

Antarctica Meta-Analysis: Psychosocial Factors Related to Long Duration Isolation and Confinement

This meta-analysis is examining the psychological effects of wintering-over in Antarctica. As an isolated, confined, and extreme (ICE) environment, Antarctica provides invaluable opportunities to experience stressors more common to spaceflight than to the average person's everyday life. Increased prevalence of psychological symptoms, syndromes, and psychiatric disorders, as well as positive effects, are expected to be associated with various demographic and environmental factors. Implications for spaceflight are discussed. Findings from statistical review of the Antarctic articles will be shared.

Antarctica Meta-Analysis

Psychosocial Factors Related to Long Duration Isolation and Confinement

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Abstract

- The purpose of this study is to examine the psychological effects of wintering-over in Antarctica. Meta-analysis was selected as the methodology of choice.
- As an isolated, confined, and extreme (ICE) environment, Antarctica provides invaluable opportunities to experience stressors more common to spaceflight than to the average person's everyday life.
- Increased prevalence of psychological symptoms, syndromes, and psychiatric disorders, as well as positive effects, are expected to be associated with various demographic and environmental factors.
- Evaluation of statistical techniques yielded an inability to conduct a traditional meta-analysis. Possible forward work may include a quantitative literature review, a re-analysis of the data (for certain individual measures) using modern longitudinal techniques, and/or a "pseudo" meta-analysis (for certain individual measures).



Introduction

Predicting the Effects of Longer Duration Missions

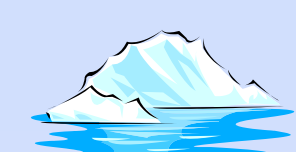
- NASA is committed to longer duration spaceflight including astronauts returning to the Moon and manned flights to Mars.
- This requires a deeper understanding of the impact extended missions pose for Astronauts.
 - Longer periods away from family and friends.
 - Absence of earthly conveniences and daily routines intensifying astronauts' feelings of isolation.
 - More time spent confined in the spacecraft and living in a potentially dangerous environment.
- Consequently, we must be able to predict the effect that extended periods of isolation will have on astronauts' psychological well-being.

Antarctica as a Space Analog

- Evidence gathered in space analogs provide insight into psychological issues that might arise during longer duration missions.
- The Antarctic is an ICE (isolated, confined, and extreme) environment and an important analog for spaceflight.
 - Physically isolated from the rest of the world, and during winter months is further isolated since the weather precludes travel to and from the continent.
 - Coldest, windiest, and highest continent, thereby limiting outdoor excursions.
 - Relatively small living and working spaces.

Evidence of Psychological Effects of Antarctica

- Psychological effects of Antarctic expeditions have been well documented from anecdotal accounts recounted by the earliest explorers
 - Men from Sir Ernest Shackleton's Imperial Trans-Antarctic Expedition of 1914–1917 were stranded on Elephant Island after their ship, the *Endurance*, was destroyed when it became trapped in ice in the Weddell Sea. Carpenter for the Expedition, Harry McNeish, wrote of being on the island saying, "I don't think there are ever many fine days on this forlorn island... I don't think there will be many survivors if they have to put in a winter here."
- And from more recent research
 - e.g., emotional stability (Suedfeld et al, 1992); anxiety (Mocellin et al., 1991).



Purpose of the Study

- The purpose of this study is
 - to examine the effects that wintering-over in Antarctica has on psychological well-being, and then
 - to relate these findings to longer duration spaceflight.
- Meta-analytic techniques are being used to synthesize existing empirical research, affording a more complete picture than can be provided by one study alone.

Categorization of Psychological Effects Experienced in Antarctica

Psychological Symptoms

- Somatic symptoms such as fatigue, headaches, weight gain
- Disturbed sleep including phenomena such as difficulty falling or staying asleep, loss of slow-wave sleep, loss of REM sleep
- Impaired cognition such as reduced accuracy and short-term memory, increased response time for cognitive tasks and spontaneous fugue states (Antarctic stare)
- Negative affect including depressed mood, anger and irritability, and anxiety
- Interpersonal tension and conflict both toward group members and non-group members

Syndromes

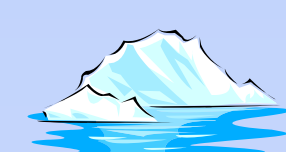
- Winter-over syndrome
 - Consists of impaired cognitive functioning, disturbed sleep, interpersonal tension and conflict, and negative affect.
 - Not usually severe enough to warrant a DSM-IV diagnosis
 - 3rd Quarter Effect—symptoms associated with the winter-over syndrome appear to peak in the 3rd quarter of the mission
- Polar T3 syndrome
 - Cold-related changes in thyroid functioning with effects similar to those seen in hypothyroidism
 - Associated with mood disturbances and reductions in cognitive performance
- Subsyndromal seasonal affective disorder (SSAD)
 - Related to variations in the amount of daylight
 - Associated with depressive symptoms

Psychiatric Disorders

- Severe enough to warrant DSM-IV diagnoses include:
 - Mood disorders
 - Personality disorders
 - Substance-related disorders
 - Sleep disorders
 - Adjustment disorders
- Incidence rates
 - All diagnoses
 - 5.2% of people wintering-over in Antarctica met criteria for at least one DSM-IV diagnosis (Palinkas, Glogower, Dembert, Hansen, & Smullen, 2004)
 - The rate of mental disorders, including depression, was 4.5% according to ANARE and 6.4% at McMurdo Station (Otto, 2007)
 - Depression—Based on 12 years of South Pole data, the overall incidence rate for depression that required pharmacological intervention was 2.03% (Otto, 2007)

Positive Effects

- Inherently enjoyable aspects of the situation
- Successful overcoming of challenges inherent in the situation
- Ingroup solidarity, cohesiveness, shared values
- Hardiness, resiliency, coping



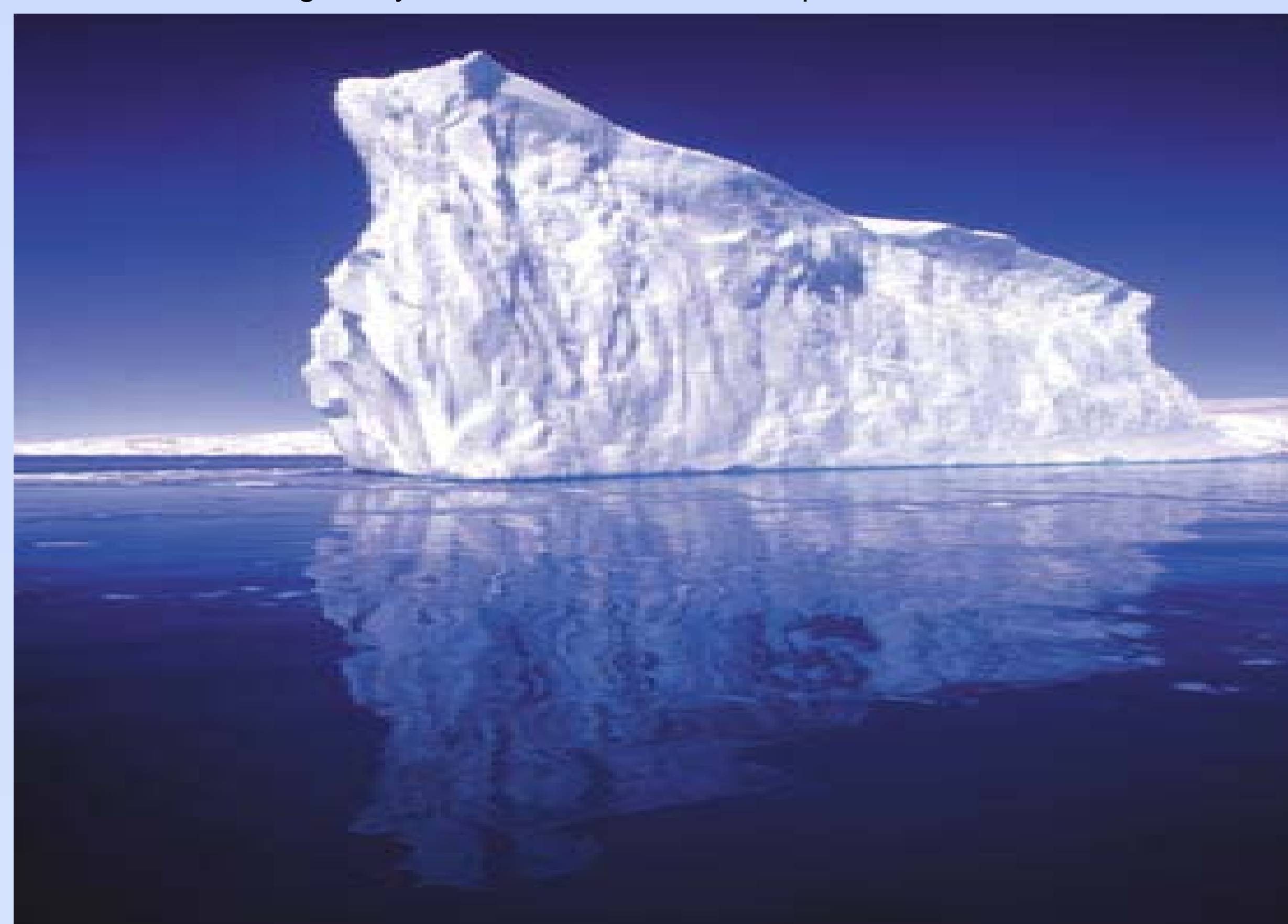
Hypotheses

Hypothesis 1

Psychological symptoms are positively associated with duration of residence in Antarctica, third quarter of Antarctic residence, and station latitude. Psychological symptoms are higher in women and military personnel. Psychological symptoms are negatively associated with size of crew, station accessibility, selection process, and prior experience.

Hypothesis 2

Syndromes are positively associated with duration of residence in Antarctica and station latitude and negatively associated with selection process.

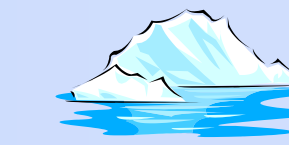


Hypothesis 3

Psychiatric disorders are positively associated with duration of residence in Antarctica and station latitude. Psychiatric disorders are higher in women and military personnel. Psychiatric disorders are negatively associated with station accessibility, selection process, and prior experience.

Hypothesis 4

Salutogenic effects are positively associated with station accessibility and severity of station environment.



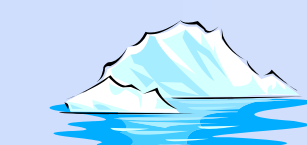
Search Criteria

- Attempted to identify and obtain all published and unpublished empirical studies of psychological effects of Antarctic stays.
- Identified well over 500 articles, books, presentations, papers on psychological effects of Antarctic missions for possible inclusion.
- Search terms: Antarctica, polar, winter-over
- Search locations: PsycInfo, Medline, similar search engines, including the Antarctic Bibliography; contacting prominent researchers in the field; examination of databases held by countries involved in Antarctic research including: Australian Antarctic Division, British Antarctic Survey, New Zealand Antarctic Bibliography, and the U.S. Defense Technical Information Center.



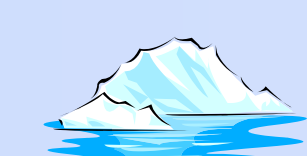
Current Status of Meta-Analysis

- Completed coding, which involves identifying and coding the relevant data found in each study.
- Met with statisticians* to evaluate feasibility of traditional meta-analysis (optimal measures were chosen including 16PF, POMS, and PANAS)
- Traditional meta-analysis was not recommended due to inconsistent measurement of data and lack of critical information reported in research articles



Possible Alternative Methodologies

- Quantitative Literature Review**
 - Although the data in these studies do not lend themselves to the stringent requirements of the meta-analysis methodology, a less formal version of a quantitative literature review remains a possibility.
 - This less rigorous quantitative literature review would use descriptive statistics, such as percentile and frequency, to summarize research findings.
- Modern Longitudinal Techniques**
 - A re-analysis of the data for the POMS might be possible if enough raw data is obtained from researchers for each measure considered.
 - Raw data has been requested from two prolific Antarctic researchers: one researcher has agreed to share raw data from multiple studies.
- Alternative Meta-Analysis**
 - Another possibility is to conduct a "pseudo" meta-analysis for the 16 PF.
 - However, this is not without caution due to the fact that reported data may contain heterogeneous sub-samples.



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