# Chapter 21
# Well-Being at the Polish Polar Station, Svalbard: Adaptation to Extreme Environments

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**Abstract** While the psychological well-being of Antarctic crews has been investigated previously, Arctic crews have received little attention. Antarctic stressors include the permanent darkness of polar night, cramped quarters and harsh weather conditions which demand that the crews work together to survive. These stressors are also present for Arctic crews with the addition of dangerous polar bears. In this study, these psychological stressors were explored at the Polish Polar Station, Svalbard. Nine crew members three of whom were women, took part in the study. They filled in the Profile of Mood States (POMS) and the Symptom Checklist 90-Revised (SCL-90-R) after their arrival, at equinox, during polar night, in spring and during the midnight sun. Depression and hostility were highest in the spring following the isolation of polar night. Vigor reached its lowest point in spring and remained low until mission completion. Confusion continued to decline throughout the mission. The Polish crew adapted by monitoring their feelings to work together and ensure survival. Up until and during the polar night, negative feelings were low. Following the isolation period, depression and hostility increased while vigor declined. This suggests adaptation paradigm wherein the participants stopped to monitor their own feelings as closely after the polar night.

## 21.1 Introduction

Research in the polar social sciences has often taken one of these two approaches: research on isolated and confined environments (ICE) at Antarctic stations, and research on Arctic indigenous peoples. The doctoral research outlined in this article

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addresses a gap in the existing research: research on ICE at Arctic research stations. Stressors that have been identified in the Antarctic environment such as dangers from crevasses, blizzards and the continuous darkness in austral winter (Palinkas and Suedfeld 2008) apply also to the Arctic, even though Arctic blizzards are fewer and weaker and the average temperature is higher than in the Antarctic (Palinkas 1991, 1990). An additional stressor are polar bears which pose a significant threat to human life (Norwegian Polar Institute 2005); they are a uniquely Arctic stressor that is entirely absent in Antarctica. Previous research has shown that Antarctica's social environment has predominant influence on mental health and well-being (Bhatia and Pal 2012). The key stressors at research stations include lack of privacy, boredom, sexual and emotional deprivation, contrived opportunities for social interaction, and reduced possibility to escape or avoid interpersonal conflict and resultant stressful situations (Palinkas 1990).

The Arctic ICE research described in this article aims to gather specific psychological knowledge relevant to mental health and well-being in Arctic personnel. Such knowledge may assist in the selection of Arctic personnel and may also indicate directions for providers of psychological support and self-care of this personnel *in situ.* Discovering the nature of psychological fluctuations and their chronological characteristics in the Arctic circle opens up the possibility of delineating the person- and situation-specific indices of mental health and well-being along with the relevant support.

## 21.2 Methodology

In this article, preliminary data is reported from nine of the 11 winter team members (comprising three women) at the Polish Polar Station, Hornsund, Svalbard. The winter team arrives at the station by early July each year and remains until late June the following year. The members are isolated at the station from late November to early March each year, with the final sunset before polar night occurring in late October. The presented participants were at the station from early July 2015 to late June 2016. Only one, the station commander, had wintered at the station before but three others had had shorter visits to the station. However, two winter team members are not accounted for in the present report: one withdrew from the study, and one had to be evacuated due to psychiatric complications. Each team member's mood and mental health was assessed using the Profile of Mood States 2 – Brief Version (POMS) and Symptom Checklist 90 Revised (SCL-90-R) at five "Mission Time" points: July ("After Arrival"), September ("Autumn"), January ("Winter"), April ("Spring") and June ("Summer"). The POMS assesses the following subscales: Anger-Hostility, Depression-Dejection, Fatigue-Inertia, Tension-Anxiety, Confusion-Bewilderment and Vigor-Activity, while the SCL-90-R measures the following symptoms of psychopathology: Somatization, Interpersonal Sensitivity, Obsessive-Compulsive Behaviour, Anxiety, Phobic Anxiety, Paranoid Ideation, Psychoticism, Depression and Hostility.

ICE research faces some issues with data analysis due to the very small sample sizes of the studies. Frequently, studies report a sample size less than 20 (e.g. Palinkas et al. 2001; Reed et al. 2001; Xu et al. 2003) or less than 10 (e.g. Corbett et al. 2012; Leon and Scheib 2007). Studies with larger sample sizes often report longitudinal data spanning several years to several decades (e.g. Bhatia et al. 2013; Palinkas et al. 2000).

Statistical analysis of small samples is potentially problematic as a single outlier may disproportionately affect the findings. As this study reports on a sample of nine participants, details on the analytic procedure are included for transparency reasons. The independent variable (IV) was Mission Time, which was used to predict the dependent variables (DV). The DV consisted of the POMS and SCL-90-R subscales listed above. First, the normality of all DV was assessed using the Shapiro-Wilk test. In case of non-normally distributed DV, the non-parametric *Friedman test* was chosen, followed by group comparisons using *Wilcoxon signed rank tests* with the effect size *r* (Field 2009, p. 579–580). For normally distributed DV, a within-subjects *analysis of variance (ANOVA)* with a *Huyn-Feldt correction* was chosen because Stiger et al. (1998) have shown that this is robust under conditions of a small sample size and ordinal data. For ANOVA effect size, *omega squared ($\omega^2$)* will be reported because it is reliable with small sample sizes (Levine and Hullett 2002). This approach allows two types of conclusions: firstly, to reject that there is no effect of Mission Time on Mood or Mental Health at all (i.e. reject the so-called "null-hypothesis"), and secondly to explain the variance in Mood or Mental Health by Mission Time. In order to accept the so-called "alternative hypothesis" that Mission Time affects Mood and Mental Health, *Bayes Factors (BF)* will be employed, which quantify how much more likely the presented data is to occur under this alternative hypothesis.

## 21.3 Results

This article focuses on the results on Hostility and Depression indicators from the SCL-90-R, as well as on the Confusion and Vigor indicators from the POMS. Depression refers to dysphoric mood, signs of withdrawal and loss of vital energy, while Hostility describes aggression, irritability and rage. Confusion includes a lack of cognitive or behavioural clarity and a disruption of awareness; Vigor means high levels of psychological and physical energy.

Depression had three levels which were non-normally distributed (Autumn ($W_{(9)} = .794$, $p = .018$), Winter ($W_{(9)} = .735$, $p = .004$), Summer ($W_{(9)} = .631$, $p = .000$); Hostility had four non-normally distributed levels (After Arrival ($W_{(9)} = .390$, $p = .000$), Autumn ($W_{(9)} = .831$, $p = .046$), Winter ($W_{(9)} = .723$, $p = .003$), Spring

($W_{(9)}$ = .801, p = .021)). Such non-normal distributions indicate that the data set contains very heterogenous individual scores so that an ANOVA may not be used. Subsequently, the non-normally distributed Depression and Hostility DV were analysed using Friedman's test and the normally distributed Confusion and Vigor DV with Huyn-Feldt-corrected ANOVA.

Mission Time had a significant main effect on Hostility ($\chi^2_{(4)}$ = 12.79, p = .012). Participants felt more hostile in Autumn (M = 1.22, SD = 1.48, p = .039, r = −.307), Spring (M = 2.22, SD = 2.49, p = .033, r = −.625) and in Summer (M = 2.11, SD = 2.26, p = .016, r = −.948) compared to After Arrival (M = 0.22, SD = 0.67). See Fig. 21.1 below.

However, when a Bonferroni correction for multiple comparisons was applied to these Wilcoxon signed rank tests (p = .0125), none of them remained significant. The null hypothesis is always that there is no effect of Mission Time on any given mood or mental health symptom, so if Mission Time had no effect on Hostility, the result above would only have a 1.2% chance of occurring. Mission Time further explains 30.7%, 62.5% and 94.8% of variability in Hostility in Autumn, Spring and Summer, respectively. The Bayesian analysis provided moderate support on the effect of Mission Time on Hostility (BF = 3.34). The combination of these analyses allows to accept that there is a moderate influence of Mission Time on Hostility which would be unlikely to occur if Mission Time did not affect Hostility at all.

Mission Time had a significant effect on the measure of Depression ($\chi^2_{(4)}$ = 12.76, p = .012). Participants reported feeling more depressed in Autumn (M = 4.89, SD = 4.56, p = .043, r = −.301) and in Spring (M = 7.33, SD = 6.40, p = .020, r = −.648) than After Arrival (M = 2.33, SD = 1.87), see Fig. 21.2.

After a Bonferroni correction (p = .0125) for multiple comparisons, none of the Wilcoxon signed rank tests remained significant. This shows an effect of Mission Time on Depression in this data that would only have a 1.2% chance of occurring if Mission Time had no influence on Depression at all. Mission Time further explained 30.1% of variability in Depression in Autumn and 64.8% in Spring. The Bayesian analysis provided moderate support of the effect of Mission Time on Depression (BF = 3.84). The combination of these analyses allows to reject the notion that Mission Time does not affect Depression and accept that its influence is moderate.

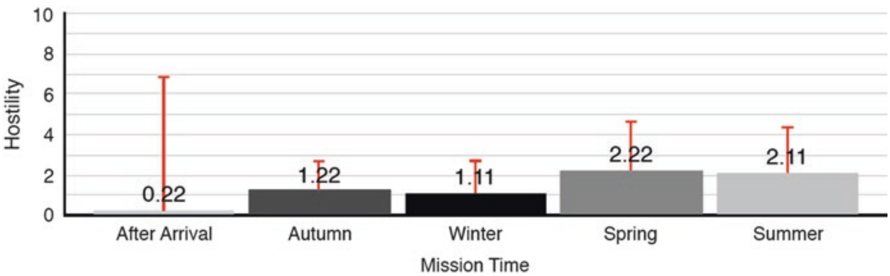


**Fig. 21.1** The SD showed greatest variation after arrival, while hostility was highest in Spring and Summer. Nevertheless, the maximum possible hostility was 24, which means participants never reported more than 9.25%

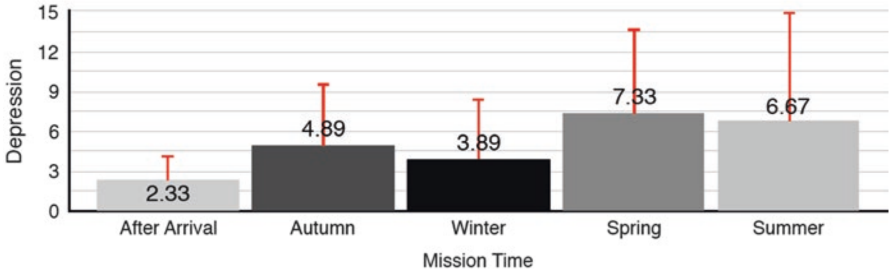


**Fig. 21.2** The SD of depression showed greatest variation in Summer. The maximum possible depression was 24, which means participants never reported more than 30.54%

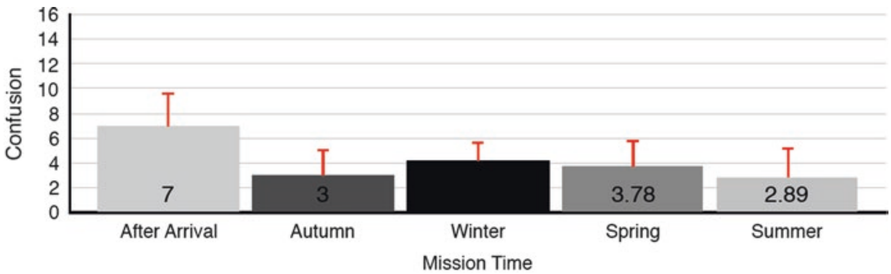


**Fig. 21.3** Confusion continued to decline over time, the highest level was 43.75% at the after arrival measuring point. Its SD remained comparatively stable

Mission Time showed a significant main effect on Confusion ($F_{(2.44,19.51)} = 3.66$, $p = .001$, $\omega^2 = .451$). Participants reported less Confusion in Autumn (M = 3.0, SD = 2.12, p < .001), Winter (M = 4.22, SD = 1.56, p = .016), Spring (M = 3.78, SD = 2.11, p = .003) and Summer (M = 2.89, SD = 2.32, p < .001) compared to After Arrival (M = 7.0, SD = 2.65), as indicated by Bonferroni post-hoc tests (Fig. 21.3).

The within-subjects ANOVA implies that in this data, Mission Time had an effect on Confusion that would only have a 0.01% chance of occurring if there were no such effect at all. The Bayesian analysis provided extreme evidence (Andraszewicz et al. 2015) in support of the effect of Mission Time on Confusion (BF = 476.36). The effect of Mission Time on Confusion was thus accepted. Mission Time further explains 45.1% of variability in Confusion.

Mission Time had a significant main effect on Vigor ($F_{(4,32)} = 2.75$, $p = .045$, $\omega^2 = .159$). Bonferroni post-hoc tests did not show any specific monthly differences (Fig. 21.4).

The within-subjects ANOVA implies that in this data, Mission Time had an effect on Vigor that would only occur with a chance of 4.5% if overall, Mission Time did not influence Vigor at all. The Bayesian analysis provided anecdotal support of the effect of Mission Time on Vigor (BF = 1.72). The combination of these analyses allowed to accept that there is a mild influence of Mission Time on Vigor. Mission Time further explains 15.9% of variability in Vigor.

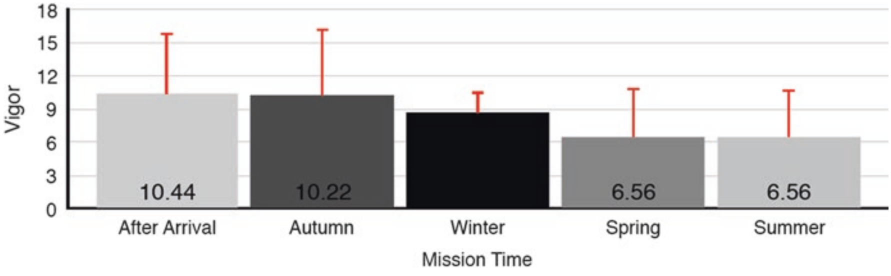


**Fig. 21.4** Vigor continuously declined. We have set the y-axis to 18 to accommodate for the SD of after arrival and Autumn but the actual maximum is 16. So the highest Vigor reported was 65.25%

## 21.4 Discussion

The results show that time spent at the Polish Polar Station comes with a mild decline in vigor, with participants feeling most vigorous right after their arrival and least vigorous just before their departure. A stronger, moderate influence of time spent at the Station on hostility and depression. Both of these were lowest after arrival and peaked in spring, after the end of the isolation. The mental state variable most susceptible to time spent at the Station was confusion: confusion was highest right after arrival and continued to decline as the mission went on. It spiked briefly in winter when participants had to adjust to polar night but proceeded to decline.

These findings imply that adaptation patterns include a decline in both liveliness and confusion: as people spend time at the station they become less excited about and more habituated to their environment. With the environmental change of polar night, confusion increases once more before declining until the end of the mission. During the winter interviews, the participants described great difficulties with monitoring their own feelings as a means to keeping the peace among the team. These interviews help with interpreting the data on hostility and depression: while adaptation continues, people become less able or less willing to monitor their feelings of hostility and unhappiness after the isolation. The interview data suggest that some participants considered that the most difficult part of the mission was behind them after the polar night; hence the observed pattern in hostility and depression with declining monitoring of feelings and more openly hostile behaviour.

The results provide an interesting contrast with research from the Antarctic. Frequently, the highest levels of depression, hostility and anxiety at Antarctic stations are reported during mid-winter (Palinkas and Suedfeld 2008). However, these studies include American, British, Japanese and Chinese nationals, in contrast with the present findings based on Polish nationals. Palinkas et al. (2004) report no POMS fluctuations over mission time for the Polish *Henryk Arctowski Station* on King George Island, Antarctica (62.16° S, 58.47° W). Their findings contrast with the ones here that observed slight fluctuations in confusion and vigor using the same measure. However, it is noteworthy that Arctowski is sub-Antarctic and does not experience polar night during its winter, possibly explaining the different results.

However, all crews of all nationalities have thus far been affected but to different degrees. Individual characteristics that make individual people more prone to winter depression include summer depression and being married (Palinkas et al. 1995).

The fore mentioned issues underline both the strengths and weaknesses of this study. To our knowledge, this is the first study focusing on Polish nationals at an isolated research station during polar night. As such it extends the knowledge of polar psychology, though requires some caution in generalising beyond the sample size used here. Especially so because the effect sizes varied greatly: the lowest variability explained by mission time was 15.9% for overall vigor, the highest was 94.8% for summer hostility. Simultaneously, the low BF for vigor only supplied anecdotal evidence (Andraszewicz et al. 2015) for the influence of mission time. This suggests that one or more other factors than mission time contribute to vigor. Wood et al. (2000) described numerous positive, salient experiences that could explain more of the variability in vigor. These experiences include a rewarding work life as well as field trips. For all of the unpleasant mental states, the variability explained was above 30%, implying that mission time influences explains mental states better than it does positive ones. This means that ICE missions time by itself may have a more negative than positive influence on mental health. Positive experiences during these missions are related to other factors than the mission progressing.

It is concluded that Polish ICE crews in the Arctic experience different adaptation patterns and mental health fluctuations to crews stationed in the Antarctic, regardless of their nationalities. While this evidence may have limited potential for generalization, it is important to collect evidence from many different ICE and nationalities. Ultimately, this kind of knowledge can inform us about selection techniques, support strategies and coping preparations for when mankind begins long-duration spaceflights. It also contributes to improving the understanding on current ICE missions. Future research needs to focus on in-mission emotional and social support and coping strategies to make missions safer and more successful. Knowledge about different nationalities' behavioural variations under ICE conditions is valuable when assembling international crews, because some cultures may be better suited for shared missions.

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