

# Psychological Functioning Among Members of a Small Polar Expedition

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**Background:** While depressed mood, insomnia, irritability and impaired cognition represent common responses to the physical and psychosocial stressors associated with polar environments, wide variations exist in their expression and the degree to which they adversely affect the health and performance of polar expeditioners. In particular, the process of successful adaptation to polar environments and the psychosocial characteristics associated with this process remains poorly understood. **Hypothesis:** Psychosocial characteristics associated with successful coping with typical stressors are also associated with successful adaptation in polar environments. **Methods:** The 4 men and 3 women participating in a 3-week scientific expedition in the Canadian High Arctic completed a battery of psychological questionnaires, including the Profile of Mood States (POMS), prior to their departure to Isachsen, N.W.T. In Isachsen, subjects completed the POMS and the Structured Interview Guide for the Hamilton Depression Rating Scale—Seasonal Affective Disorders Version (SIGH-SAD) each week. **Results:** Good psychological adjustment was demonstrated by a significant decline in POMS factor scores for tension-anxiety ( $p = 0.005$ ), fatigue ( $p < 0.0001$ ), and confusion ( $p = 0.024$ ) from baseline to Week 3, and a significant decline in SIGH-SAD depressive symptoms ( $p < 0.0001$ ) during Weeks 1-3. This is attributed to high levels of paratelic dominance and low levels of neuroticism, and use of planful problem-solving as a coping strategy more frequently than other coping strategies. **Conclusions:** Improved psychological functioning among polar expeditioners reflects a combination of psychosocial characteristics that facilitate successful adaptation to any stressful experience, as well as characteristics specifically adaptive for living in polar environments.

THE HIGH LATITUDES are an extreme, stressful environment. This environment is characterized by cold temperatures, especially during the winter months; extreme variation in daylight and darkness; very low humidity; and relative inaccessibility from the rest of the world. However, as Lantis (10) points out, the social environment rather than the physical environment is the most potent source of stress in polar regions. This social environment is characterized by prolonged isolation, restricted travel due to severe weather conditions, difficulties in communicating with family or friends back home, lack of privacy in cramped quarters, boredom due to the lack of environmental stimulation and interaction with the same limited number of individuals, reductions in the gratification of the "basic" human needs of affection and feelings of personal significance, and the absence of customary statuses and roles which define one's social position in the outside world (18,21).

Previous research conducted in both the Arctic and Antarctic suggests that prolonged exposure to such ex-

treme conditions carries with it certain adverse psychological and physiological effects for individuals not indigenous to these regions. These effects include: insomnia; irritability; headache; nightmares; anxiety; depression; boredom; fatigue; decline in personal hygiene; reduced motivation combined with intellectual inertia, impaired memory, impaired concentration, decline in alertness, and apathy; increased appetite and weight gains; digestive ailments; rheumatic aches and pains; and increased sensitivity to physical and social stimuli (7,20,25). A complex of these symptoms, known as the "winter-over syndrome," has been described in polar expeditions who overwinter in the Antarctic (27). Similar problems have been observed in Arctic expeditions of much shorter duration. A study of 13 scientists on a 10-d, 200 km Arctic survival trek in central Alaska found significant emotional regression upon completion of the march (22). Another study found a range of personal and interpersonal problems in 5 of 11 Canadian and French subjects during 17 d of field exposure in the Canadian High Arctic (23).

On the other hand, most investigators of polar expeditioners report that any adverse psychological symptoms that do occur are relatively mild (12), and that the stress of isolated duty does not produce psychiatric disorders in otherwise healthy people (15,27). For instance, Mocellin and colleagues (16) found that neither Arctic nor Antarctic crewmembers showed higher state anxiety than did their respective control groups. In fact, some investigators (34) have hypothesized that prolonged isolation in an extreme environment may actually have a health-enhancing, "salutogenic" effect (1). Support for the existence of this effect has come from empirical studies of Antarctic winter-over personnel who have reported an

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increase in self-reliance (29), an inverse relationship between severity of station environment and symptoms of the winter-over syndrome (19), and a reduced long-term risk for hospital admissions (18) associated with the winter-over experience. The work emanating from crisis theory (13) and stress inoculation training (15) also supports the notion that stressors can provide an opportunity for psychological growth rather than necessarily creating a risk to psychological health and well-being.

While symptoms such as depressed mood, insomnia, irritability and impaired cognition represent common responses to the physical and psychosocial stressors associated with prolonged isolation in an extreme environment, wide variations exist in their expression and the degree to which they adversely affect the health and performance of polar expeditioners. One potential source of this variation is the psychosocial characteristics of those who volunteer for such assignments. According to Biersner and Hogan (2), adjustment in polar environments is a positive function of narrow interests and a low need for social stimulation. Extroverts are less successful at adapting to this environment than more inner-directed, quiet, retiring types. Self-sufficient, intelligent, calm, and independent, the latter group of individuals perform better and report for sick call significantly less often than more group-centered personnel (21). However, previous research on the relationship between individual personality traits and criteria of adaptation and adjustment has found that personality traits that predict successful adaptation in one subgroup of polar expeditioners may fail to predict adaptation in other subgroups (6).

Because polar environments are presumed to be stressful, an examination of coping styles and strategies used by polar expeditioners is important. Although significant life events may affect an individual's physical, social and emotional functioning, recent studies suggest that such events do not necessarily have disruptive long-term effects. Individual variation in the appraisal of and response to specific life events has prompted a search for personal and social resources that may be moderating factors. Among these coping or "resistance" resources are psychological characteristics with various labels such as hardiness (9), coherence (1) and optimism (25); various forms of instrumental and emotional support obtained through social ties and relationships (3); and an increased use of approach coping strategies and decreased use of avoidance coping strategies (11).

This paper examines the psychosocial characteristics and mood changes of participants in a 3-week expedition to Isachsen, an abandoned and decommissioned Canadian weather station located on Ellef Ringnes Island at 78°50'N 103°50'W. The objectives of this study were to quantify selected psychosocial characteristics of polar expeditioners and to investigate changes in their psychological functioning over time.

## METHODS

### Subjects

The expedition team consisted of four men and three women, ages 23–57 yr (Md = 37.1), and all well-educated (all of the authors served as subjects). A description of the

characteristics of these individuals is provided in Table I. With the exception of Subject 7, each of the study participants had been acquainted with one or more other study participants in a social and/or professional context prior to the study. However, none of these individuals had been acquainted with all of the remaining study participants. Unlike some polar expeditions (12), the study participants did not train or otherwise prepare for this expedition as a group prior to their arrival in the Arctic.

### Measures

Prior to their departure for Isachsen, subjects completed a battery of psychological tests and inventories compiled under the auspices of the Polar Psychology Project (PPP) (27). Informed consent was obtained from each participant after the protocol had been fully explained. The protocol, approved by Committees for the Protection of Human Subjects at the University of California, San Diego and the University of British Columbia, included the following:

*NEO-FFI*: This is the most current brief version of the most widely used test of personality, which measures five personality variables now thought to be central in determining behavior patterns (4). These scales are neuroticism, extroversion, openness to experience, agreeableness, and conscientiousness.

*Telic Dominance Scale*: This scale measures the degree to which the respondent is tightly focused on goals that he or she considers essential or important, perceiving any delay or frustration as negative (telic orientation), versus the degree to which he or she can accept, enjoy, and benefit from the process of moving toward a goal as well as reaching it (paratelic orientation) (17). There are 3 subscales: serious-mindedness, the degree to which an individual is oriented toward a specific goal; planning orientation, the degree to which an individual plans ahead and organizes in pursuit of goals rather than taking things as they come; and arousal avoidance, the degree to which an individual avoids situations which generate high arousal and seeks situations in which arousal levels are low. High scores on each indicate high telic dominance; low scores indicate high paratelic dominance.

*Ways of Coping Inventory (revised)*: The Ways of Coping Inventory is a self-report measure of a broad range of behavioral and cognitive coping strategies used in response to the most stressful situation encountered in the past 6 months. These strategies include: confrontive coping, distancing, self-controlling, use of social supports, accepting responsibility, escape or avoidance, planful problem-solving, and positive reappraisal. In the revised version of this inventory, the response format was changed from a yes or no answer to a 4-point Likert scale; 5 additional items, all dealing with problem-focused coping, were added to broaden the base of items measuring that specific strategy (25).

*Profile of Mood States (POMS)*: The POMS is a 65-item, self-report mood questionnaire that obtains data on 6 factors: Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigor-Activity, Fatigue-Inertia, and Confusion-Bewilderment (14). In addition, a Total Mood Disturbance (TMD) score can be calculated by summing the scores of the individual factors after weighting the Vigor-

TABLE I. ISACHSEN EXPEDITION DEMOGRAPHIC CHARACTERISTICS.

Subject No.	Age	Sex	Education	Occupation	Marital Status	Number of Polar Seasons*
1	24	female	post secondary	student	single	0
2	23	female	post secondary	student	divorced	0
3	37	male	M.D.	physician	divorced	2
4	39	male	Ph.D.	university professor	married	3
5	33	male	M.A.	student	married	7
6	57	male	Ph.D.	university professor	married	7
7	47	female	B.S.	research assistant	divorced	0

\* Refers to a summer or winter spent in a polar region.

Activity score negatively. The TMD provides a global estimate of affective state.

*Structured Interview Guide for the Hamilton Depression Rating Scale, Seasonal Affective Disorders Version (SIGH-SAD):* The SIGH-SAD is the standard clinical interview schedule for the assessment of seasonal affective disorder (30). It consists of a 21-item Hamilton Depression Rating Scale and a list of 8 supplemental questions on symptoms characteristic of SAD including fatigability, social withdrawal, appetite increase, hyperphagia, carbohydrate craving, weight gain, and hypersomnia.

#### Procedure

Subjects flew from the United States and southern Canada to Resolute Bay, N.W.T., in June 1992. Upon arrival in Resolute Bay, subjects completed the PPP battery of personality and coping scales. They were instructed to complete the Ways of Coping R scale based on their most stressful encounter over the past 6 months. Subjects also completed the POMS at this time and once a week during the 3 weeks at Isachsen. The Hamilton Depression Rating Scale was administered once a week during the 3 weeks at Isachsen only.

The expedition departed for Isachsen 3 d after arriving at Resolute Bay. There were 3 expedition members who remained at Isachsen for 16 d, and the remaining 4 members stayed for a total of 21 d. Team members slept in unheated buildings where room temperatures ranged from +4° to -10°C.

All subjects conducted and served as participants in a series of studies related to behavioral and physiological patterns and processes of adaptation and adjustment in high latitude environments. Among other tasks, these studies required subjects to provide daily urine samples and blood samples by venipuncture at specified periods throughout the study period, to participate in interviews, to maintain a detailed log of their daily activities, and to complete standardized questionnaires weekly.

In addition, all subjects participated in an intensive environmental work project in and around the weather station, which included a survey of thousands of abandoned fuel drums and collection and identification of potentially hazardous materials for removal and retrograde transport to Resolute Bay. Each subject also contributed to camp maintenance and survival activities such as cooking, cleaning and repairing common living areas, shoveling and melting snow for water, and storage of supplies. Subjects also spent considerable time in both indoor and outdoor recreation. All of these activities

were conducted either alone or in groups of various sizes. None of the activities imposed time constraints; the timing of all activities, including meals, work, recreation, and sleeping, occurred at each subject's discretion. With the exception of a daily radio check with Resolute Bay conducted by the field manager and one resupply flight, there was no contact with anyone outside the group.

#### Statistical Analysis

Because of the small sample size, quantitative analyses were limited to comparisons of changes in mood over time. Comparisons of POMS and SIGH-SAD measures across time were performed using repeated measures analyses of variance adjusting for sex and occupational status. Paired *t*-tests were used to compare POMS scores at each week of the expedition with similar scores obtained prior to departure. However, no adjustments to the significance level for the effect of multiple comparisons were made, and caution should be exercised in interpreting results.

#### RESULTS

The first week at Isachsen was the most physically demanding and psychologically stressful part of the expedition. Each member was required to help transfer food and supplies over a distance of one-half mile from the airstrip to the station, shovel snow from blocked doorways, clean out and make habitable sections of the buildings to be used for living quarters, and participate in a series of experiments that required a blood draw every 6 h over a 36-h period as well as completing several psychological scales. The female expedition members, none of whom had any prior polar experience, expressed some anxiety about their performance and meeting their own expectations as well as the imagined expectations of the male team members. Some expedition members were disappointed with the primitive living conditions and lack of facilities or supplies necessary to conduct certain experiments, while other team members expressed surprise that conditions were not even more primitive. The field manager initially experienced some resentment from fellow expedition members for attempting to exercise what was perceived as too much leadership.

However, by the end of the first week, the initial series of data collection activities were completed and a routine of camp chores, data collection, environmental assessment and cleanup, and leisure activities established. Re-

TABLE II. ISACHSEN EXPEDITION NEO-FFI SCORES.

Subject No.	NEO-FFI Subscales				
	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
1	13	37	33	37	40
2	15	35	30	37	38
3	14	26	25	30	29
4	12	38	43	47	47
5	14	35	46	30	34
6	17	26	44	28	26
7	17	28	30	37	35
M	14.6	32.1	35.9	35.1	35.5
SD	1.9	5.3	8.3	6.5	7.0
Normative Sample M	20.6	27.9	28.2	29.8	31.9

lations between team members became quite relaxed and less formal. Some members compared the second and third weeks of the expedition to taking a vacation, providing an opportunity to relax, view the scenery of the surrounding countryside, and distance themselves from the demands and obligations of their lives back home.

*Personality characteristics:* The results of the NEO-FFI scale suggest a well-adjusted group of individuals. All participants scored as less neurotic than the normative group (Table II). On all other subscales, the majority of participants scored above the norms.

Of the six expeditioners who completed the Telic Dominance Scale, five scored below the normative group mean, and one only marginally exceeded it (Table III). This pattern suggested a high paratelic orientation of the Isachsen group with an emphasis on deriving pleasure from the process of taking part in such an expedition and enhanced arousal from the novelty of the environment. The Isachsen group was less focused on avoiding new experiences, reflected in the low mean scores on the arousal avoidance subscale relative to the normative group. The Isachsen group was also less focused on task performance, reflected in the low mean scores on the serious-mindedness subscale relative to the normative group.

*Coping patterns:* Planful problem-solving and self control were the most frequently reported methods of coping with stressful experiences over the past 6 mo (Table IV). The methods used least frequently by the group as

a whole were escape-avoidance, confrontive coping and use of social support.

*Mood Changes:* Total Mood Disturbance (TMD) scores over the course of the study are presented on Table V, while changes in individual POMS factors are illustrated in Fig. 1. The data presented in Table V indicate a reduction in negative affect over the course of the study in 6 of the 7 expedition members. The results of repeated measures analyses of variance indicated significant reductions in TMD scores ( $F = 6.5$ ;  $d.f. = 3,18$ ;  $p = 0.004$ ) and levels of tension-anxiety ( $F = 6.1$ ;  $d.f. = 3,18$ ;  $p = 0.005$ ), fatigue ( $F = 14.2$ ;  $d.f. = 3,18$ ;  $p < 0.0001$ ), and confusion ( $F = 4.0$ ;  $d.f. = 3,18$ ;  $p = 0.024$ ) over the course of the study from baseline (i.e., prior to departure) through Week 3. No significant differences were found in these trends by sex or occupational status, which is not surprising given the small sample size. TMD scores in Weeks 2 and 3 ( $t = 3.27$ ,  $df = 6$ ,  $p = 0.017$ ; and  $t = 3.79$ ,  $df = 6$ ,  $p = 0.009$ , respectively); tension-anxiety scores during Weeks 1-3 ( $t = 2.44$ ,  $df = 6$ ,  $p = 0.05$ ;  $t = 3.03$ ,  $df = 6$ ,  $p = 0.02$ ; and  $t = 2.73$ ,  $df = 6$ ,  $p = 0.03$ , respectively); depression scores during Week 3 ( $t = 3.06$ ,  $df = 6$ ,  $p = 0.02$ ); anger scores during Week 1 ( $t = 2.65$ ,  $df = 6$ ,  $p = 0.04$ ); fatigue scores during Weeks 1-3 ( $t = 2.96$ ,  $df = 6$ ,  $p = 0.025$ ;  $t = 5.89$ ,  $df = 6$ ,  $p < 0.001$ ; and  $t = 3.58$ ,  $df = 6$ ,  $p < 0.001$ , respectively); and confusion scores for Week 3 ( $t = 2.88$ ,  $df = 6$ ,  $p = 0.03$ ) were all significantly lower than scores obtained prior to departure.

TABLE III. ISACHSEN EXPEDITION TELIC DOMINANCE SCALE (TDS) SCORES.

Subject No.	Telic Dominance Scale Scores			TDS Total
	Serious-Mindedness	Planning Orientation	Arousal Avoidance	
1	7.0	8.5	4.5	20.0
2	3.0	8.5	4.0	15.5
3	6.5	5.0	4.0	15.5
4	2.5	6.5	4.0	13.0
5	3.5	4.0	4.5	12.0
6	7.0	4.5	4.0	15.5
7*				
M	4.9	6.2	4.2	15.3
SD	2.1	2.0	0.3	2.8
Norm Group				
M	6.4	5.6	6.4	18.5
SD	1.9	2.1	2.3	4.2

\* Subject No. 7 did not complete this instrument.

TABLE IV. ISACHSEN EXPEDITION WAYS OF COPING SCALE SCORES.

Subject No.	Ways of Coping R Subscales							
	Confrontive Coping	Distancing	Self Controlling	Social Support	Accepting Responsibility	Escape-Avoidance	Planful Problem Solving	Positive Reappraisal
1	0.83	0.67	1.29	0.50	1.00	0.13	1.83	0.86
2	0.17	1.67	0.86	0.17	0.50	0.38	1.17	1.00
3	0.17	0.33	0.57	0.83	0.50	0.13	1.00	0.57
4	0.33	0.83	2.29	0.17	1.50	0.50	1.50	1.57
5	0.67	0.50	0.86	1.17	1.75	0.38	2.50	1.29
6	1.00	1.50	1.43	1.50	1.50	1.00	2.50	0.71
7	0.17	0.67	0.29	0.67	0.25	0.25	1.00	0.71
M	0.48	0.88	1.08	0.72	1.00	0.40	1.64	0.88
SD	0.35	0.51	0.66	0.50	0.60	0.30	0.66	0.34

A sex-specific comparison of study subject scores with the normative sample of 2360 adults reported in the POMS manual (14) is provided in Table VI. Because of the small sample size, no significance tests were performed. Nevertheless, it is apparent that the Isachsen group showed less depression, anger, and confusion and more vigor than the norm group. The men reported more fatigue than their respective norms prior to departure and during Week 1, and the women reported more fatigue and more tension-anxiety than their respective norms prior to departure.

Changes in the SIGH-SAD mean depressive symptom scores during the 3 weeks of the expedition are presented in Fig. 2. The results of a repeated measures analysis of variance indicated that these scores all declined significantly during this period ( $F = 17.7$ ;  $df = 2,12$ ;  $p < 0.0001$ ).

#### Case Studies

A quantitative analysis of the association between the psychosocial characteristics of the expedition members and changes in mood over the study was precluded by the small sample size. However, an examination of individual members of the expedition provides some additional insight into the role of psychosocial characteristics in the process of adapting to the polar environment.

*Subject 5:* Although not the senior member of the expedition, Subject 5 had been to Isachsen on a previous expedition and served as the field manager of the present expedition. The heavy demands and responsibilities

placed upon him for organizing the expedition, handling the logistics, and coordinating the pre-departure activities of expedition members scattered across the United States and Canada is reflected in the higher than average POMS scores for anxiety, depression, anger, and fatigue, and the lower than average scores for vigor prior to departure. At Isachsen, this individual also assumed responsibility for setting up camp, directing the environmental cleanup activities, and maintaining radio communications with Resolute Bay. However, this subject also displayed the greatest change in Total Mood Disturbance scores over the study period (Table V). This individual also scored one standard deviation above the group mean for openness to experience, accepting responsibility and planful problem-solving, and one standard deviation below the mean for planning orientation and telic dominance.

*Subject 4:* This individual had the lowest POMS mood disturbance scores at both baseline and in Week 3 of the expedition, although the change in his total mood disturbance score over the study approximates the average for the entire group. He also scored one standard deviation below the group mean for neuroticism, serious-mindedness, social support, and one standard deviation above the group mean for extraversion, agreeableness, conscientiousness, self-controlling coping, and positive reappraisal. As with Subject 5, this individual scored one standard deviation below the mean on the Telic Dominance Scale. This suggests a greater concern with the process of seeking a goal than with the goal itself.

TABLE V. TOTAL MOOD DISTURBANCE SCORES DURING THE EXPEDITION.

Subject No.	Total Mood Disturbance Score				Change over study period*
	Prior to departure	Week 1	Week 2	Week 3	
1	18	-7	-4	-10	-28
2	17	-21	-19	-11	-27
3	5	-10	-7	-7	-12
4	-3	17	-26	-27	-24
5	45	13	-2	-8	-53
6	0	19	11	1	1
7	29	14	-8	-22	-51
Mean	15.9	3.6	-7.9	-12.0	-27.9
SD	17.1	15.9	12.0	9.5	19.4

\* Refers to the difference between Week 3 score and the score obtained prior to departure. Note: A positive score indicates negative affect; a negative score indicates positive affect.

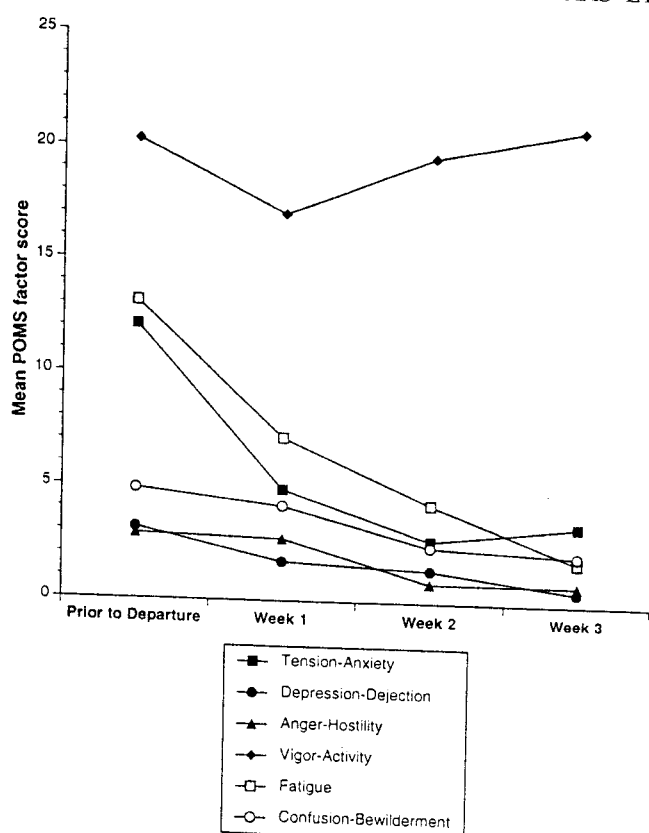


Fig. 1. Mean POMS factor scores, pre-departure through week 3 of expedition.

DISCUSSION

During the expedition, participants experienced a significant decline in depressive symptoms. They also experienced significant declines in tension-anxiety, fatigue, and confusion compared to baseline measures of these moods. A possible explanation for this improved psychological functioning is that polar environments are inherently less stressful than they are generally portrayed.

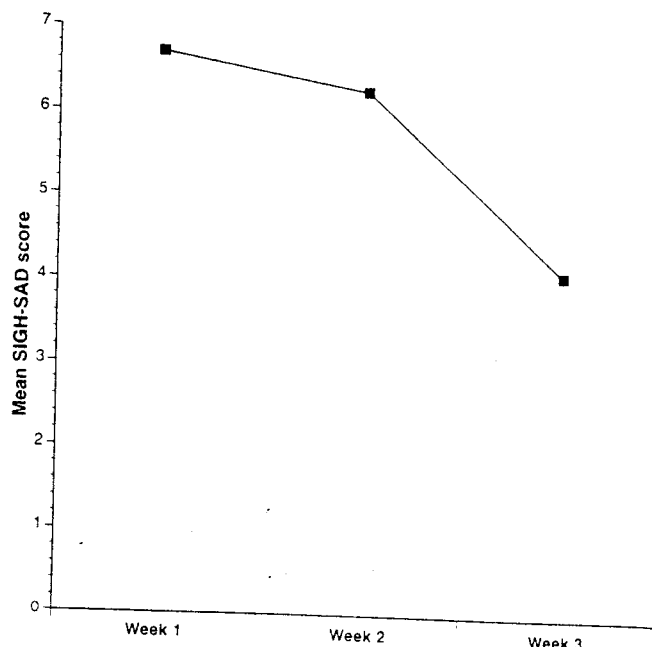


Fig. 2. Mean SIGH-SAD score by week of expedition.

Despite the physical discomfort of living and working in cold temperatures, 24-h daylight, confinement in close quarters, and lack of communication with family and friends, such an environment offers a certain measure of time out from overstimulation, and a brief respite from work, family, and other stressors back home. Apart from participation in data collection activities, the expedition members in this study were free to schedule their own daily activities. In short, the improvement in psychological functioning found in this study may be attributed to exposure to an environment that is less stressful than the urbanized environments in which these individuals normally reside.

The improvement in psychological functioning observed on this expedition may also be attributed to the

TABLE VI. MEAN POMS SCORES OF 1992 ISACHSEN EXPEDITION TEAM BY SEX.

POMS Factor	Isachsen Sample				Adult Norms*
	Predeparture	Week 1	Week 2	Week 3	
Men (n = 4)					
Tension-anxiety	8.8	6.5	3.0	2.3	12.3
Depression-dejection	3.8	2.8	1.3	0.5	8.3
Anger-hostility	3.0	4.5	0.8	0.8	9.2
Vigor	20.0	15.8	17.8	18.5	16.3
Fatigue	13.0	8.3	5.3	3.3	7.0
Confusion	3.3	3.5	1.5	1.5	6.7
Women (n = 3)					
Tension-anxiety	16.7	2.7	2.3	5.0	12.8
Depression-dejection	2.3	0.3	1.7	0.7	10.2
Anger-hostility	2.7	0.3	1.0	1.0	9.7
Vigor	20.7	18.7	22.0	24.0	14.9
Fatigue	13.3	5.7	3.0	0.0	8.4
Confusion	7.0	5.0	3.7	3.0	7.3

\* Scores for 1130 men and 1230 women as reported in McNair et al. (14).

individuals themselves. An analysis of the personality characteristics of expedition members indicated that the team overall possessed the qualities found to be associated with successful adaptation in other polar environments: high ability, stability, and compatibility (7). The expeditioners scored well below the norm group on the NEO-FFI measure of neuroticism. Paratelic dominance was also high, suggesting a desire to seek out rather than avoid experiences likely to result in increased arousal and, hence, an ability to benefit from the challenge of living and working in an extreme and isolated environment. Planful problem-solving and self control were the most frequently used coping strategies in this group. Leon and colleagues (12) found that planful problem solving, positive reappraisal, and self control were the most frequently used means of coping with the harsh conditions and demands placed upon the members of the North Pole Expedition. These personality characteristics and use of these coping strategies may also account for the lower levels of depression, anger, fatigue, and confusion, both at baseline and during the Isachsen Expedition, relative to those found in the general population (8). In short, this group might have experienced improved psychological functioning in any environment given their personality and coping styles.

A third possible explanation for the changes in mood is found in the interactive effect of this unusual environment with the personality and psychosocial characteristics of individuals who seek out this environment. Obviously, self-selection plays an important role here. The kind of person who deliberately seeks out challenges and then meets them successfully is likely to derive certain psychological benefits. Taylor (29) noted increased self-esteem and self-efficacy among winter-over personnel of the New Zealand Antarctic Program. Benefits of exposure to such an environment by certain individuals fits in with Csikszentmihalyi's (5) theory of flow.

Support for this interpretation is derived from the Leon et al. (12) study of members of an expedition to the North Pole. These individuals faced harsher conditions than the 1992 Isachsen Expedition. The North Pole Expedition travelled by dog sleds from Ellesmere Island, Canada, reaching the North Pole in 56 d. In temperatures ranging from  $-29^{\circ}$  to  $-59^{\circ}\text{C}$  four team members slept in each of two tents. Two of the expedition members were forced to abandon the expedition during the trip to the North Pole because of injuries and severe frostbite (12). Nevertheless, Leon reported personality characteristics and declines in negative mood scale scores similar to those found in the Isachsen group.

Social support was used relatively infrequently by members of both the Isachsen and North Pole expeditions. Leon and colleagues hypothesized that the lack of personal sharing or emotional intimacy may actually be adaptive in this environment, "since too much personal revelation and expression of vulnerabilities might have interfered with the task-oriented missions of the group" (12, p. 178). Palinkas (20) made a similar observation with respect to Antarctic winter-over personnel.

The interpretation of the study results in this manner, however, must keep in mind the obvious limitations in study design. For instance, this study reports mood data collected over the course of a 3-week period. Anticipation

of the expedition may have accounted for elevated mood scores in these individuals prior to departure. The decline in negative affect, therefore, may simply reflect a return to values that are normal for these individuals. On the other hand, the expedition members were well educated, and three of the members had prior experience with psychological scales and inventories that may have biased their responses to the study questionnaires and resulted in their reporting less depression, anger and confusion and more vigor than the normative group. However, an examination of individual responses to each questionnaire revealed no consistent pattern which would suggest response bias. The practice of researchers serving as subjects has been done in other studies of polar expeditions (24,26). Further, the results of this study are similar to those of other expeditions comprised of individuals with little or no experience with psychological instruments and facing more extreme conditions for longer periods of time (12,24).

Despite these limitations, however, the results of this study indicate that living and working in polar environments is not inherently stressful. Successful adaptation to polar environments is associated with certain psychosocial characteristics enabling individuals to cope with any stressful experience combined with certain characteristics such as high paratelic dominance and low use of social support that are especially useful in coping with the isolation, confinement and physical conditions associated with these environments.

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