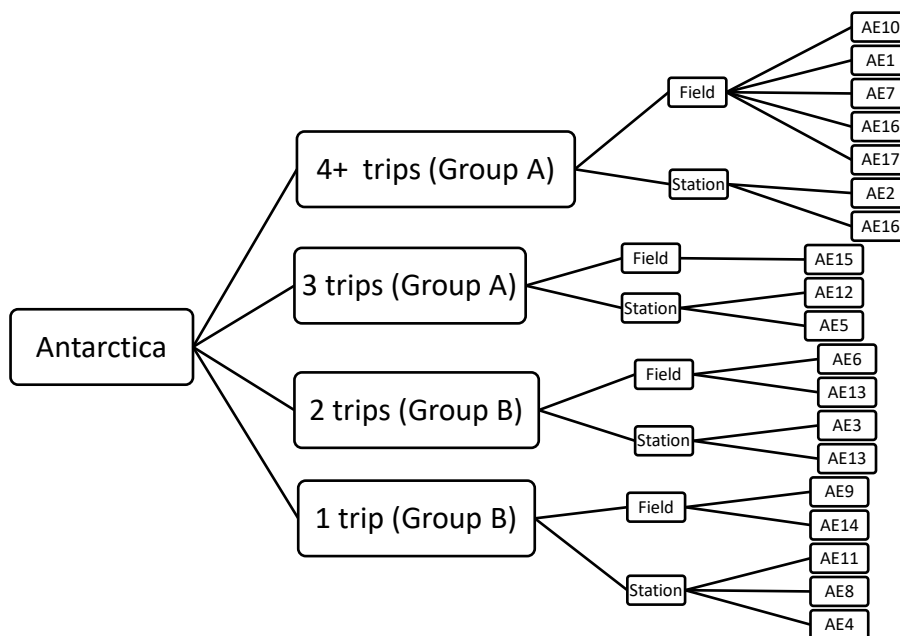
The target population was English-speaking polar expeditioners over the age of 18 years who spent longer than one month living and working in remote areas of Antarctica. As temporal effects on the exhibition of PEG were of interest, the duration of time since returning from Antarctica was not a reason for exclusion from the study. Overall, 73% of participants completed service in Antarctica within one year of completing the study's survey. Participants were recruited using an email template that was disseminated by the study's first author as well as third party researchers with connections to expeditioners with past experiences in Antarctica.

**Sampling Method.** Typically, because of the scarcity of individuals working in remote environments in Antarctica, sample sizes for studies of this nature are relatively small. Based on a power analysis computed in R for a moderate effect size of  $d = .50$ ,  $p = .05$ , power = .80, 50

was deemed to be a sufficient sample size for our planned analyses. In order to effectively reach a saturation point for qualitative analyses, we required between 10 and 20 participants for our interview. From the original pool of participants in the quantitative analysis, purposive sampling was used to select 17 individuals for qualitative interviews. Before analyses were conducted, the pool of qualitative participants was divided into two groups (A and B) by level of remoteness experienced (i.e., field camps or research stations) and total number of trips (1, 2, 3, or 4+ trips) to Antarctica. The main reason for purposive sampling was to saturate the sample with those who had undergone a variety of unique Antarctic experiences. See Figure 2 for an illustration of purposive sampling procedures. A more thorough description of qualitative setting, procedures, and analysis is included under the heading “Qualitative Interviews” below.

**Figure 2**

*Purposive Sampling Based on Two Level Factors: Number of Trips, and Degree of Remoteness*



## Measures

**Demographic variables.** Participants provided demographic information regarding their age, sex, gender, and ethnicity. Additionally, participants responded to items relating to approximate amount of time spent in Antarctica, number of trips taken, duration of time since their most recent expedition, and general locations of where they were stationed. Further, because of the highly unique timing of data collection for this study, questions regarding participants' experiences living through the global COVID-19 pandemic (specifically, different experiences of social isolation and confinement) were asked. Last, questions derived from the adverse childhood experiences (ACEs) questionnaire (Felitti et al., 1998) were utilized to assess participants' history of childhood abuse and trauma.

**Brief Resilience Scale (BRS).** The Brief Resilience Scale (Smith et al., 2008) was used to assess expeditioners resilience. The BRS contains six items that measure the ability to recover or “bounce back” from stress. Participants were asked to respond to each item using a 5-point Likert scale ranging from 1 (*strongly agree*) to 5 (*strongly disagree*). The BRS has reported high levels of internal reliability in large independent samples with alpha coefficients ranging from .80 - .91 (Smith et al., 2008).

**Schwartz Short Value Scale (SSVS).** The Schwartz Short Value Scale (SSVS) (Lindeman & Verkasalo, 2005) is a shortened, ten-item version of the Schwartz Value Survey (SVS). The SSVS was used to measure the ten broad value priorities of power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity, and security. Participants were asked to rate the importance of these values on a Likert scale of 0 (*Opposed to my principles*) to 8 (*Of supreme importance to my principles*). The SSVS has reported high levels of internal consistency and reliability ( $\alpha = .88$ ).

**Post Experience Change Inventory-Revised (PECI-R).** The PECI-R (Suedfeld et al., 2012) is a variation of the PECI including the same 21 items of the original version with the inclusion of 4 new items specific to spiritual change. This inventory was used to measure PEG, and comprises items designed to measure changes in “relations to others”, “new possibilities”, “personal strengths”, “spiritual change”, and “appreciation of life”. Suedfeld (2012) adapted items on the PECI-R to refer specifically to experiences in Antarctica (e.g., “as a result of my experiences in *Antarctica*, I have changed what is important in my life.”). Participants were asked to indicate the degree to which statements reflected their experiences in Antarctica on a Likert scale of 1 (e.g., “I did not experience this change as a result of my experiences(s) in Antarctica”) to 6 (“I experienced this change to a very great degree as a result of my experience(s) in Antarctica.”). The PECI has been used in past research that explored post-expedition changes following experiences in ICE environments. In this literature, alpha coefficients for the PECI subscales range from .77 to .97 (Blight & Norris, 2018; Ihle et al., 2006). In line with the methodology provided by Jansen et al. (2011), PEG levels will be dichotomized in the following way: mean scores of 0-1 = no growth at all to very small, 1-2 = very small to small, 2-3 = small to moderate, 3-4 = moderate to great, and 4-5 = great to very great).

**Big Five Personality Inventory (BFI).** The Big Five Inventory is a 44-item self-report questionnaire and was used to assess the big five personality traits (John et al., 1991) of *openness*, *agreeableness*, *conscientiousness*, *extraversion*, and *neuroticism* in each expeditioner. Participants were given a series of statements and asked to indicate the degree to which they agree or disagree with each one using a Likert scale of 1 to 5. Internal consistency for the BFI is reported to be high across validation procedures ( $\alpha = .77 - .81$ ; Fossati et al. (2011)).

**Five Facet Mindfulness Questionnaire (FFMQ-SF) – Short Form.** The Five-Facet Mindfulness Questionnaire short form (Bohlmeijer et al., 2011) is a 24-item self-report questionnaire that was used to assess the “five facets” of mindfulness referred to as *observing, describing, acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience*. These five facets were measured by asking participants to indicate the degree to which each scale item applies to them, using a 5-point Likert scale from 1 (*never or very rarely true*) to 5 (*almost always or always true*). The FFMQ-SF has been shown to have good internal consistency with alpha values ranging from .73 to .91 (Bohlmeijer et al., 2011).

**Proactive Coping Inventory (PCI).** The Proactive Coping Inventory (Greenglass et al., 1999) measured multidimensional coping strategies. Participants were asked to respond to 55 items measured on a 4-point Likert scale ranging 1 (*never*) to 4 (*always*) and organized into seven separate scales, which are as follows: (1) proactive coping, (2) reflective coping, (3) strategic planning, (4) preventive coping, (5) instrumental support seeking, (6) emotional support seeking, and (7) avoidance. The PCI reports high levels of internal reliability with alpha coefficients ranging from .85 to .80 in two large, representative samples (Greenglass et al., 1999).

## **Analyses**

**Quantitative Analyses.** For the quantitative portion of the study, aggregated scores for each of questionnaires/subscales were computed, along with descriptive statistics to provide insight into the duration (e.g., length of stay, number of trips to Antarctica, time elapsed since most recent trip to Antarctica) and “type” (e.g., summer vs. winter, location of stay) of expedition.

*Temporal Effects:* To assess temporal effects, expeditioners were categorized into three groups based on the cumulative duration of time they spent working and living in Antarctica:

more experienced (5+ trips), some experience (2-4 trips), and less experienced (1 trip). Groups were dichotomized in this way to create roughly equally sized groups. A one-way analyses of variance (ANOVA) was then used to examine differences in growth according to the aforementioned dichotomization of variables within each group.

*Correlates, Predictors, and Moderators of Post-expedition Growth:* Potential correlates and predictors of PEG were assessed using both bivariate and multivariate correlation tables, and a series of hierarchical regression models that controlled for demographic covariates such as age and gender. Finally, moderation/mediation models were used to analyze the hypothesized role of variables in associations between predictor variables (i.e., ACEs) and PEG.

**Qualitative Analyses: Setting and Procedure.** Of the subgroup invited to participate in the qualitative section of the study, each participant took part in a 45-60-minute semi-structured interview with the first author as a follow-up to their completion of standardized surveys. Interviews were conducted and recorded via the University of Victoria's iteration of the Zoom videoconference platform (Zoom Video Communications Inc., 2016). A predetermined set of interview questions was devised based predominantly on the author's understanding of PEG and based loosely on the potential correlates to be examined in this study (e.g., forms of coping; see Appendix B: Surveys).

To assess PEG, thematic groupings of the five dimensions of growth were used to develop the preliminary coding framework, which corresponds to Tedeschi and Calhoun's (1996) inventory on Post Traumatic Growth (see Table 4, below). During the initial interview, an "other" category was added to allow for the emergence of new themes and ideas. In accordance with previous qualitative studies assessing PEG, the word "change" was substituted for "growth" when delivering the interview questions to avoid biasing responses.

**Table 4***Initial Coding Framework*

Growth Variable and Sub-Dimension(s) of Growth	
1.	New appreciation of life
2.	Personal strength <i>2.1 Confidence</i>
3.	A better understanding of spiritual matters <i>3.1 Transcendent and awe-inspiring experiences</i> <i>3.2 Existential changes</i>
4.	New opportunities available which would not have been otherwise available
5.	Relationships with others <i>5.1 Sense of unity</i> <i>5.2 Sense of belonging</i>

**Interview Transcription and Coding.** Interview transcription was conducted by the first author of the study and two supervised research assistants. Microsoft Word (2016) was used for data transcription. NVivo V.12 (2018) was used for thematic content analysis . As noted above, the study had an a priori conceptual framework derived from what was known of PEG research. Further analysis of data was developed using the framework analysis approach (Gale et al., 2013) which involves using both deductive (i.e., the application of preexisting codes to qualitative data) and inductive (i.e., applying data to new codes that arise throughout the coding process) methods for dealing with data.

The coding procedure was undertaken by the first author of the study, and checked for accuracy and reliability by the first author's graduate supervisor, as well as two undergraduate

RAs who also assisted in transcription. Initially, data was applied to themes according to the preliminary coding framework. Upon further review, new themes emerged and were coded appropriately. Coding involved reading the interview transcripts, selecting text that applied to relevant codes and allocating the text to those codes within the NVivo software program. After initial coding of all 17 interviews, the first author of the study had a working framework that then evolved into the final framework upon further careful analysis of each theme and its constituent codes.

## Results

### Quantitative Results

Out of 182 individuals contacted, 49 were recruited into the study and completed the online study survey (response rate: 27%). Demographic survey data shows participants took part in expeditions to a variety of unique research stations and field sites across and around (on research vessels) the continent of Antarctica. Most expeditioners (84%) had taken part in voyages that were scheduled during the austral summer months (i.e., between October and March), though a minority (16%) had lived on stations for the entirety of the austral winter months.

Additional characteristics of study participants are included in Table 5. Participant ages ranged from 23 to 74 years, most study respondents were male (53%; female = 47%), and nearly all participants worked full-time in scientific disciplines. Most (45%) were classified as “more experienced” expeditioners (i.e., 5+ trips to Antarctica), whereas 22% had only been to Antarctica one time.

Table 6 outlines PEG scores based on gender and experience level. In general, participants reported predominantly low to moderate levels of PEG ( $M = 1.84$ ), which is consistent with previous findings from studies that examined PEG in Antarctic expeditioners and astronauts (see Table 7 for study comparisons). Increases in personal strength ( $M = 2.37$ ), new possibilities ( $M = 2.25$ ), and appreciation of life ( $M = 2.24$ ) were reported as the most changed dimensions of growth, broadly consistent with prior research findings, whereas spirituality ( $M = 1.26$ ) and relationships with others ( $M = 1.56$ ) were the two least changed dimensions.

Means, standard deviations, internal reliability and consistency, and comparison scores from general population samples (where applicable) are included in Table 8. Overall, participants from this study scored higher than general population samples on measures of resilience,

proactive and preventive coping, personal value traits of universalism and self-direction, as well as personality traits of agreeableness, openness to new experiences, conscientiousness, and extraversion. Further, participants scored higher on three out of five sub dimensions of mindfulness: non-judgment of inner experience, describing, and non-reacting to inner experience. Participants scored lower than the general population on measures of neuroticism, and two out of the five sub dimensions of mindfulness: observing and acting with awareness. Regarding ACEs, exposure to emotional abuse, sexual assault, violence towards a parent, family substance abuse, and divorce was more prevalent in this study's sample than a general population sample of adolescents and young adults. Histories of emotional and physical neglect, physical abuse, family mental illness, family members in prison, however, were less prevalent.

**Table 5**

*Summary of Participant Attributes*

<b>Participant Category</b>	<b>N</b>	<b>%</b>
<b>Gender</b>		
Male	26	53
Female	23	47
<b>Employment Status</b>		
Unemployed	1	2
Part-time	2	4
Full-time	41	84
Retired	1	2
Student/Research Assistant	4	8
<b>Employment Type</b>		
Scientific	48	98
Unemployed	1	2
<b>Relationship Status</b>		
Single	9	18
Married	25	51
In a relationship	15	31
<b>Time Spent in Antarctica</b>		
1 Trip	11	22
2-4 Trips	16	33
5+ Trips	22	45
<b>Time Since Last Deployment</b>		
1-6 Months	17	35

6-12 Months	18	37
12+ Months	14	29
<b>Season(s) Spent in Antarctica (Past 5 Trips)</b>		
Summer Only	41	84
Winter Only	2	5
Summer and Winter	6	12

**Table 6***PEG Scores Based on Gender and Experience Level*

Variable	Male N = 26		Female N = 23		1 Trip N = 11		2-4 Trips N = 16		5+ Trips N = 22		Total Sample N = 49	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age	50	13.32	39	10.3	36	13.09	38	6.38	54.0	10.97	45	13.22
<u>PECI-R</u>	1.77	1.0	1.91	1.2	1.8	1.17	1.44	.75	2.14	1.2	1.84	1.09
<i>Strength</i>	2.35	1.34	2.4	1.54	2.16	1.58	2.09	1.23	2.68	1.47	2.37	1.42
<i>Possibilities</i>	2.28	1.23	2.21	1.34	1.98	1.21	1.9	1.06	2.64	1.39	2.25	1.27
<i>Spiritual</i>	1.24	1.12	1.28	1.19	1.48	.92	.77	.8	1.5	1.36	1.26	1.14
<i>Appreciation</i>	2.08	1.29	2.42	1.26	2.39	1.42	1.77)	1.05	2.5	1.31	2.24	1.27
<i>Relating</i>	1.39	1.14	1.75	1.27	1.47	1.23	1.17	1.02	1.88	1.27	1.56	1.2

**Table 7***PEG Scores Across Comparison Groups*

Dimension of Growth	Antarctic Expeditioners (N = 49) (Present Study)	Antarctic Expeditioners (N = 225) Blight and Norris (2018)	Active Astronauts (N = 39) Ihle et al. (2006)
PECI-R Total	1.77 (1.0)	2.29 (1.18)	1.71 (1.28)
Personal Strength	2.35 (1.34)	2.91 (1.38)	1.69 (1.31)
New Possibilities	2.28 (1.23)	2.75 (1.27)	1.84 (1.11)
Spiritual	1.24 (1.12)	1.63 (1.37)	.89 (1.43)
Appreciation of Life	2.08 (1.29)	2.70 (1.41)	1.79 (1.31)

Relating	1.39 (1.14)	2.00 (1.27)	1.30 (1.18)
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**Table 8**

*Means, Standard Deviations, and Internal Reliability of Study Variables*

Variable	M	SD	Chronbach's $\alpha$	General Population M (SD)
<b>PEG</b>				
Personal Strength	2.35	1.34	.89	<i>See above for comparisons</i>
New Possibilities	2.28	1.23	.85	
Spiritual	1.24	1.12	.84	
Appreciation of Life	2.08	1.29	.76	
Relating	1.39	1.14	.90	
<b>Resilience</b>	3.74	.67	.85	3.53 (.68) <sup>1</sup>
<b>Personal Value Priorities</b>				
Universalism	6.65	1.44	NA	5.31 (1.98) <sup>2</sup>
<b>Proactive Coping</b>				
Proactive Coping	44.65	5.26	.80	41.58 (7.57) <sup>3</sup>
Strategic Planning	12.92	1.62	.53	
Reflective Coping	33.94	5.35	.88	26.51 (4.85)
Preventive Coping	30.92	4.35	.80	
Inst. Support Seeking	24.39	4.15	.85	
Emot. Support Seeking	14.96	3.39	.84	
Avoidance Coping	7.88	1.81	.66	
<b>Personality</b>				
Neuroticism	2.60	.69	.80	2.95 (.72) <sup>4</sup>
Extraversion	3.30	.92	.90	3.26 (.75)
Agreeableness	3.98	.52	.70	3.71 (.60)
Openness	3.94	.62	.85	3.55 (.59)
Conscientiousness	4.12	.51	.72	3.49 (.62)
<b>Facets of Mindfulness</b>				
Observing	15.41	3.28	.83	15.74 (2.96) <sup>5</sup>
Describing	18.55	3.71	.87	17.49 (3.47)
Aware Actions	18.61	3.41	.83	19.04 (3.66)
Non-judgment	16.55	3.63	.79	14.95 (3.89)
Non-reactivity	16.78	3.29	.74	14.54 (3.75)
<b>Total ACEs</b>	1.57	2.14	NA	
<b>ACE Item</b>				
	<b>%</b>			<b>General Pop.</b>
Emotional Abuse	32.6%			13.5% <sup>6</sup>
Physical Abuse	10.2%			13.3%
Sexual Assault	16.3%			5.2%
Emotional Neglect	4%			6.4%

Physical Neglect	4%	15.9%
Divorce	22.4%	21.3%
Violence Towards Parent	20.4%	13.7%
Family Substance Abuse	20.4%	9.2%
Family Mental Illness	22.4%	32.5%
Parent to Prison	4%	7.2%

*Note.* Range for PEG = 0-5, personality = 1-5, resilience = 1-5, proactive coping = 1-4, personal value priorities = 1-8, five facets of mindfulness = 1-5 (5-25 total score, except for Observing, which ranges from 5-20); ACEs = 0-10; general population samples consisted of <sup>1</sup>128 undergraduate students (Smith et al., 2008), <sup>2</sup>57 undergraduate Norwegian students (Demi et al., 2020), <sup>3</sup>206 U.S. undergraduate students (Moring et al., 2011), <sup>4</sup>10,497 U.S. undergraduate students ages 18-30 years (63% female, 37% male) (Nofle & Robins, 2007), <sup>5</sup>211 adults (community sample) aged 21-84 years (Iani et al., 2020), 1,949 U.S. adolescents ages 10-17 years (Finkelhor et al., 2015).

**Effect of Experience Level on PEG.** A one-way between-groups analysis of variance (ANOVA) was conducted to compare the effect of number of trips to Antarctica (i.e., experience level) on PEG. Groups were categorized based on the number of trips individuals had taken. Ultimately, three groups were compared: those with one experience made up the first group, some experience (i.e., 2-4 trips) the second group, and more experience (i.e., 5+ trips) the third. No significant effect was found between groups [ $F(2, 46) = 2.03, p = .144$ ] (see Table 9).

**Table 9**

*Fixed-Effects ANOVA Results Using PECE-R Scores as the Criterion*

Predictor	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>p</i>	partial $\eta^2$	partial $\eta^2$ 90% CI [LL, UL]
(Intercept)	145.55	1	145.55	127.92	.000		
Number of Trips	4.61	2	2.31	2.03	.144	.08	[.00, .20]
Error	52.34	46	1.14				

*Note.* LL and UL represent the lower-limit and upper-limit of the partial  $\eta^2$  confidence interval.

**Correlations.** A series of correlation tables were generated using Pearson's  $r$  to examine associations between PEG and other potential predictor variables. A summary of significant correlations can be found in Table 10. Correlations between PEG total mean score and the big five personality factors, as well as the personal values traits of universalism and self-direction, were all found to be non-significant. Significant moderate correlations were found between universalism and PEG dimensions of new possibilities,  $r(47) = .34, p < .05$ , and appreciation of life,  $r(47) = .34, p < .05$ . Proactive coping strategies were also found to be significantly and positively correlated with appreciation of life,  $r(47) = .29, p < .05$ , whereas avoidant coping strategies had no significant correlations with any growth dimensions. Last, a moderate negative correlation was found between the acting with awareness facet of mindfulness and relationships with others,  $r(47) = -.34, p < .05$ .

**Table 10***Summary of Significant Correlations Between Variables*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. Universalism	6.65	1.44					
2. Aware Action	3.72	0.68	-.13 [-.40, .16]				
3. Proactive Coping	3.19	0.38	.13 [-.15, .40]	.15 [-.14, .41]			
4. Appreciation of Life	2.24	1.27	.34* [.06, .57]	-.23 [-.48, .06]	.29* [.00, .52]		
5. New Possibilities	2.25	1.27	.34* [.07, .57]	-.19 [-.45, .10]	.13 [-.16, .40]	.74** [.58, .84]	
6. Relationships with Others	1.56	1.20	.21 [-.08, .46]	-.34* [-.57, -.07]	.21 [-.07, .47]	.75** [.59, .85]	.80** [.67, .88]

*Note.* Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). \* indicates  $p < .05$ . \*\* indicates  $p < .01$ .

**Hierarchical Regressions.** To further assess predictors of the PEG dimension new possibilities, two models were tested using a hierarchical regression analysis (Table 11, below). With the first model, new possibilities was predicted by covariates age and gender. The second model predicted new possibilities by age, gender, and universalism. The first and second models both met assumptions of linearity, homoscedasticity, and normality. A nested model was used to compare which of the two models was the better predictor of new possibilities. Model 2 showed the best fit, demonstrating that universalism makes up just under 15% of the total variance in new possibilities ( $R^2=.137$ ,  $F(3,45) = 2.38$ ,  $p < .05$ ).

To assess predictors for the PEG dimension of Appreciation of Life, another pair of models was tested using hierarchical regression. In the first model, appreciation of life was predicted by age, gender, and proactive coping. The second model predicted appreciation of life by age, gender, proactive coping, and universalism. The first and second models both met assumptions of linearity, homoscedasticity, and normality. After using a nested model to compare between the two models, it was determined that Model 2 showed the best fit, demonstrating that universalism and proactive coping each make up around 9% of the total variance of appreciation of life ( $R^2=.184$ ,  $F(4,44) = 2.48$ ,  $p < .05$ ).

A hierarchical regression approach was also used to test the significance of the interaction between participants' Adverse Childhood Experiences (ACEs) and resilience. The first model predicted PEG by ACEs and resilience, and then a second model was fit that predicted PEG (mean total score) by testing the addition of the interaction between the two. All predictor variables were mean-centered to reduce the likelihood of multicollinearity (Iacobucci et al., 2017). Tests of both models met assumptions of linearity, normality, and homoscedasticity. A nested-model comparison of both models indicated no significant differences between the two

models. Analysis of the second model also showed that the interaction between ACEs and resilience was non-significant. ( $R^2=.06$ ,  $F(3,45) = .957$ ,  $p > .05$ ; see Table 13). To determine whether resilience moderated the relationship between ACEs and PEG across all dimensions of growth, five separate analyses (i.e., for each dimension) were run. However, the relationships between the interaction of ACEs and resilience for each dimension were all found to be non-significant.

**Table 11***Regression Results Using New Possibilities as the Criterion*

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> <sup>2</sup>	<i>sr</i> <sup>2</sup> 95% CI [LL, UL]	<i>r</i>	Fit	Difference
(Intercept)	2.59**	[0.93, 4.24]							
Age	-0.01	[-0.04, 0.03]	-0.06	[-0.39, 0.26]	.00	[-.03, .04]	-.04		
Gender	-0.14	[-0.97, 0.68]	-0.06	[-0.38, 0.27]	.00	[-.03, .03]	-.03		
								$R^2 = .004$	
								95% CI[.00,.05]	
(Intercept)	0.63	[-1.53, 2.79]							
Age	-0.01	[-0.04, 0.02]	-0.10	[-0.41, 0.21]	.01	[-.04, .05]	-.04		
Gender	-0.40	[-1.20, 0.41]	-0.16	[-0.48, 0.16]	.02	[-.05, .09]	-.03		
Universalism	0.33*	[0.08, 0.59]	0.38	[0.09, 0.66]	.13	[-.04, .31]	.34*		
								$R^2 = .137$	$\Delta R^2 = .133^*$
								95% CI[.00,.28]	95% CI[-.04, .31]

*Note.* A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*<sup>2</sup> represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively.

\* indicates  $p < .05$ . \*\* indicates  $p < .01$ .

**Table 12***Regression Results Using Appreciation of Life as the Criterion*

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> <sup>2</sup>	<i>sr</i> <sup>2</sup> 95% CI [LL, UL]	<i>r</i>	Fit	Difference
(Intercept)	-0.36	[-3.81, 3.09]							
Age	-0.01	[-0.04, 0.02]	-0.09	[-0.41, 0.23]	.01	[-.04, .05]	-.12		
Gender	0.03	[-0.81, 0.88]	0.01	[-0.32, 0.35]	.00	[-.01, .01]	.14		
Proactive Coping	0.93	[-0.09, 1.95]	0.27	[-0.03, 0.58]	.07	[-.07, .20]	.29*		
								$R^2 = .090$	
								95% CI[.00,.22]	
(Intercept)	-1.80	[-5.35, 1.75]							
Age	-0.01	[-0.04, 0.02]	-0.12	[-0.42, 0.19]	.01	[-.04, .06]	-.12		
Gender	-0.16	[-0.99, 0.66]	-0.06	[-0.39, 0.26]	.00	[-.02, .03]	.14		
Proactive Coping	0.86	[-0.12, 1.84]	0.25	[-0.04, 0.54]	.06	[-.06, .18]	.29*		
Universalism	0.28*	[0.03, 0.53]	0.32	[0.03, 0.60]	.09	[-.05, .24]	.34*		
								$R^2 = .184$	$\Delta R^2 = .093^*$
								95% CI[.00,.32]	95% CI[-.05, .24]

*Note.* A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*<sup>2</sup> represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively.

\* indicates  $p < .05$ . \*\* indicates  $p < .05$

**Table 13***Regression Results Using Mean PEG as the Criterion*

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> <sup>2</sup>	<i>sr</i> <sup>2</sup> 95% CI [LL, UL]	<i>r</i>	Fit	Difference
(Intercept)	2.43**	[0.64, 4.21]							
ACEs	0.09	[-0.04, 0.22]	0.21	[-0.08, 0.50]	.04	[-.07, .15]	.19		
Resilience	-0.21	[-0.68, 0.26]	-0.13	[-0.42, 0.16]	.02	[-.05, .09]	-.11		
								<i>R</i> <sup>2</sup> = .054	
								95% CI[.00,.19]	
(Intercept)	1.93	[-0.71, 4.58]							
Resilience	-0.08	[-0.78, 0.62]	-0.05	[-0.48, 0.38]	.00	[-.02, .02]	-.11		
ACEs	0.40	[-0.82, 1.62]	0.92	[-1.88, 3.72]	.01	[-.04, .06]	.19		
Interaction	-0.08	[-0.39, 0.23]	-0.72	[-3.57, 2.12]	.01	[-.03, .05]	.17		
								<i>R</i> <sup>2</sup> = .060	$\Delta R^2$ = .005
								95% CI[.00,.18]	95% CI[-.03, .05]

*Note.* A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*<sup>2</sup> represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively.

\* indicates  $p < .05$ . \*\* indicates  $p < .01$ .

## Qualitative Results

**Sample Demographics.** Full demographic characteristics of 17 interview cases are shown below in Table 14. Ten interviewees (59%) noted experiencing a heightened degree of remoteness by having to live and work in field camps that were situated in locations distant (i.e., 2+ hour drive) from the nearest research station. A minority of participants (41%) lived in research stations. Most participants (76%) had only experienced the austral summer, whereas 24% had either undergone a full (12%) or partial (12%) austral winter.

**Table 14**

*Relevant Demographic Information for Each Case*

Participant no.	Gender	Trips to Antarctica	Locations Visited
AE1 (A)	F	5+ Trips	Field camps
AE2 (A)	M	5+ Trips	Station <sup>sw*</sup>
AE3 (B)	M	2 Trips	Station <sup>s</sup>
AE4 (B)	F	1 Trip	Station <sup>s</sup>
AE5 (A)	M	3 Trips	Station <sup>s</sup>
AE6 (B)	M	2 Trips	Field camps <sup>s</sup>
AE7 (A)	M	5+ Trips	Field camps <sup>s</sup>
AE8 (B)	F	1 Trip	Station <sup>w</sup>
AE9 (B)	F	1 Trip	Field <sup>s</sup>
AE10 (A)	M	5+ Trips	Field <sup>s</sup>
AE11 (B)	F	1 Trip	Station <sup>s</sup>
AE12 (A)	M	3 Trips	Station <sup>s</sup>
AE13 (B)	M	2 Trips	Field <sup>s</sup> /Station <sup>w</sup>
AE14 (B)	F	1 Trip	Field <sup>s</sup>
AE15 (A)	F	3 Trips	Field <sup>s</sup>
AE16 (A)	M	5+ Trips	Field <sup>s</sup> /station <sup>w</sup>
AE17 (A)	F	5+ Trips	Field <sup>s</sup>

**Note.** w = wintered over or spent portion of winter in Antarctica. s = spent summer in Antarctica

Post-expedition changes were observed and analyzed in all 17 (i.e., 100%) of the transcripts. The final thematic framework for PEG in Antarctic expeditioners is detailed in Table 15.

**Table 15**

*Final Conceptual Framework with Definitions and Percentage of Cases Mentioned*

<b>PEG</b>	<b>Definition of positive perceived change (i.e., increased perception of...)</b>	<b>Frequency</b>
1 Personal Strength	...capacity to handle adversity, bounce back from stress.	71%
<i>1.1 Confidence</i>	...self-reliance and inner strength.	53%
2 Relationships with Others and Community Belonging	...sense of closeness or belonging to a community or group, and/or ability to socialize with others.	88%
<i>2.1 Sense of Belonging</i>	...belongingness to a social group or community groups.	35%
<i>2.2 Sense of Unity</i>	...sense of togetherness, purpose, or meaning because of relationships established in Antarctica	59%
<i>2.3 Social Skills</i>	...new social skills or confidence in ability to socialize with others.	35%
3 Spiritual	...change in understanding of spiritual or religious matters, as outlined below.	65%
<i>3.1 Awe and Transcendence</i>	...appreciation for, or understanding of, the vastness and power of the natural world/universe.	53%
<i>3.2 Existential</i>	...questioning or understanding of what is meaningful or valuable in life.	18%
4 Appreciation of Life	...gratitude...becoming increasingly grateful for the life you lead.	76%
5 New Possibilities	...new opportunities becoming available, which wouldn't have been otherwise.	47%
<b>Other</b>		
6 Relationships with the Natural World	...connection to or appreciation for the natural world.	65%
<i>6.1 Sense of Unity</i>	...closeness to or unitedness with the natural world.	29%
<i>6.2 Interest</i>	...desire to be in nature or experience the natural world in new ways.	47%
<i>6.3 Eco Awareness</i>	...understanding of and/or motivation towards environmental issues (e.g., climate change).	53%

**Personal Strength.** Expeditioners confronted many challenges while living and working in Antarctica. Commonly reported physical obstacles included inclement weather, altitude sickness, and 24-hour daylight cycles. Among the more frequently identified emotional hurdles were interpersonal issues and a lack of communication with loved ones back home. Both groups commented on how overcoming these adversities lead to realizations of increased self-reliance, confidence, and inner strength.

*Challenges and Confidence:* Many participants, especially the more experienced ones (i.e., Group A), made comments that reflected a seeming appreciation for encountering adverse events in Antarctica, noting that “problems” provide opportunities for learning that can be useful when presented with similar situations in the future. For instance, AE1, a female expeditioner who made over 20 trips to remote locations in Antarctica, stated, “...it’s given me confidence that a) I know what I’m doing and that b) I have the skills to figure a way out of any problems that would arise because I have experienced a lot of these problems before and gotten through them.” Similarly, AE5, a male participant with three completed expeditions, noted feeling “more confident” in his “problem solving abilities” since returning from Antarctica.

For less experienced volunteers (i.e., Group B), in many cases it was clear that one or two trips had nevertheless impacted their perception of their capabilities. AE14, a female who had experienced Antarctica only once, asserted that her experiences led her to recognize that she was “stronger than [she] had thought.” Another two-time female expeditioner noted that “it was helpful for me to be thrown into this, like, very stressful environment and then to have, like, done it. And then to, like, do it again. It’s kind of a nice confidence booster....”

**Relationships with Others and Community Belonging.** Many expeditioners noted how the social, or interpersonal, conditions in Antarctica were challenging. In field camp settings, individuals typically worked within small teams where it was noted that the isolation and confined setting made it “easy to get on each other’s nerves” (AE14). At research stations, where there were more people and resources close by, individuals described a division between year-long systems and maintenance workers and scientists. According to these individuals, the formation of social “cliques” (AE3) could make it difficult for short-term workers to integrate into the preformed social dynamic upon arrival.

*Sense of Belonging and Unity:* Despite these social obstacles, 88% of expeditioners found that their experiences in Antarctica helped cultivate stronger relationships with others. For those with more experience, Antarctica is a place where friendships and communities can be built and revisited, contributing to a stronger sense of unity and belonging. For instance, AE2 commented that “if you go 18 times it becomes a part of your life...you become an Antarctic,” and AE16 stated that “you make very close friends...that you work with.” For those with fewer trips, there were less statements of belonging but more recognition around the learned importance of what is required to function as a team collaborating towards a shared purpose. AE4 commented on this, disclosing that prior to her Antarctic experience she had not realized she was “so team oriented...” and that “it was really rewarding to have these conversations of like, ‘ok...how do we all get this task done the best.’” Similarly, AE12 was “really impressed with how cohesive and functional the community was...” and felt she had benefitted by learning to work as a part of a “cohesive team.”

*Social Skills:* For most participants, living in Antarctica required socializing with the same groups or teams of individuals daily. As mentioned above, camaraderie established by

overcoming challenging obstacles as a team was common. Similarly, but on a more individual level, many expeditioners commented on how they perceived enhancements in social ability, such as increased capacity for empathy as a means of accommodating or making the acquaintance of individuals from a variety of unique backgrounds. According to AE17, a female expeditioner, these changes were ones that lasted beyond her time in Antarctica. She said, “you...interact with people who are very different from you...yeah, it gives you a level of insight and empathy across the long-term, and I feel that going forward.” Another expeditioner, AE12, was responsible for graduate students and a field team while in Antarctica and asserted that he learned how to be more “accommodating” in an environment where there were “a lot of different personalities.”

**Spirituality.** One long-form interview question, derived from Mason et al. (2007) was used to probe for spiritual change in expeditioners. The question centered around spiritual enhancements that may not have been captured by the PECCI-R inventory, such as experiences of awe and transcendence and connection to a higher power or something greater than oneself.

*Awe and Transcendence:* Generally, participants denied spiritual affiliation, or connecting to some sort of higher power, but commented frequently on how the perceived vastness of the Antarctic made them feel small by comparison. In this sense, Antarctica seemed to inspire an emotional response similar to awe which, in many cases, was a draw for return expeditions to the continent. For example, female expeditioner AE17, who had experiences in field camps and on Antarctic research vessels, asserted that she felt motivated by the awe she experienced from her surroundings:

Yeah. I think that that’s a common thread of anyone that is lucky enough to go to these environments and it’s possibly why it becomes so integral to

someone's life, you know... that they would become addicted to it...because that level of awe, and wonder, and insignificance in comparison to what's around you is really exemplified in these locations in Antarctica....especially when you get those wonderful moments when you're by yourself.

Others mentioned that they sought to find a similar feeling of awe following Antarctic deployment, but most were unable to capture the exact emotional experience they had in Antarctica: "you get that connection...like you're a part of something bigger or things like that...just by taking the time to, like, marvel a little bit, even if it's, like, on a smaller scale than you would experience in Antarctica" (AE14).

*Existential Change:* Another subtheme of spiritual change was existential change. The Antarctic experience led three expeditioners to question the meaning of life, or their purpose or role in the world. Existential self-examination of this nature was commonly brought on as a result of awe-inspiring moments, such as feeling overwhelmed by the vast complexity and timelessness of the natural world. For example, AE6 mentioned that, prior to his experience in Antarctica, "he had never thought of us humans as being any more special" than any other part of the world; "we're just nothing" he said. After his experience in Antarctica, however, he noted how his views had changed slightly to reflect the importance of humankind's existence and how it fits in with the rest of the world: "we're kind of just part of this whole...nothing special in comparison to the rest of the Earth's system....everything is really complicated." On the other hand, another expeditioner questioned the meaning of her existence. When juxtaposing her timeline to that of Antarctica, which, as she noted has been around for "millions of years," she

noted feeling “obsolete...like, just a blip” (AE14) which she asserted was a particularly challenging thought to grapple with as she adjusted to life post-Antarctica.

In assessing existential change, similarities were observed between existentialist thinking and the dimensions of appreciation of life and new possibilities. Often, participants noted how their Antarctic experiences provided opportunities to change their values about what is meaningful or important in life. For example, a greater appreciation for close relationships was evident in many cases, as were feelings of gratefulness for the “simpler” things in life. These changes seemed to provide expeditioners with an increased sense of purpose and meaning in life, though often this was inferred and not stated outright.

**Appreciation of Life.** Overall, participants expressed enhanced feelings of gratitude for the privilege of the opportunity to travel to and experience the Antarctic. As many noted, most people in their lifetimes will not be given the opportunity to travel to such a pristine and beautiful, albeit challenging environment. For those who experienced more remote settings, there was a seemingly greater appreciation for aspects of their lives back home that they missed while away. For instance, activities such as having a warm shower, sitting in a comfortable chair, “going to the pub” (AE6), or “making myself scones on Sunday for breakfast” (AE8) became more appreciated upon return from Antarctica. Additionally, an appreciation of getting to meet and become friends with a wider variety of people (e.g., those of different nationalities, or unique research backgrounds) resulting from Antarctic experiences was commented on frequently and overlaps with perceived enhancements in the PEG sub dimension of relationships with others. Further, as mentioned above, a significant challenge for many was separation from families and loved ones back home. These challenges led to a newfound appreciation for family members and the general needs of the family unit, which, for some, meant not going back to Antarctica.

**New Possibilities.** Participants in this study were predominantly scientists who were drawn to Antarctica to carry out research projects. In addition to conducting their own data collection, expeditioners noted that Antarctica also provided many opportunities to gain experience with unfamiliar scientific disciplines as individuals would often cohabitate or work alongside those from a variety of unique research endeavours. For instance, male expeditioner AE10 asserted that he:

[interacted] with more...disciplines than I would have ever...I worked with seismologists and people doing earth motion...and so, yeah, the opportunities to look at other disciplines was, is, quite amazing.

In addition to recognizing new possibilities in research and science, and as touched on above, individuals also shared that Antarctica had motivated them to engage in climate change issues more readily, as well as seek out friendships and social connections from individuals from “very different” (AE17) cultural and scientific backgrounds.

**Relating to the Natural World.** After carefully reading through interview transcripts, a sixth dimension of growth, relating to the natural world, emerged as a theme.

*Sense of Unity:* According to one expeditioner, Antarctica inspired “more than just unitedness with people”, it encouraged unitedness “with the landscape, too” (AE1). In addition to being a physically dangerous place to live and work, expeditioners found Antarctica to be a stunningly beautiful environment that inspired a deep and enduring connection to the natural world. Comparisons, such as the one made above between a connection to people and a connection to the landscape were made in several cases, suggesting that processes comprising the formulation of human-to-human bonds may also underlie connections to nature. For example, female expeditioner AE11, stated

you get out there and all of your worries melt away, and that you're a part of the whole world, but just a tiny, tiny piece...a tiny fish in a larger sea. So, yeah, I definitely had those moments a lot...or, once again, realizing that I was a part of a community who had been exploring this area for so long and had continued. And just to kind of see the family connections that form in that regard.

Experiences that enhanced perceptions of closeness to nature varied between participants. Across all expeditioners, the most affecting experiences were ones that were faced in solitude. As an example, AE5, a male expeditioner with experiences both on station and in remote field camps, commented that "it's sort of the feeling of being in this beautiful place by yourself, there's nothing else around you and...you're, I don't know, you're sort of embedded in nature...you feel like you are sort of one with the continent." For those living on station, expeditioners expressed some frustration around finding the time and space to be alone in nature. It was noted that research stations, such as McMurdo, had limited hiking trails where one would often encounter others along the path. Whereas, in more remote locales, it seemed easier to carve out the time necessary to be alone in the natural world.

A number of expeditioners noted an increased desire to spend more time outdoors following Antarctic deployment. One individual remarked that this change came because of an increased awareness "of how beautiful nature is" and that she began to appreciate and look at the natural world in more detail upon return:

Last weekend my husband was fishing, and I was sitting there and had my camera and took immensely great pictures [of] bumble bees. All the details, you know, their wings, their tiny wings on their big body, and how shiny they are, and almost a skeleton through the fur. I started to look at

these things in much more detail...I sit much more in my garden even now than before..." (AE15)

Others noted that time spent in confinement in Antarctica contributed to a newfound understanding and appreciation for the benefits of the natural world on personal wellbeing:

When you're trapped at the research station you're, like, man, all I want to do is get out to the field. So, I think I've developed new interests in...I mean I already enjoyed being outside and going on hikes and stuff, but I think it increased that dramatically after my trip to Antarctica. So, I try to find new and exciting ways to enjoy nature (AE14).

*Eco-Awareness:* In addition to inspiring awe, exposure to the landscape and ecosystems of Antarctica also increased awareness of the fragility of the natural world. Particularly, climate change and the effect it is having on the Antarctic, was mentioned in almost all cases. More experienced expeditioners mentioned witnessing the detrimental effects of climate change in the Antarctic firsthand, either through the research they carried out or by noticing the changes in the landscape over the years. Less experienced expeditioners discussed the physical impact of climate change less but, like the more experienced expeditioners, they were moved by their experiences to act against climate change. For some, the desire to help the environment was channeled into personal projects following Antarctic deployment. For instance, male expeditioner AE7, assisted in producing a film about the waning ecosystems in the Antarctic. Another expeditioner (AE12) was inspired to offer a university-level course on climate change. He said:

A lot of my motivation for developing that class was from that experience...There's always this underlying theme of climate change, but there's a lot of research in Antarctica that directly deals with it.

Moved by their Antarctic-inspired realizations of climate change and frustrated by the public's apathy towards environmental issues, several expeditioners also discussed how witnessing the majesty of Antarctica might influence others to come to their senses about the importance of environmental conservation and climate change. A female expeditioner, AE4, commented on this, saying:

If everybody could see this, if everybody could have this experience where you stand out here on top of the ocean which is frozen solid and you look around and there are 14,000 foot mountains on this side and there's a volcano on that side, it's crazy...if we could put everybody right here...do you think that maybe we would stop, like, melting the ice caps, and like, you know, would it work?

**Coping with COVID-19.** Expeditioners were asked if their experiences in Antarctica had affected their ability to cope with COVID-19. Responses to this question were mixed. More experienced individuals tended to agree that Antarctica cultivates important tools such as self-reliance, inner peace, and "vast amounts of patience" (AE1), which can be useful during a global pandemic, especially in coping with the unpredictability of the future. To this point, AE1 likened COVID-19 to sitting in a tent and waiting for a plane to come that might not show up for two weeks, "you just learn to be patient...I know that I can wait it out," she said. AE6, an expeditioner who spent several weeks in a tent waiting for bad weather to pass, also suggested that Antarctica improved his ability to cope with boredom and uncertainty, thereby strengthening his external locus of control. He said,

I think I probably do have a pretty good ability to just, like, accept that you aren't gonna do anything, because that's what you do in the field when you're in layup...In Antarctica when we can't do anything, we can't send any emails, you can't do anything at all so we're just gonna lie here and do nothing and just accept that...then you can be happy. (AE6).

In addition to helping expeditioners cope with uncertainty, according to some, time spent in Antarctica served as a primer for coping with negative thought patterns during periods of isolation. Female expeditioner AE8 explained this phenomenon, saying:

After a while, yeah of course, I was lonely sometimes and sometimes I was just annoyed by the whole, like not getting close to anybody and the whole avoiding people on the sidewalk and shit like that. But yeah, as I said, these bad feelings,

I'm a lot better at controlling them because of the experience of Antarctica (AE8).

Other expeditioners found the question difficult to answer because of the apparent differences between the two environments. For example, when asked if the Antarctic experience had affected his ability to cope with COVID-19, AE13 remarked that he "[felt] like it should" but that it's really a "completely different situation."

**Environmental Differences Between COVID-19 and Antarctica.** In answering the question about coping with COVID-19, some expeditioners disagreed with the idea that COVID-19 provided a similar environmental context to that of Antarctica and made a point of highlighting key differences between the two. Perhaps the clearest difference that was mentioned by several participants was that the decision to travel to Antarctica was voluntary whereas the choice to go through a global pandemic was not. Thus, a more positive outlook was built into preparing for the Antarctic venture because the trip was desired and anticipated. In addition,

several mentioned that the social environment of Antarctica, especially for those at research stations, was easier to navigate because in-person gatherings were allowed. While in Antarctica, some expeditioners even noted experiencing more social support than they had ever felt before in their lives. On the other hand, others noted that it has been much easier to keep in touch with loved ones, due to reliability of internet and cellphone service, during the pandemic than it was in Antarctica.

Accessibility to the natural world was another point that separated Antarctica from the COVID-19 experience. According to some, opportunities to be close to or feel united with nature were more abundant in the Antarctic than they were back home, which led to increased feelings of isolation and disconnect from the natural world following deployment and during the COVID experience. For instance, AE11 stated:

I definitely think I feel more isolated in this COVID world, in the United States, where I can drive a car places, than I did when I was in Antarctica... I think that that ability to be able to get out into nature was definitely...it definitely impacts you. And being in Antarctica you're just surrounded by this amazing, pristine environment all the time which I think probably helps reduce that feeling. (AE11)

**Coping Advice from Expeditioners.** Expeditioners were asked to provide advice about effective ways of coping during the pandemic. Like responses to the question about how Antarctica affected COVID-19 coping, some expeditioners suggested that their Antarctic experiences had not prepared them to cope any more effectively with a global pandemic, and that their advice should therefore not be valued higher than anyone else's. Others discussed a range of different methods to be used for coping during the pandemic, but no clear themes emerged from these recommendations. Among the suggestions were the importance of building a

schedule and having a routine, accessibility to nature, and taking advantage of technology and virtual communication platforms to stay in touch with close family and friends.

## Discussion

The objective of this study was to assess the incidence and correlates of PEG in a sample of Antarctic expeditioners using a mixed-methods design. To our knowledge, this is the first study to date that has endeavored to use a multifaceted approach to both (1) capture the qualitative experiences of PEG in a subset of the study sample, as well as (2) explore the potential predictor variables for PEG using quantitative methods. Contrary to results from past literature, this research did not find associations between various PEG dimensions and facets of personality (i.e., agreeableness and openness) but does underscore the roles of universalism and proactive coping as proponents of growth to be considered in future research. Further, based on results from qualitative interviews, a sixth dimension of PEG – relating to the natural world – which comprises enhancements in eco-awareness and a sense of unity or harmony with the natural world – emerged as a main theme along with the five other dimensions of growth.

Compared to general population samples (based on original measure development data or other published samples), participants in this study scored higher on most scales and subscales of interest, including resilience, dimensions of proactive coping and mindfulness, as well as all personality traits, neuroticism excluded. This finding was rather unsurprising given that higher trait conscientiousness, agreeableness, and openness from participants in this sample are consistent with personality and trait profiles of individuals who typically live and work in remote polar locales (Kjærgaard et al., 2013), and ICE environments in general (Palinkas & Suedfeld, 2008). In terms of ACEs, the overall mean of ACEs items endorsed was between one and two, which is comparable to general population samples (Felitti et al., 1998). However, the prevalence of specific types of ACEs was higher in our sample. Notably, our sample more frequently reported emotional abuse, sexual assault, violence towards a parent, family substance abuse, and

divorce. To our knowledge, this is the first time ACEs have been addressed in ICE environment research, and further research is needed to clarify how past trauma may be impacting individuals in these settings.

### **Specific Relationships to PEG**

In accord with past studies that focused on returned astronauts, participants from this study reported very small to small levels of PEG on the PECI-R (i.e., the overall mean score was between 1 and 2). Moreover, 100% of the subsample of participants who completed qualitative interviews spoke of experiencing a change in at least one of six identified dimensions of PEG.

**Personal Strength.** In line with my hypothesis, quantitative reports suggest that perceived changes in personal strength were highest across the study sample, followed by reports of growth in the areas of new possibilities and appreciation of life. These findings are consistent with past ICE environment literature (i.e., Blight & Norris, 2018; Ihle et al., 2006), where items pertaining to enhancements in perceived personal strength – and self-reliance in particular – received a higher score (i.e., 4-5) with more frequency than other items on the PECI-R measure (Blight & Norris, 2018). Narrative accounts from this study also reflect expeditioners felt they had gained strength by becoming more self-reliant in Antarctica. This was particularly true of individuals with more experience (i.e., 5+ expeditions) on the ice. Experienced participants commented on how troubleshooting a diversity of obstacles over the course of past expeditions led to a greater capacity for overcoming challenges in present and future situations, a finding which suggests that multiple expeditions may contribute to a more refined ability to cope with ICE related adversity. This conclusion is also supported by evidence gleaned from interviews. When asked about how experiences in Antarctica affected their ability to cope with the psychosocial limitations of COVID-19, more experienced expeditioners recalled strategies

learned from their experiences in ICE environments for overcoming obstacles during the pandemic. Less experienced expeditioners, on the other hand, tended to focus more on the incompatibility of the Antarctic and COVID-19 environments, claiming that challenging experiences in polar environments were typically different and therefore less applicable to those faced during the pandemic.

**Universalism.** Associations between PEG and the personal value, universalism, were tested. As predicted, universalism was positively correlated with PEG dimensions, including appreciation of life and new possibilities, even after controlling for age and gender. Aspects of universalism, such as a greater sense of unity with others and with nature (Schwartz, 2012), were also commonly reported themes from the interviews, and, consistent with quantitative findings, were topics that dovetailed with an increased appreciation for both the beauty of the natural world and humanity in general. These findings are consistent with past research, including a qualitative study on astronauts which demonstrated an increase in universalism following long duration missions to the International Space Station (Suedfeld et al., 2010). In the (2010) study, authors found that viewing the world from outer space seemed to inspire astronauts to become more concerned with the fragility of the natural world, and increased their desire to help others and the environment. This transformative phenomenon of viewing the Earth from outer space is described in the literature as “the overview effect” (Yaden et al., 2016), and is exemplified in this passage from a female astronaut’s journal:

“maybe if people had the chance to see this [the Earth from space], they wouldn’t be so parochial, they wouldn’t be so interested in their own particular territories. That will come in time, I think. Perhaps we could put the Security Council on the space station, and let them see where their little bailiwick is. To me and I think to all of us, it was a

realization that our world is finite, it is small, it is fragile, and we need to start thinking about how to take care of it” (Suedfeld et al., 2010, p. 1414)

Expressing similar sentiment to the female astronaut above, one participant from my study commented on her desire to share her experiences of awe and universalism with others, noting how she wished others could see the beauty of Antarctica as she believed it would inspire them to protect and conserve the environment.

Although they weren't viewing the world from orbit, a similar effect from the physical environment was experienced by many expeditioners in my study. Interviewees noted feelings of awe and connectedness when experiencing the natural beauty of Antarctica, and this seemed to inspire more concern for the natural world, and in some instances, an increase in pro-environmental behaviours upon return home. This discovery coincides with previous work that found environmental concerns and pro-environmental behaviours were associated with higher levels of universalism (Hansla et al., 2008), and suggests that the characteristics of the physical surroundings in ICE environments (e.g., beauty, grandeur) may also contribute to PEG in terms of an enhanced desire to band together as human beings to protect and conserve the fragile ecosystems of planet earth. Unfortunately, due to the cross-sectional design of this study, pre to post expedition changes in universalism were not explored quantitatively.

**Spirituality.** Past research has also categorized universalism as a dimension of self-transcendence (Schwartz, 2012) and spirituality (Urgesi et al., 2010). Though spirituality was reportedly the least changed of the five dimensions which comprise PEG on the PECI-R, it could be reasoned that some aspects of spiritual enhancement were captured better in qualitative interviews than they were in survey response data. A possible explanation for this is that spirituality can be difficult to define operationally as it comprises a broad range of attitudes,

experiences, practices, and beliefs that vary across cultures. Definitions of spirituality have changed over the years, evolving from a construct concerned solely with religion and religious involvement to one that incorporates secular, non-religious spiritual practices as well as positive psychological states, such as purpose and meaning in life, connectedness, and harmony (Koenig, 2008). Nonetheless, spirituality has been and continues to be interpreted in many ways, and therefore proves to be a difficult construct to measure reliably and comprehensively (Koenig, 2008). Tedeschi and Calhoun's (1996) PTG inventory has undergone similar changes to expand on their version of spiritual change, which initially contained only two factor loadings, "I have a better understanding of spiritual matters" and "I have a stronger religious faith." Concerns over this limited conceptualization of spiritual change were addressed in a recent study by Tedeschi et al. (2017) that revised the dimension to include four additional items pertaining to existential change: (1) a greater clarity about life's meaning, (2) enhanced ability to face questions about life and death, (3) more connectedness with all of existence, and (4) a greater sense of harmony with the world. Though the (2017) study demonstrated strong reliability and validity of the measure across different cultural contexts, it remains to be seen whether these changes account for the diverse range of enhancements that could qualify as spiritual. As mentioned above, based on interview data from the present study, spiritual change indeed seems to be occurring in my sample. Expeditioners frequently endorsed feeling more united – through transformative experiences of awe – with the natural world. This finding seems important as spirituality is often reported as the least changed dimension of PEG in ICE environment research (Blight & Norris, 2018; Ihle et al., 2006).

**Coping Styles.** Proactive coping style was found to be moderately and positively correlated with the PEG sub dimension, appreciation of life. To our knowledge, this is the first

study that has explored associations between proactive coping styles and PEG specifically within the context of ICE environments. Past research with trauma survivors has demonstrated relationships between proactive coping and three dimensions of the PTGI subscale: relating to others, spiritual change, and new possibilities (Bhushan & Kumar, 2012). However, no study assessing PTG has reflected the implication of proactive coping on appreciation of life. It was somewhat surprising that proactive coping wasn't significantly correlated with other dimensions of growth in my study. Proactivity implies future oriented thoughts and action directed towards transforming adversity into positive growth (Schwarzer & Luszczynska, 2008), and therefore seems like it would serve as an important underlying mechanism of change in the reappraisal process that occurs post-expedition. The positive relationship between proactive coping and appreciation of life could be explained in terms of the gratitude one experiences from successfully surmounting obstacles in a challenging environment. This interpretation was reflected in interviews where more experienced expeditioners frequently discussed how adversity in Antarctica is an opportunity for personal growth, and that self-regulatory action led to better outcomes on future expeditions, and in life in general.

**Mindfulness.** Most correlations between facets of mindfulness and PEG were found to be non-significant, including the facets hypothesized to predict growth: Non-reacting to inner experience and Acting with Awareness. In addition, and contrary to our hypothesis, analyses revealed that Acting with Awareness had a significant *negative* correlation with the PEG dimension, relationships with others. Further, mean scores of acting with awareness were found to be lower in expeditioners compared to a general population sample. These findings are surprising. Though no studies to date have evaluated the relationships between mindfulness facets and PEG in ICE environments, substantial work has been done to positively link trait

mindfulness with all five dimensions of PTG in samples of trauma exposed individuals (Hanley et al., 2015). Future approaches to evaluating the relationship between mindfulness and PEG may consider asking participants about their engagement in contemplative practices both prior to and during their expedition. Past research demonstrates that individuals who actively engage in contemplative practices experience both higher levels of trait mindfulness and PTG (Hanley et al., 2015). This finding could indicate that participants from my study were less involved with contemplative activities compared to general population samples. Alternatively, it could reflect that individuals who are more self-aware and self-reflective on ICE missions may be more prone to negatively impacting their perception of relationships they have with others, and particularly with loved ones left behind during the expedition.

**Resilience and ACEs.** It was predicted that resilience would moderate the relationship between ACEs and PEG as prior research demonstrates that resilience can serve as a buffer to those with childhood trauma. I speculated that those with higher ACE burden and lower resilience would perceive growth less, whereas those with lower ACE burden and higher resilience would perceive growth to a greater degree. However, in our study no significant main effect or interactions were found between these variables. Compared to general population samples, resilience levels were found to be higher and ACE burden lower in our sample, which could help to explain why the variables didn't interact as hypothesized.

### **Study Limitations and Future Directions**

**Limitations.** There were several limitations to consider along with the findings from this study. First, as is typical in ICE environment research, the sample size collected may have been too small for significance to be reached in between-groups comparisons. For instance, when comparing the effect of experience level on growth, participants were dichotomized into three

separate groups with unequally sized samples, a limitation that could have accounted for the lack of significance between the most experienced group (i.e., 5+ trips,  $n = 22$ ) and least experienced group (i.e., 1 trip only,  $n = 11$ ). The overall sample of 49 participants, however, was robust compared to previous ICE environment research which tends to rely on small sample sizes. A second limitation of this study was that it utilized a cross-sectional retrospective design and is therefore missing pre-expedition data that would have been useful for understanding and controlling for changes in certain variables, such as universalism. Similar to the methods used in the Suedfeld (2010) study, to further understand how universalism is affected by experiences in ICE environments, researchers could seek to measure expeditioners' personal value priorities longitudinally and ask participants to rate the importance of universalism both before and after their expeditions. Another potential concern was the low response rate of participants recruited to the study. The study used a snowball sampling method, where potential participants were encouraged to disseminate the survey to others who had spent time in Antarctica. Overall, 182 individuals initiated the survey but only 27% completed it, a rate that is substantially lower than the ideal range of 60-80% response which is generally recommended for web-based surveys (Fincham, 2008; Nulty, 2008). High nonresponse rates (i.e., 70-80%) like this are typical for studies that collect data using online methods (Nulty, 2008), and can indicate a discrepancy between responders and non-responders that introduces bias into the experiment. A potential explanation could also be timing. The survey was sent out in the midst of a global pandemic and therefore participants may not have been as receptive to answering questions regarding isolation and confinement – two hallmark characteristics of life during a global pandemic. Recommendations for reducing nonresponse bias include providing rewards and incentives for completing the study questionnaire, increasing survey accessibility, and creating surveys that are

brief, all of which could be considered in future research of this nature (Nulty, 2008). Last, in the qualitative portion of the study participants were asked to reflect on all their Antarctic and post-Antarctic experiences instead of focusing exclusively on the aftermath of their most recent expedition. Though most respondents had completed expeditions within the year, it may have been difficult for some to recall details of their earlier post-expedition experiences which could have influenced the validity of responses.

**Future Directions.** Much work remains to be done to elucidate the variables that contribute to positive adjustment and wellbeing following adversity in extreme environments. Herein, we briefly discuss a few ideas for future testing.

*Experience Level:* Results from this study suggest that no significant relationships exists between experience level and PEG. As this is the second ICE-related study to date that has achieved this result, future researchers could instead focus on how other expedition characteristics, including, expedition type (e.g., remote vs. on-station, or level of perceived isolation), perceived stress of adversity encountered, perception of mission success, and recency of latest deployment, may serve as indicators of PEG in both similar and different ICE settings.

*Universalism:* Qualitative and quantitative results from this study showcase universalism as an important catalyst of positive post-expedition changes. Similar to the methods used in the Suedfeld (2010) study on astronauts, to further understand how universalism is affected by experiences in ICE environments, researchers could measure expeditioners' personal value priorities longitudinally and ask participants to rate the importance of universalism both before and after their expeditions. Aspects of universalism also emerged in statements made by expeditioners in qualitative interviews, particularly in regard to an enhanced connection with nature and pro-environmental attitudes. To further elucidate this finding, researchers could ask

participants the degree to which their views of nature and/or pro-environmental behaviours have increased. Further, correlations between (post-expedition) pro-environmental behaviours and PEG could be explored. If it is found that pro-environmental behaviours correspond positively with indicators of growth and adjustment, perhaps institutions and organizations who regularly send people to ICE settings (e.g., NASA, the National Science Foundation, etc.) could recommend that their explorers engage in the mutually beneficial act of educating the public around the urgency of climate change. It would also be of interest, considering both universalism and proactive coping correlated positively with appreciation of life, to examine the role proactive coping plays in positively impacting the environment or engaging in pro-environmental behaviours (i.e., behaviours that demonstrate an enhanced appreciation of life).

*Mindfulness:* The negative association between Acting with Awareness and Relationships with Others is a finding deserving of follow-up as Aware Action has been positively linked to friendship quality and social cognition in past work with trauma-exposed individuals (Pratscher et al., 2018). Future research should also consider the role contemplative practice plays for individuals coping through the aftermath of ICE environment missions as several expeditioners mentioned they began meditating more often while reintegrating into society.

*Coping:* Future studies could further evaluate the relationship between proactive coping and PEG qualitatively by asking participants to describe methods for coping during the reintegration phase into civilian life following deployment. Perhaps the mechanisms used for coping through adversity on the ICE are different from those utilized post-expedition and could provide valuable insight into the growth process.

*Spirituality:* As mentioned above, spirituality can be challenging to capture comprehensively with one measure. To measure spiritual change in ICEs quantitatively,

researchers could consider an examination of spirituality pre- to post-expedition using several measures, as opposed to just one, that aim to assess the construct in more detail.

*Resilience and ACEs:* Researchers should be encouraged to continue exploring the impact ACE burden plays on individuals in ICE environments as well as the protective factors that can help stimulate growth despite deeply rooted trauma and adversity.

## **Conclusion**

In this study a broad range of experiences were captured and thoughtfully compared to help elucidate the positive experiences that occur in the aftermath of Antarctic deployment. To our knowledge, this study is the first to use a mixed methods design to explore the incidence and correlates of PEG in a comparatively large sample of Antarctic expeditioners. Results provide both qualitative and quantitative evidence for the emergence of PEG. In addition, new evidence provides an impetus to further explore growth as a beneficiary of universalism and proactive coping styles. Moreover, qualitative reports indicate the occurrence of a new facet of growth, relationship to nature, which seems to coincide with universalism and spiritual change. Moving forward, researchers can expand on these findings to determine the roles these variables play in other ICE environments. It seems unlikely that the new theme of connection to nature would emerge in settings where exposure to the outside world is limited. Findings were mixed regarding COVID-19 and how experiences in Antarctica have affected expeditioner's ability to cope with the pandemic. While Antarctica serves as the preeminent natural laboratory for studying the psychosocial effects of long-duration space travel, our results provide compelling evidence that there may be too many idiosyncratic variables in play to compare experiences in polar ICE environments to COVID-19. Regardless, insight from this study should assist

researchers and industry alike to understand the underlying factors contributing to growth and other adaptive sequelae of ICE environment exposure.

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## Appendix A: Recruitment Materials

### Recruitment Flyer



**DO POLAR EXPEDITIONERS  
EXPERIENCE PERSONAL GROWTH  
FOLLOWING THEIR EXPERIENCES  
IN ANTARCTICA?**



A team of researchers at The University of Victoria is interested in understanding which factors may underly healthy adaptation and personal growth outcomes following exposure to isolated, confined, and extreme (ICE) environments.

### RESEARCH WILL INVOLVE

**A survey of questionnaires** relating to your personality, values, and experiences in Antarctica (~ 30 minutes to complete).

**A virtual interview** conducted via BlueJeans (an end to end encrypted videoconferencing modality) that will give you an opportunity to tell us a bit more about what it was like to live and work 'on the ice', in Antarctica (~45 minutes to complete).

### ARE YOU ELIGIBLE TO PARTICIPATE?

- ✓ Worked in Antarctica for longer than 1 month.
- ✓ 18 years or older

...then you qualify to complete our survey:

[Link to survey:](#)

<http://web.uvic.ca/~psyclimate/index.php/466136/lang-en>

### CONTACT US

*Your information and data **will not** be associated with your name or other personal information. However with so few potential participants, anonymity could be limited within the special circumstances of this study.*

*We are more than happy to communicate the results of the overall findings to you; however, your individual results will not be disclosed and cannot be used for diagnostic purposes.*



University of Victoria  
Department of  
Psychology

## Recruitment Email

Dear Participant,

My name is Patrick Nicoll and I'm a graduate student in the Department of Psychology at The University of Victoria. For my master's thesis, I am conducting research with my supervisor (Dr. Colette Smart) on personal growth that may occur in the aftermath of expeditions to isolated, confined, and extreme environments (e.g., Antarctica). Following ethical approval, your contact information was gathered via the NSF webpage of recently funded projects in Antarctica, where it was determined that you and/or your research team may qualify to participate in [my study](#).

The purpose of the research is to examine the incidence of personal growth as well as other factors that may improve and/or inhibit psychological functioning after Antarctic expedition/s. A secondary goal is to determine how individuals with past experience in Antarctica are coping with COVID-19 related stress.

### Do you qualify?

- If you are an adult (18+) who has lived/worked in Antarctica for 1+ month(s) (Antarctic experience does not have to be recent) then you qualify for this study.
- \*If you know of other individuals with experience in Antarctica, we encourage you to forward this email to them.\*

### What is required?

- Completion of a brief (30-40 minute) post-expedition survey (ideally completed within the next month), consisting of a few questionnaires. **The survey and letter of information/implied consent (providing further details about the study) can be accessed here:** [link](#)
- An **optional** qualitative interview, done over Zoom Business (an end-to-end encrypted and safe videoconferencing modality), where I would ask more in-depth questions about the overall experience of what living and working in Antarctica was like. You will be prompted to opt in or out of the interview at the end of the survey.

### Anonymity & Confidentiality

Regarding the data collected from surveys/interviews: I will not identify you or use any information that would make it possible for anyone else to identify you in any presentation or written reports about this study. Also, it's important to note that you can choose to do the survey and opt out of doing the interview (and vice-versa) as everything is completely voluntary. If you have any questions, please don't hesitate to reply to this email. In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or [ethics@uvic.ca](mailto:ethics@uvic.ca))

Thank you so much for your consideration to participate in my research and I hope you stay healthy and safe during these unprecedented times!

Sincerely,

Pat Nicoll

-

## Appendix B: Surveys

### Survey Preamble/Letter of Information for Implied Consent

Before beginning the survey, please read the following (below the line). If you agree to the terms and conditions then continue to the next section. If by the time you have completed the survey you no longer wish to be a part of the study then you will be given the option to exclude your data from the results.

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#### About the Researchers

##### Pat Nicoll

Patrick Nicoll is a first year Master's student at The University of Victoria's doctoral program in Clinical Psychology. His interests stem from his experiences as a United States' Peace Corps Volunteer in remote rural communities in Central America and the Caribbean, as well as through his work as an associate research scientist at NASA Ames Research Center, where he was exposed to literature and research that looks at the psychosocial implications of long-duration spaceflight through space-analog ICE environments (e.g. isolated polar research locales in Antarctica, and capsule habitats situated in isolated environments). His main motivation for conducting this study is to explore connections between challenge, resilience, and personal growth for individuals living and working in social and geographical isolation.

##### Dr. Colette Smart

Dr. Colette Smart (PI) is a registered psychologist and professor at the University of Victoria. Dr. Smart has extensive training in clinical techniques, particularly in the realm of meditative practices that promote well-being and positive outcomes for individuals facing adversity. In her research, she has explored self and emotion regulation practices and how each can serve to enhance resilient outcomes.

#### Purpose and Objectives of the Research

The main purposes of this study are 1.) to enhance our understanding of the positive and negative outcomes of individuals following exposure to isolated, confined, and extreme (often referred to as "ICE") polar environments, and 2.) to draw important conclusions regarding which factors may propagate or catalyze positive psychological outcomes in the face of the shared challenges linked to exposure to ICEs. As such, the following questionnaires will ask about topics related to your personality, mindful awareness, coping strategies, values, and resilience. The study will also examine factors suspected to diminish, or impede, personal growth following challenging experiences. With this goal in mind, the survey battery will include a questionnaire that asks about sensitive topics related to childhood trauma and abuse. This section, as well as all of the other sections in the survey are optional, and you may cease participation at any time. Importance of this Research This study has the potential to substantiate or further existing research on ICEs by adding to our understanding of why and how personal growth manifests in individuals following expeditions in isolated environments. We also hope it will shed light on

how individuals cope with social isolation in the context of a worldwide pandemic, such as COVID-19.

## **Participants**

Antarctica is commonly referred to as the preeminent location for conducting research that examines the psychological consequences and benefits of ICEs. Antarctic researchers are of particular interest because of the stressful environmental circumstances – geographical and social isolation, challenges associated with 24hr daylight, the cold climate, etc. – they have to endure on a daily basis. You qualify to participate in this study because you recently conducted field research in an isolated region/s of Antarctica and are over the age of eighteen years.

## **What is Involved?**

If you consent to voluntarily participate in this research, then your participation will include the completion of this survey (should take no more than 30-45 minutes to complete), the opportunity to sign up for a one-on-one (and end-to-end encrypted) video interview centered around your experiences of living and working in Antarctica (30-45 minutes) that will take place in about one month, and an opportunity to sign-up to participate in a follow up study in six months. You should note that some of the questions ask about sensitive topics, such as exposure to abuse and traumatic events. You can always choose to skip questions you do not wish to answer.

## **About Limesurvey**

Please be ensured that information about you that is gathered for this research study uses an online program (Limesurvey: [www.limesurvey.org](http://www.limesurvey.org)) with servers located within Canada. As such, there is no possibility that information about you may be accessed or seized by the U.S. government without your prior knowledge or consent (in compliance with the US Freedom Act). Similarly, BlueJeans, the video-conference modality that will be utilized for one-on-one interviewing purposes, uses end-to-end encryption and does not rely on a third-party source to store secure information. All data obtained from you (the participant) will be anonymized and kept confidential.

## **Inconvenience**

The main inconvenience you may experience is the amount of time it takes to complete the survey and qualitative interviews. To mitigate this inconvenience, you won't be scheduled to participate in the questionnaires and qualitative interviews successively. Instead, you have the option of completing the questionnaire at your own leisure, and then will be prompted to pick a separate time to complete the interview (sometime prior to November, 2020).

## **Risks**

In the present study, you may experience stress, frustration, boredom, and fatigue while completing the questionnaire items at home. In an effort to mitigate these risks, the survey will include written recommendations to take breaks between tasks at the estimated quarter, halfway, and three-quarter way completion points. Your answers to survey items will be completely confidential. Last, as elaborated on below (see: “Anonymity”), all forthcoming data provided by you will be anonymized. The risks to participating in this research are considered no more than you would encounter in your daily life. Through completing questionnaires, some individuals might find that greater awareness of their emotions can, in and of itself, be emotionally upsetting. That said, if you feel unduly distressed by participating in any aspect of this research, you are encouraged to directly contact Dr. Colette Smart (csmart@uvic.ca) or the SMARTLab coordinator (smartlab@uvic.ca) to see how we can best assist you moving forward.

## **Benefits**

As a participant in this study, you would be assisting in an ongoing campaign to improve behavioral health and performance for those living in isolating environments. A deeper understanding of personal growth in the context of these environments – as well as the promotive factors that strengthen positive outcomes – could inform the development of countermeasures to mitigate risks inherent in known and novel endeavors requiring ICE exposure (i.e. individuals living in social and/or geographical isolation). Additionally, the interview may be of interest as a way to reminisce about your experiences and tell your story (to an eager audience), which can have a therapeutic effect. **Voluntary Participation:** Your participation in this research must be completely voluntary. If you do decide to participate, you can withdraw at any time without any consequences or any explanation. If you do withdraw from the study your data will only be used if you give explicit permission. Otherwise, it will be permanently destroyed. **Anonymity:** To ensure your anonymity, you will be assigned a numerical code to classify your data during collection and storage. In this way, your (as well as other participants’) anonymity will be protected. Additionally, for quantitative measures, data will be analyzed at the group level, and individual data will not be reported. To anonymize the qualitative portion of the study, the usage of code names will be used and disclosed only to those directly working on the data collection and analyses portion of the study. Given the likelihood of a small, and potentially homogenous sample, descriptive features (e.g. age, gender, ethnicity, etc.) of individuals will be confidential to everyone but Patrick and his supervisor, Dr. Smart, throughout the course of the study.

## **Confidentiality**

The population from which this sample is drawn (individuals who have lived and/or work in Antarctica) is small, which makes individual subjects more easily identifiable. However, because the data collection will not take place until after the expeditions are over, it is unlikely that personal information will be as easily attributable to you as it would be if the study were conducted while you were still in Antarctica. Regarding the data collected from the interviews, if you choose to name or address other people (third parties), those individuals’ names will be anonymized to ensure that you will be unrecognizable when the results are distributed. Further,

any details of adverse or unique experiences surrounding other people will be changed as is appropriate to preserve anonymity and protect them from being recognizable in the results. Additionally, legal requirements may also limit confidentiality. Dr. Colette Smart, Patrick's supervisor is also a Registered (Clinical) Psychologist and is thereby required to report any individuals who voice the intent to harm themselves or others or report ongoing elder or child abuse.

### **Dissemination of Results**

It is anticipated that the results of this study will be shared with others in the following ways: thesis dissertations, class presentations, presentations at scholarly meetings, and published articles in peer-reviewed journals. Last, and importantly, the results will be shared with you. At the completion of the study, information on the specific purpose of the study as well as the implications of the findings and potential opportunities for future relevant research will be explored. .

### **Disposal of Data/Future Use of Data**

After seven years, electronic data from this study will be deleted; paper data will be shredded. The data may be used in future studies to compare and contrast findings/data. The data will not be used for purposes that have not already been outlined within this application. Further, at all stages, the data will be de-identified. This of course includes when it is presented to future researchers.

### **Contacts**

You may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or [ethics@uvic.ca](mailto:ethics@uvic.ca)). By continuing on to the next section of this questionnaire, **YOUR FREE AND INFORMED CONSENT IS IMPLIED** and indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.

## **Demographic Questionnaire**

### **Preamble to Demographic Questionnaire**

Please read the following before continuing on to the next section: In this study, we are interested in positive psychological (growth) outcomes following exposure to isolated environments. We know from prior research that certain demographic variables such as age, sex, and previous exposure to similar environments can all potentially influence these outcomes. As such, in the following questionnaire we will be asking questions associated with these and other variables so we can gain a better understanding of our specific sample of participants. \*Note that all questions are optional. Though we encourage answering all items, you can advance to a following section without answering every question.

1. Age: \_\_\_\_\_
2. Assigned sex at birth (circle all that apply)
  - a. Female
  - b. Male
  - c. Intersex
  - d. Other: \_\_\_\_\_
3. Gender (circle):
  - a. Female
  - b. Male
  - c. Trans man/male
  - d. Trans woman/female
  - e. Gender Queer/Gender Non-conforming
  - g. Other: \_\_\_\_\_
4. Relationship Status (circle)
  - a. Single
  - b. Married
  - c. In a relationship but not married
5. Ethnicity (circle)
  - a. Asian
  - b. African American
  - c. Caucasian
  - d. North African
  - e. Sub-saharan African
  - f. Middle-eastern
  - g. Latin-x
  - h. Pacific Islander
6. Which of these describes you?
  - a. Unemployed
  - b. Part-time Employed
  - c. Full-time Employed
  - d. Not employed for pay
7. If employed, please indicate your type of work (e.g. "Researcher") in the space below:  
\_\_\_\_\_.
8. Please indicate the highest level of education you have obtained
  - a. High-school (GED)
  - b. Some undergraduate
  - c. Completed undergraduate degree
  - d. Some graduate school
  - e. Completed graduate school
9. Which of these describes your income last year?
  - a. \$1 - \$999
  - b. \$10,000 - \$24,999

- c. \$25,000 – \$49,999
  - d. \$50,000 – \$74,999
  - e. \$100,000 – \$149,000
  - f. \$150,000 and greater
  - g. Prefer not to answer
10. Approximately how many months/years has it been since you returned from your most recent trip to Antarctica? (Circle the duration that applies to you)
- a. Less than one month (I just got back!)
  - b. 1+ months
  - c. 2+ months
  - d. 3+ months
  - e. 4+ months
  - f. 5+ months
  - g. 6+ months
  - h. 6-12 months
  - i. 1-2 years
  - j. 3-5 years
  - k. 5+ years
  - l. 10+ years
11. Indicate how many times (total) you have traveled to Antarctica.
- a. One trip
  - b. Two trips

- c. Three trips
- d. Four trips
- e. Five + trips

12. Below, please indicate the specific months (i.e., September – February; March – August) you were in Antarctica

- a. Trip 1: \_\_\_\_\_
- b. Trip 2: \_\_\_\_\_
- c. Trip 3: \_\_\_\_\_
- d. Trip 4: \_\_\_\_\_

10. Below, please provide 1. the general location/s (e.g. "McMurdo," "Thwaites Glacier,") of where you stayed during your most recent expedition to Antarctica, and 2. The approximate duration of time spent at each designated location/s (e.g. "10 days," "1 month").

	Location 1	Location 2	Location 3	Location 4	Location 5
In the following boxes, list up to five separate locations where you spent the most time during your most recent expedition to Antarctica					
In the following boxes, list the approximate amount of time spent at					

each location specified above.					
--------------------------------	--	--	--	--	--

11. Below, please circle the degree to which you agree or disagree with the following statement:  
“I would like to go back to Antarctica.”

1. Strongly Disagree    2. Disagree    3. Neutral    4. Agree    5. Strongly Agree

## Personal Values, Resilience, Post-expedition Growth

### Introduction

In the next section we will be asking you questions about your personal values, ability to bounce back from stress, and personal growth following your experiences in Antarctica. \*Friendly reminder: feel free to take breaks and/or save your answers to the survey and come back later.

### Short Schwartz Value Scale (Lindemann & Verkesalo, 2005)

#### Instructions

In this section, please rate the importance of the following values as a life-guiding principle for you. Use the 8-point scale in which 0 indicates that the value is opposed to your principles, 1 indicates that the value is not important for you, 4 indicates that the value is important, and 8 indicates that the value is of supreme importance for you.

	Opposed to my principles	0	1	2	3	4	5	6	7	8	Of supreme importance
1. POWER (social power, authority, wealth)	0	1	2	3	4	5	6	7	8		
2. ACHIEVEMENT (success, capability, ambition, influence on people and events)	0	1	2	3	4	5	6	7	8		
3. HEDONISM (gratification of desires, enjoyment in life, self-indulgence)	0	1	2	3	4	5	6	7	8		
4. STIMULATION (daring, a varied and challenging life, an exciting life)	0	1	2	3	4	5	6	7	8		
5. SELF-DIRECTION (creativity, freedom, curiosity, independence, choosing one's own goals)	0	1	2	3	4	5	6	7	8		
6. UNIVERSALISM (broad-mindedness, beauty of nature and arts, social justice, a world at peace, equality, wisdom,	0	1	2	3	4	5	6	7	8		

unity with nature,  
environmental protection)

7. BENEVOLENCE (helpfulness, honesty, forgiveness, loyalty, responsibility)	0	1	2	3	4	5	6	7	8
8. TRADITION (respect for tradition, humbleness, accepting one's portion in life, devotion, modesty)	0	1	2	3	4	5	6	7	8
9. CONFORMITY (obedience, honoring parents and elders, self-discipline, politeness)	0	1	2	3	4	5	6	7	8
10. SECURITY (national security, family security, social order, cleanliness, reciprocation of favors)	0	1	2	3	4	5	6	7	8

**Brief Resilience Scale (Smith et al., 2008)****Instructions**

Please indicate the extent to which you agree with each of the following statements using the following scale: 1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree.

1. I tend to bounce back quickly after hard times 1 2 3 4 5
2. I have a hard time making it through stressful events 1 2 3 4 5
3. It does not take me long to recover from a stressful event 1 2 3 4 5
4. It is hard for me to snap back when something bad happens 1 2 3 4 5
5. I usually come through difficult times with little trouble 1 2 3 4 5
6. I tend to take a long time to get over set-backs in my life 1 2 3 4 5

**Post-experience Change Inventory (Suedfeld et al., 2012; modified from Tedeschi & Calhoun, 1996)**

**Instructions**

Indicate for each of the statements below the degree to which this change occurred in your life as a result of your experience(s) in Antarctica using the following scale.

<b>0</b>	=	I did not experience this change as a result of my experience(s) in Antarctica.
<b>1</b>	=	I experienced this change to a very small degree as a result of my experience(s) in Antarctica.
<b>2</b>	=	I experienced this change to a small degree as a result of my experience(s) in Antarctica.
<b>3</b>	=	I experienced this change to a moderate degree as a result of my experience(s) in Antarctica.
<b>4</b>	=	I experienced this change to a great degree as a result of my experience(s) in Antarctica.
<b>5</b>	=	I experienced this change to a very great degree as a result of my experience(s) in Antarctica.

1. I changed my priorities about what is important in life. 1 2 3 4 5
2. I have a greater appreciation for the value of my own life. 1 2 3 4 5
3. I developed new interests. 1 2 3 4 5
4. I have a greater feeling of self-reliance. 1 2 3 4 5
5. I have a better understanding of spiritual matters. 1 2 3 4 5
6. I more clearly see that I can count on people in times of trouble. 1 2 3 4 5
7. I established a new path for my life. 1 2 3 4 5

8. I have a greater sense of closeness with others. 1 2 3 4 5
9. I am more willing to express my emotions. 1 2 3 4 5
10. I know better that I can handle difficulties. 1 2 3 4 5
11. I am able to do better things with my life. 1 2 3 4 5
12. I am better able to accept the way things work out. 1 2 3 4 5
13. I can better appreciate each day. 1 2 3 4 5
14. New opportunities are available which wouldn't have been otherwise. 1 2 3 4 5
15. I have more compassion for others. 1 2 3 4 5
16. I put more effort into my relationships. 1 2 3 4 5
17. I am more likely to try to change things which need changing. 1 2 3 4 5
18. I have a stronger religious faith. 1 2 3 4 5
19. I discovered that I'm stronger than I thought I was. 1 2 3 4 5
20. I learned a great deal about how wonderful people are. 1 2 3 4 5
21. I better accept needing others. 1 2 3 4 5
22. I have a greater sense of harmony with the world. 1 2 3 4 5
23. I feel more connected with all of existence. 1 2 3 4 5
24. I feel better able to face questions about life and death. 1 2 3 4 5
25. I have greater clarity about life's meaning. 1 2 3 4 5

## COVID-19 Specific Questions

### Introduction

COVID-19 is causing an increasing divide among people around the world. To curb the spread of the virus and prevent further outbreaks, governments and businesses are urging people to stay safe by practicing “social distancing” and staying home, away from others. For many, the effects of social isolation are beginning to set in. Others who are more accustomed to social isolation, may have a better understanding of how to cope. Social and geographical isolation are hallmark characteristics of living and working in isolated environments, such as Antarctica. Below are a few questions that ask about how living in remote regions of Antarctica may be impacting your ability to cope with the current COVID-19 situation.

### Instructions

Please indicate the extent to which you agree with each of the following statements using the following scale: 1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree.

1. I felt more socially isolated living and working in Antarctica than I do now due to COVID-19.  
(1 2 3 4 5)
2. Living in Antarctica taught me useful skills for handling stress associated with isolation.  
(1 2 3 4 5)
3. My experiences in Antarctica make it easier for me to tolerate feeling isolated.  
(1 2 3 4 5)
4. I've felt more socially isolated due to the social impact of COVID-19 than I did while living in Antarctica.  
(1 2 3 4 5)
5. Through my experiences in Antarctica I have learned that social isolation is an opportunity for personal growth.  
(1 2 3 4 5)
6. My experiences in Antarctica have given me tools to better handle COVID-19 imposed social isolation.  
(1 2 3 4 5)
7. I feel socially isolated due to the distancing measures imposed by COVID-19.  
(1 2 3 4 5)
8. I felt socially isolated while living in Antarctica.  
(1 2 3 4 5)

## Personality and Coping

### Introduction

In this next section we will be asking some questions about your personality and how you cope with stress.

### The Big Five Inventory (Goldberg, 1993)

#### Instructions

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Below, indicate the extent to which you agree or disagree with the statement.

I see myself as someone who...	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
	↓	↓	↓	↓	↓
Is talkative.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tends to find fault in others.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does a thorough job.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is depressed, blue.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is original, comes up with new ideas.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is reserved.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is helpful and unselfish with other.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can be somewhat careless.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is relaxed, handles stress well.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is curious about many different things...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is full of energy.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Starts quarrels with others.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Is a reliable worker.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can be tense.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is ingenious, a deep thinker.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Generates a lot of enthusiasm.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has a forgiving nature.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tends to be disorganized.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Worries a lot.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has an active imagination.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tends to be quiet.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is generally trusting.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tends to be lazy.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is emotionally stable, not easily upset.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is inventive.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has an assertive personality.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can be cold and aloof.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perseveres until the task is finished.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<b>I see myself as someone who...</b>	<b>Disagree strongly</b>	<b>Disagree a little</b>	<b>Neither agree nor disagree</b>	<b>Agree a little</b>	<b>Agree strongly</b>
	↓	↓	↓	↓	↓
Can be moody.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Values artistic, aesthetic experiences.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Is sometimes shy, inhibited.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is considerate and kind to almost everyone.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does things efficiently.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Remains calm in tense situations.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prefers work that is routine.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is outgoing, sociable.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is sometimes rude to others.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Makes plans and follows through with them.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gets nervous easily.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Likes to reflect, play with ideas.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has few artistic interests.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Likes to cooperate with others.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is easily distracted.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is sophisticated in art, music, literature...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Proactive Coping Inventory (Greenglass & Schwarzer, 1998)

### Instructions

The following statements deal with reactions you may have to various situations. Indicate how true each of these statements is depending on how you feel about the situation, using the following scale: 1 = Not at all true; 2 = Barely true; 3 = Somewhat true; 4 = Completely true.

- |  |      |
|--|------|
| 1 I am a "take charge" person.   | 1234 |
| 2 I try to let things work out on their own. (-)   | 1234 |
| 3 After attaining a goal, I look for another, more challenging one.                                    | 1234 |
| 4 I like challenges and beating the odds.  | 1234 |
| 5 I visualise my dreams and try to achieve them.   | 1234 |
| 6 Despite numerous setbacks, I usually succeed in getting what I want.                                 | 1234 |
| 7 I try to pinpoint what I need to succeed.  | 1234 |
| 8 I always try to find a way to work around obstacles; nothing really stops me.                        | 1234 |
| 9 I often see myself failing so I don't get my hopes up too high. (-)                                  | 1234 |
| 10 When I apply for a position, I imagine myself filling it.   | 1234 |
| 11 I turn obstacles into positive experiences.   | 1234 |
| 12 If someone tells me I can't do something, you can be sure I will do it.                             | 1234 |
| 13 When I experience a problem, I take the initiative in resolving it.                                 | 1234 |
| 14 When I have a problem, I usually see myself in a no-win situation.                                  | 1234 |
| 15 I imagine myself solving difficult problems.  | 1234 |
| 16 Rather than acting impulsively, I usually think of various ways to solve a problem.                 | 1234 |
| 17 In my mind I go through many different scenarios in order to prepare myself for different outcomes. | 1234 |

- 18 I tackle a problem by thinking about realistic alternatives. 1234
- 19 When I have a problem with my co-workers, friends, or family, I imagine beforehand how I will deal with them successfully. 1234
- 20 Before tackling a difficult task I imagine success scenarios. 1234
- 21 I take action only after thinking carefully about a problem. 1234
- 22 I imagine myself solving a difficult problem before I actually have to face it. 1234
- 23 I address a problem from various angles until I find the appropriate action. 1234
- 24 When there are serious misunderstandings with co-workers, family members or friends, I practice before how I will deal with them. 1234
- 25 I think about every possible outcome to a problem before tackling it 1234
- 26 I often find ways to break down difficult problems into manageable components. 1234
- 27 I make a plan and follow it. 1234
- 28 I break down a problem into smaller parts and do one part at a time. 1234
- 29 I make lists and try to focus on the most important things first. 1234
- 30 I plan for future eventualities. 1234
- 31 Rather than spending every cent I make, I like to save for a rainy day. 1234
- 32 I prepare for adverse events. 1234
- 33 Before disaster strikes I am well-prepared for its consequences. 1234
- 34 I plan my strategies to change a situation before I act. 1234
- 35 I develop my job skills to protect myself against unemployment. 1234
- 36 I make sure my family is well taken care of to protect them from adversity in the future. 1234

- 37 I think ahead to avoid dangerous situations. 1234
- 38 I plan strategies for what I hope will be the best possible outcome. 1234
- 39 I try to manage my money well in order to avoid being destitute in old age. 1234
- 40 When solving my own problems other people's advice can be helpful. 1234
- 41 I try to talk and explain my stress in order to get feedback from my friends. 1234
- 42 Information I get from others has often helped me deal with my problems. 1234
- 43 I can usually identify people who can help me develop my own solutions to problems. 1 2 3 4
- 44 I ask others what they would do in my situation. 1234
- 45 Talking to others can be really useful because it provides another perspective  
on the problem. 1234
- 46 Before getting messed up with a problem I'll call a friend to talk about it. 1234
- 47 When I am in trouble I can usually work out something with the help of others. 1234
- 48 If I am depressed I know who I can call to help me feel better. 1234
- 49 Others help me feel cared for. 1234
- 50 I know who can be counted on when the chips are down. 1234
- 51 When I'm depressed I get out and talk to others. 1234
- 52 I confide my feelings in others to build up and maintain close relationships 1234
- 53 When I have a problem I like to sleep on it. 1234
- 54 If I find a problem too difficult sometimes I put it aside until I'm ready to deal with it. 1234
- 55 When I have a problem I usually let it simmer on the back burner for a while. 1234

## Mindfulness, Meta-emotion, Executive Functioning

### Introduction

In the following section you will be asked a series of questions about mindfulness, how you experience emotion, and your executive functioning.

### Five Facet Mindfulness Questionnaire (Baer et al., 2006)

#### Instructions

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you, where 1 = Never or very rarely true, and 5 = Very often or always true.

- \_\_\_\_\_ 1. When I'm walking, I deliberately notice the sensations of my body moving.
- \_\_\_\_\_ 2. I'm good at finding words to describe my feelings.
- \_\_\_\_\_ 3. I criticize myself for having irrational or inappropriate emotions.
- \_\_\_\_\_ 4. I perceive my feelings and emotions without having to react to them.
- \_\_\_\_\_ 5. When I do things, my mind wanders off and I'm easily distracted.
- \_\_\_\_\_ 6. When I take a shower or bath, I stay alert to the sensations of water on my body.
- \_\_\_\_\_ 7. I can easily put my beliefs, opinions, and expectations into words.
- \_\_\_\_\_ 8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
- \_\_\_\_\_ 9. I watch my feelings without getting lost in them.
- \_\_\_\_\_ 10. I tell myself I shouldn't be feeling the way I'm feeling.

- \_\_\_\_\_ 11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
- \_\_\_\_\_ 12. It's hard for me to find the words to describe what I'm thinking.
- \_\_\_\_\_ 13. I am easily distracted.
- \_\_\_\_\_ 14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
- \_\_\_\_\_ 15. I pay attention to sensations, such as the wind in my hair or sun on my face.
- \_\_\_\_\_ 16. I have trouble thinking of the right words to express how I feel about things
- \_\_\_\_\_ 17. I make judgments about whether my thoughts are good or bad.
- \_\_\_\_\_ 18. I find it difficult to stay focused on what's happening in the present.
- \_\_\_\_\_ 19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.
- \_\_\_\_\_ 20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
- \_\_\_\_\_ 21. In difficult situations, I can pause without immediately reacting.
- \_\_\_\_\_ 22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.
- \_\_\_\_\_ 23. It seems I am "running on automatic" without much awareness of what I'm doing.
- \_\_\_\_\_ 24. When I have distressing thoughts or images, I feel calm soon after.
- \_\_\_\_\_ 25. I tell myself that I shouldn't be thinking the way I'm thinking.
- \_\_\_\_\_ 26. I notice the smells and aromas of things.
- \_\_\_\_\_ 27. Even when I'm feeling terribly upset, I can find a way to put it into words.
- \_\_\_\_\_ 28. I rush through activities without being really attentive to them.
- \_\_\_\_\_ 29. When I have distressing thoughts or images I am able just to notice them without reacting.
- \_\_\_\_\_ 30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.

\_\_\_\_\_ 31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.

\_\_\_\_\_ 32. My natural tendency is to put my experiences into words.

\_\_\_\_\_ 33. When I have distressing thoughts or images, I just notice them and let them go.

\_\_\_\_\_ 34. I do jobs or tasks automatically without being aware of what I'm doing.

\_\_\_\_\_ 35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.

\_\_\_\_\_ 36. I pay attention to how my emotions affect my thoughts and behavior.

\_\_\_\_\_ 37. I can usually describe how I feel at the moment in considerable detail.

\_\_\_\_\_ 38. I find myself doing things without paying attention.

\_\_\_\_\_ 39. I disapprove of myself when I have irrational ideas.

## Executive Functioning Index (Spinella, 2005)

### Instructions

This scale assesses an individual's executive functions in daily life. Instructions: Please rate how well each of the following statements describes you, where 1 = Not at all like me; 3 = Somewhat like me; and 4 = Very much like me.

1. I have a lot of enthusiasm to do things. 1 2 3 4 5
2. When doing several things in a row, I mix up the sequence 1 2 3 4 5
3. I try to plan for the future 1 2 3 4 5
4. I can sit and do nothing for hours. 1 2 3 4 5
5. I take risks, sometimes for fun. 1 2 3 4 5
6. I have trouble when doing two things at once, multi-tasking 1 2 3 4 5
7. I'm interested in doing new things. 1 2 3 4 5
8. I have a lot of concern for the well-being of other people. 1 2 3 4 5
9. I'm an organized person. 1 2 3 4 5
10. I save money on a regular basis. 1 2 3 4 5
11. I do or say things that others find embarrassing. 1 2 3 4 5
12. People who are foolish enough to be taken advantage of deserve it. 1 2 3 4 5
13. I only have to make a mistake once in order to learn from it. 1 2 3 4 5
14. I tend to be an energetic person. 1 2 3 4 5
15. I make inappropriate sexual advances or flirtatious comments. 1 2 3 4 5
16. When someone is in trouble, I feel the need to help them. 1 2 3 4 5
17. I sometimes I lose track of what I'm doing. 1 2 3 4 5
18. I feel protective towards a friend who is being treated badly. 1 2 3 4 5

19. I think about the consequences of an action before I do it. 1 2 3 4 5
20. I lose my temper when I get upset. 1 2 3 4 5
21. I take other people's feelings into account when I do something. 1 2 3 4 5
22. I have trouble summing up information in order to make a decision with it. 1 2 3 4 5
23. I start things, but then lose interest and do something else. 1 2 3 4 5
24. I swear/use obscenities. 1 2 3 4 5
25. I don't like it if my actions or words hurt someone else 1 2 3 4 5
26. I use strategies to remember things. 1 2 3 4 5

### Meta Emotion Scale (Mittsmangruber et al., 2009)

#### Instructions

After reading each of the following statements, rate them, not as you think you should react, but as your actual experiences are. 1 = Is not at all true for me; 2 = Is mostly true of me. 3 = Is somewhat true of me; 4 = Is somewhat true of me; 5 = Is mostly true of me; 6 = Is completely true of me.

- |  |   |   |   |   |   |   |
|--|---|---|---|---|---|---|
| 1. When I am sad or anxious, I become demanding of myself.   | 1 | 2 | 3 | 4 | 5 | 6 |
| 2. When I feel stressed and I experience negative emotions,<br>I treat myself with compassion.                             | 1 | 2 | 3 | 4 | 5 | 6 |
| 3. I repeatedly get angry about my emotional reactions.  | 1 | 2 | 3 | 4 | 5 | 6 |
| 4. I downright cajole myself when I experience major emotional burden.   | 1 | 2 | 3 | 4 | 5 | 6 |
| 5. Sometimes I could get really mad at myself about the way I react emotionally.   | 1 | 2 | 3 | 4 | 5 | 6 |
| 6. I repeatedly force myself to pull myself together.  | 1 | 2 | 3 | 4 | 5 | 6 |
| 7. In stressful situations, I try to treat myself in a similar caring fashion as I would treat people who are close to me. | 1 | 2 | 3 | 4 | 5 | 6 |
| 8. When I see my emotions as inappropriate, I get very strict with myself.   | 1 | 2 | 3 | 4 | 5 | 6 |
| 9. When I am sad or anxious, I do myself something good to make things easier for myself.                                  | 1 | 2 | 3 | 4 | 5 | 6 |
| 10. I fight strongly against my emotions.  | 1 | 2 | 3 | 4 | 5 | 6 |
| 11. I indulge myself when I feel bad.  | 1 | 2 | 3 | 4 | 5 | 6 |
| 12. When I am ashamed about my emotional reactions, I can hardly think of anything else.                                   | 1 | 2 | 3 | 4 | 5 | 6 |
| 13. Again and again, I discover new forms of experiences in myself.  | 1 | 2 | 3 | 4 | 5 | 6 |
| 14. Repeatedly, there are situations when I excoriate myself.  | 1 | 2 | 3 | 4 | 5 | 6 |
| 15. I often think my emotional reaction is wrong.  | 1 | 2 | 3 | 4 | 5 | 6 |

16. My thoughts and my feelings are an inexhaustible source of information about myself. 1 2 3 4 5 6
17. When I feel guilty behavior I have made a mistake, I am quite unforgiving with myself. 1 2 3 4 5 6
18. Negative emotions provide me with interesting information about myself. 1 2 3 4 5 6
19. When talking to myself in my thoughts, I am often harsh with myself. 1 2 3 4 5 6
20. When I cannot live up to my own expectations in everyday life, I do not put myself down. 1 2 3 4 5 6
21. I cannot forgive myself for a long time when I have done something wrong. 1 2 3 4 5 6
22. I am kind to myself when I feel burdened by my emotions. 1 2 3 4 5 6
23. I learn through my feelings. 1 2 3 4 5 6
24. When I experience strong negative emotions, I comfort and encourage myself. 1 2 3 4 5 6
25. I cannot come to grips with strong emotions. 1 2 3 4 5 6
26. I place high demands on myself to gain control over my feelings. 1 2 3 4 5 6
27. Repeatedly, I am irritated by my stupid emotional reactions. 1 2 3 4 5 6
28. Time and again, my thoughts and emotions are fascinating and important to me. 1 2 3 4 5 6

**Questions Taken from: Revised Adverse Childhood Experiences Inventory (Finkelhor et al., 2016)**

**Introduction/preamble**

Before continuing on to the next section, please stop to read the following: In the next set of questions, we are going to be asking about any history of trauma or abuse you might have experienced. We ask that you do not disclose the name or location of any perpetrators. If you yourself wish to report on any child abuse or maltreatment, it is recommended that you contact the Child Protective Services or the local police. Please continue to the next section when you have finished reading.

**Instructions**

Please select your answers from the options below, or use text where space is provided. All responses

1. In the past, have you ever experienced any of the following? (check all that apply):
  - a. Neglect \_\_\_
  - b. Physical abuse \_\_\_
  - c. Emotional abuse \_\_\_
  - d. Sexual abuse/Inappropriate touching \_\_\_
  - e. Yes to one of the above, would rather not specify\_\_\_
2. Did you ever witness either of your parents or guardians being subjected to sexual, emotional, or physical abuse?
  - a. Yes \_\_\_
  - b. No \_\_\_
3. Did your parents or guardians get divorced or separate?
  - a. Yes \_\_\_
  - b. No \_\_\_
4. Did you ever live in a house with an alcoholic or abusive drinker?
  - a. Yes \_\_\_
  - b. No \_\_\_
5. Did you ever live with someone mentally ill, or someone who attempted suicide?

a. Yes \_\_\_

b. No \_\_\_

6. Did a family member or caretaker ever go to prison?

a. Yes \_\_\_

b. No \_\_\_

7. In the past, have you ever experienced any of the following?

a. Traumatic motor vehicle accident

b. Traumatic physical injury

c. Traumatic psychological event

d. Other traumatic event

#### **Data Inclusion and Follow Up**

1. Are you willing to have your data included in our study?

a. Yes \_\_\_

b. No \_\_\_

If yes, please provide your first name and email/phone number below for the purpose of scheduling your interview. As stated previously, your name will remain anonymous to everyone but the PI (Dr. Smart) and her student (Patrick Nicoll). Additionally, your responses to this survey will be anonymized and not linked to your name.

Name: \_\_\_\_\_ email: \_\_\_\_\_

2. Are you willing to participate in a short follow-up interview about your experience(s) in Antarctica?

a. Yes \_\_\_

b. No \_\_\_

If yes, please provide your first name and email/phone number below for the purpose of scheduling your interview. As stated previously, your name will remain anonymous to everyone but the PI (Dr. Smart) and her student (Patrick Nicoll). Additionally, your responses to this survey will be anonymized and not linked to your name.

Name: \_\_\_\_\_

email: \_\_\_\_\_

## **Qualitative Interview Questions**

### **Initial, open-ended questions (Background/Rapport building)**

What motivated you to do research/work in Antarctica?

If gone back: what motivated you to go back to Antarctica?

### **Intermediate questions (Correlates of Growth – Coping and Resilience)**

What are a couple of your best memories from your time in Antarctica

What did you know about the challenges you would face in Antarctica prior to leaving for your polar expedition? What parts of living and working in Antarctica seemed the most challenging to you, pre-departure?

When presented with these challenges, how do you feel you handled them? Do you feel you can handle challenges better now, as a result?

What did you do to manage the stress associated with the challenges you described? What were some of the ways other people on your team handled stress?

Describe the most important lessons you learned through the hardships that you had to face on your own.

Could you describe the most important lessons you learned through the hardships that you faced as a team?

Did the benefits of the experience outweigh the costs and/or challenges?

Have the experiences of living and working in Antarctica improved your ability to cope with the social stress associated with COVID-19?

### **Ending Questions (PEG)**

Tell me about how your views of the world may have changed following your experiences in Antarctica

How do you feel you have changed as a person since returning from your expedition to Antarctica?

After living in Antarctica, do you feel you value your life differently?

Do you feel you have developed new interests?

Upon return from Antarctica, did you find it easier to get along with others?

Upon return from Antarctica, did you find you felt any sort of newfound sense of purpose in life?

Did you in any way feel like your life was lacking meaning and purpose?

People sometimes say they sense a kind of presence or power, or they feel a part of something bigger or greater than themselves. Sometimes this can be sensing a presence which brings you comfort or reassurance in time of deep stress, but it can also be when you're at the beach or going for a walk or hike when suddenly and kind of inexplicably you feel strongly that you are united with the world around you, or nature seems especially beautiful or amazing. Has anything like that ever happened to you. Did you feel like it happened in Antarctica? Did you feel like that happened more often to you after you lived in Antarctica?

Having been through this experience, is there anything that you value more about yourself now? What do you think others most value in you?

think I should know to understand your experience in Antarctica better?

Is there anything you would like to ask me?

Timeframe

Beginning	~5 minutes max
Intermediate	20 minutes
Ending	20 minutes