

Adaptation and coping strategies in Chinese Antarctic Expeditioners' winter-over life

YAN GongGu^{1, 2*}, YE Qian¹ & TANG Che¹

¹ School of Psychology, Beijing Normal University, Beijing 100875, China;

² Beijing Key Laboratory of Applied Experimental Psychology, Beijing Normal University, Beijing, 100875, China

Received April 12, 2011; accepted May 19, 2011

Abstract The harsh natural and social environments in Antarctica challenge the limit of physical and psychological adaptation. Psychological research on Antarctic expeditioners' winter-over life can enhance our understanding of how humans adapt to isolated, confined and extreme environments. In this qualitative study, nine people who worked at either the Great Wall station or Zhongshan Station were interviewed. Most of the problems related to adaptation in Antarctica could be summarized and categorized into four types: physical, emotional, interpersonal and task-related. Two main sets of factors which impact quality of work and life in Antarctica were identified. The first set refers to internal factors comprising personality, attitude, age and previous experience. The second set is external factors including natural environments as well as conditions of stations and key persons, especially the chef and station master. A theoretical framework of coping strategies including organizational and individual aspects was developed. Among the seven ways of coping, energy transferring such as taking part in sports entertainment or learning played the most important role. The results not only provide a strong theoretical base for future research of polar psychology, but also provide an empirical base for more applications on Antarctic expeditions, flight and space missions.

Keywords Antarctica, winter-over life, adaptation, coping strategies

Citation: Yang G, Ye Q, Tang C. Adaptation and coping strategies in Chinese Antarctic Expeditioners' winter-over life. *Adv Polar Sci*, 2011, 22: 111–117, doi: 10.3724/SP.J.1085.2011.00111

0 Introduction

In Antarctica, the harsh physical environment, including frigidity, high altitude, polar nights, desolation and glaciers, and the social environment, including loneliness, anxiety and lack of communication, present great challenges for human beings. It is broadly accepted that polar expeditions involve considerable risk and challenges and require high physiological ability, psychological diathesis, personal capability and team management. Thus, studying the polar expeditioner's life from a psychological perspective has unique scientific value^[1]. An increasing number of research studies have supported the idea that in other extreme circumstances such as spaceflight and undersea explorations, people face similar problems as in

Antarctica^[2–3]. Results from the psychological analysis of Antarctic expeditioners may have wider applications for understanding how people adjust to extreme environments, such as space stations, submarines, oil platforms in the sea and so forth.

Previous collections of polar expeditioners' self-report data have suggested that they often suffer varying forms of maladjustment. Palinkas first proposed the idea of 'winter-over syndrome'^[4], which includes depression, anaphylaxis, hostility, insomnia, cognitive impairment, attention deficits, mild memory loss and other physiological and psychological symptoms. Subsequently, investigators became interested in psychological factors associated with wintering-over. Leon^[5] reported that the harsh environment and interpersonal problems may be major stressors. The cyclical changes of emotions and mood, known as the third-quarter phenomenon, illustrate that emotion is also an important issue in wintering^[6–9].

* Corresponding author (email: greyan@bnu.edu.cn; greg2000@126.com)

It is important to initiate further in-depth study on the coping strategies Antarctic explorers use that involve personal adaptation and team management. Leon^[5] observed that during assignment in Antarctica, reading, writing and resting instead of initiating conversations dominate personal activities. People seldom share emotions, and social support is usually accomplished in work situations. The most prevalent method of promoting communication and emotional sharing is through leisure activities, many of which are accompanied with alcohol consumption. The most common coping strategies are planned problem solving and positive reappraisal, while the least common strategy is to escape. Peri, Scarlata and Barbarito^[10] found there was a diminishing desire to seek social support, and they argued that instead emotions subside and effective coping strategies may therefore be different from those shown in other studies focusing on more typical or normal environments. In other words, in Antarctica, instead of attempting to overcome external difficulties, people tend to adjust their internal mentality to endure them. Thus, examining winter-over coping processes

and strategies will help us understand the process of adaptation to extreme environments.

This study of wintering expeditioners addresses three progressive questions: (1) What are the major problems for wintering expeditioners? (2) What are the key factors for adapting to Antarctica? (3) What kind of coping strategies do personnel adopt to manage the wintering over experience?

1 Method

1.1 Participants

Participants were nine Chinese Antarctic expeditioners from the 21st, 22nd, and 23rd Antarctic expeditions. Together, they represent all main positions, and each of them continuously worked in one station for at least 12 months between 2003 and 2007. They were all male and are now currently working in Beijing. Interviews took place from April to May 2008. Table 1 contains details (duration of work indicates the nearest working duration in Antarctica).

Table 1 Interviewee details

Number	Age (2008)	Education	Winter-over post	Station	Working duration (months)	winter-over experience (times)
M1	35	Master	meteorological observation	Zhongshan	14	1
M2	56	College	communication	Zhongshan	17	3
M3	25	Bachelor	meteorological observation	Great Wall	12	1
M4	51	Bachelor	station leader	Zhongshan	17	2
M5	54	Bachelor	station leader	Zhongshan	17	7
M6	37	Ph.D.	administrator	Great Wall	12	1
M7	59	Bachelor	station leader	Zhongshan	17	5
M8	26	Bachelor	meteorological observation	Great Wall	12	1
M9	33	Secondary	chef	Zhongshan	16	1

1.2 Assessment

This study employed semi-structured interviews. The outline was developed by the investigators. In order to obtain information on key incidents and characteristics, the pre-interview outline was composed according to the investigators' knowledge of wintering. It was then revised into a formal interview outline after pre-interviews of several Antarctic expeditioners. Key questions included the following:

1. Reviewing your wintering experiences in Antarctica, what has changed for you physiologically and psychologically?
2. Did you experience any maladjustment symptoms or

problems?

3. When facing these symptoms/problems, what did you do to adjust? Could you give us an example?

During the interview, the order of questions was adjusted to reflect the respondents' comments, and all were given as much time as needed to address the questions. Interviewers asked for details or clarifications when necessary.

1.3 Procedure

The interviews were organized and implemented directly by the investigators. At the same time, a psychology graduate student recorded the conversations. Appointments were made to set up the interviews at which time the inter-

viewees were informed of the purpose, content, time, form and confidentiality of the interview. The investigator then conducted the interview after agreement. Formal interviews took place in the interviewee's office or a quiet conference room, and the interviews were recorded completely. The shortest recording lasted 50 minutes; the longest lasted 84 minutes. The average duration was 68 minutes, and the total duration was 611 minutes. All interviews were transcribed word for word and checked twice by the investigators.

1.4 Data Analysis

The transcriptions were analyzed by computer-aided qualitative analysis software QSR NVivo8.0 based on semantic units. Primary coding was classified and analyzed afterwards.

2 Results

2.1 Major problems of winter-over life

Interviewees reported a total of 107 problems during wintering that could be generalized into four types: physical, emotional, interpersonal and task-related.

Physical problems included memory impairment (reported by 55.6%), slow trauma recovery (33%), response impairment (22%) and lack of sleep (11%). For example:

a. "Life was too simple there. I didn't need to remember many things, so after coming back I had some difficulty remembering things that happened recently. But it's no big deal because I recovered quickly." (M8)

b. "Antarctica is special. There are no bacteria, so you won't catch cold. But if you get injured, it is difficult to recover. I sprained my ankle in Antarctica while playing soccer. It took me a month or two to recover when usually one week is enough." (M1)

Emotional problems included negative mood (44%), irritability (44%), depression (44%), homesickness (44%), over sensitivity (11%) and anxiety (11%). For example:

a. "I felt kind of lonely and abandoned to an island. Most people went back, but we still had to stay for a long time. This was kind of depressing or something." (M4)

b. "Gradually I occasionally gave in to the environment in the later period because there were few people and it was easy to be fretful." (M9)

Interpersonal problems included interpersonal tension or conflicts (67%), such as:

a. "It was not a big deal but it might cause quarrels or conflicts." (M5)

b. "Sometimes we had intense discussions about social phenomena, but occasionally they become more than just discussions because they related to our own interests. So they could escalate into personal disagreements." (M8)

Task-related problems included equipment malfunction,

unexpected weather changes during missions, encountering danger, personnel injury and responsibility disputes with 33% of the interviewees reporting task-related problems. For example

a. "The instrument malfunctioned again and I was unable to fix it. I was really stressing out at that moment." (M1)

2.2 The major factors that affect the quality of life in winter-over

The unique environment and working conditions in Antarctica have always been the core factors that influence the life quality of wintering, no matter whether in the Great Wall Station or the Zhongshan Station. The rigid weather, lack of communications, limited library and internet resources* and scarcity of fresh food affect the life of wintering directly (see Table 2). Note that the influence that the chef has on the team was as significant as the station leader. "All of the conflicts originated around the cafeteria...in Antarctica, we exercised and we ate. You didn't feel good if you didn't eat well..." (M1)

For internal factors, first, a positive attitude would seem crucial in promoting success in wintering over. "You can think of this as one year in prison, cruel and tough or a field trip and vacation to Antarctica." (M7) Second, some interviewees believed those who were cheerful (M8) and extroverted (M7) adapted better in Antarctica. But other interviewees suggested that it was not necessary to be lively and sociable. Being "quiet" and "introverted" was also welcomed, as long as "one doesn't have a negative impact" (M7). Third, age and family status might also affect personnel's adaptation and emotion in Antarctica. For example, "The young may feel lonely while older ones may be more tolerant of it..." (M7). Or, "Parents and kids at home may be burdens to their elders. They worry about their family and might face more psychological problems. We, the younger ones, only need to take care of ourselves. Even if something happened at home, my family wouldn't let me know since I was in Antarctica and unable to help. They knew bad news would only make me worry. So in Antarctica, there were few emotional changes in us youth." (M8). In addition, those who had been to Antarctica more than once appeared to adapt better and stay calmer, while those who were experiencing their first Antarctic trip seemed to be more excited. "When I first arrived there, I was happy and everything was new to me because I stepped on Antarctica" (M9). "When I first went to Antarctica, it was an unknown world to me. But when I went there again, I felt experienced and handled things with more confidence." (M3). Therefore, previous Antarctic experience can also

* Internet and cheaper domestic telephone calls were available at the Great Wall Station and Zhongshan Station in January 2009, which changed the sense of confinement related to lack of communication and information resources.

Table 2 Important factors in Chinese Antarctic expeditioners' winter-over life

Type	Key factor	Content	Frequency	Percentage ^a (%)
External factors	Circumstance of the Station	Location, environment, weather and social environment of the station	23	100
	Condition of the Station	Facilities and available resource of the station	14	100
	Core character	Core character of the team (especially chef and the station leader)	16	77.8
Internal factors	Attitude	Attitude to Antarctica and the philosophy of winter-over life	25	88.9
	Personality	Personal character and style	14	66.7
	Age	Age and his family condition	12	88.9
	Experience	Amount of Antarctic experience	— ^b	—

a. percentage = number of interviewees who mentioned the factor/ total number of interviewees;

b. "Antarctic experience" is a demographic variable so it's not calculated by frequency.

affect attitude and confidence during wintering.

2.3 Coping strategies in Antarctic expeditioners' winter-over life

According to the interviews, the researchers built a framework describing the Antarctic expeditioners' winter-over coping strategies (Figure 1).

Five key factors associated with personal strategies are grounded in individual competence, relating to motivation, attitude and self-adjustment. Four key factors related to organizational strategies are based on collective competence, relating to organizational climate, culture and group activities. Note that "Proactivity in resolving problems" and "Diversion and distraction" are both efficient strategies on personal and organizational levels (Table 3).

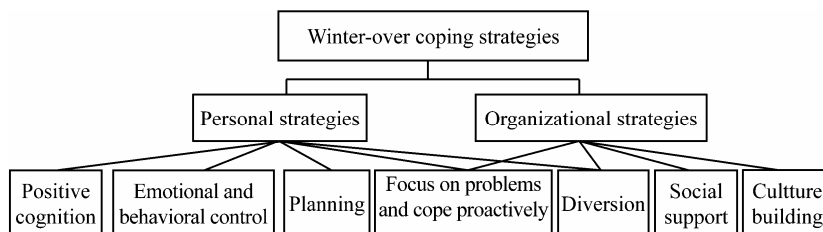


Figure 1 The framework of Chinese Antarctic Expeditioners' coping strategies in winter-over life.

Table 3 Definitions and frequencies of Chinese Antarctic expeditioners' coping strategies in winter-over life

Coping strategies	Content	Definition	Frequency	Percentage* (%)	
Personal strategies	Positive cognition	Gentleness	Treat life and teammates gently and friendly	18	88.9
		Engagement	Work seriously and regard it as the most important thing in Antarctica	7	55.6
		Enjoyment	Treasure the opportunity, choose to enjoy Antarctica rather than suffer from it	7	33.3
	Emotional and	Service consciousness	Serve the others without calculating personal gains and losses	6	33.3
		Emotional control	Actively control the emotion and seek emotional stability	11	66.7

(To be continued on the next page)

(continued)

Coping strategies	Content	Definition	Frequency	Percentage* (%)	
behavioral control	Behavioral control	Be disciplined and friendly, avoid conflicts	10	66.7	
Planning	Plan	Try best to make wintering life rich and colorful	16	55.6	
	Implement regularly	Abide by the plan and keep a regular life	10	44.4	
Focus on problems and cope proactively	Knowledge preparation	Collect information of Antarctica and learn from experienced ones	8	66.7	
	Mental preparation	Anticipate the pros and cons of Antarctic life	6	55.6	
	Proactivity	Focus on problems themselves and solve them directly	13	77.8	
Organizational strategies	Learning	Learn based on interest or need	7	44.4	
	Diversion	Physical exercise	Be active in outdoor sports and take physical exercise	22	100
		Entertainment	be active in entertainment and relaxation	17	100
	Social support	Interpersonal aid	Sharing and emotional communication and the willingness to help	16	88.9
		Group activities	Organize group activities and cooperate with others	19	77.8
		External affairs	Organize and take part in activities with foreign stations	12	55.6
Culture building	Culture building	Build harmonious atmosphere and culture	12	77.8	

* Percentage = number of interviewees who mentioned the factor/ total number of interviewees

3 Discussion

3.1 Adaptation problems and influencing factors in Antarctic expeditioners' winter-over life

Unalterable features of Antarctica such as the extreme environment, climate and its inaccessibility inevitably affect people's perceptions, beliefs and behavior. Mental isolation, confinement and occupational demands are the most critical stressors affecting expeditioners physiologically and psychologically^[9]. Therefore, aiming at problem solving and stress relief is consistent with the foundation of positive psychology that includes taking a positive attitude as the premise for successful coping and adaptation. Besides attitude, personality cannot be overlooked.

Musson et al.^[11-12] and Aspa^[13] concluded that Antarctic expeditioners' scores were above the norm on 'extraversion', 'agreeableness', 'conscientiousness', 'openness' and in relation to being 'less competitive'. However, the present study discovered that a higher scores on 'extraversion' and 'openness' do not guarantee better adaptation in Antarctica. A confined environment with little information and a monotonous life will not fulfill those who seek

external stimulation and a variety of experiences and opportunities. Those that are more calm and less active have less need for external stimuli and variability in their environment. The adaptation of these divergent personality types to an enduring monotonous life will be significantly different. The results of interviews confirmed this inference indirectly since at least half of the interviewees were more highly introverted, calm and not as talkative or socially interactive, but were introspective and more 'nature-friendly'. In this situation, where it is necessary to have diversification to ensure efficiency of the team and to keep the team harmonious, variability in personality factors are expected and required when constructing an Antarctic winter-over team. In addition, Schmidt, Wood and Lugg^[14] reported that age and experience are not sufficient to predict a team's performance. Contextual factors, task and other team characteristics should also be taken into consideration. Thus, appropriately constructing a team in which people of different ages and experience can extend themselves to give their best performance relative to their job description and in the overall social environment is a vital step for a winter-over team.

Among the external factors relating to the variables

researchers focus on, it should be noted that expeditioners at different stations experienced winter-over life in different ways. The Great Wall Station (62°12'59"S, 58°57'52"W) is located in Sub-Antarctica (out of the Antarctic Circle) with frequent international contacts and more entertainment opportunities. As a showcase of China's presence in Antarctica, the Great Wall Station stands out for its rich cultural ambience and cordial atmosphere. On the other hand, the Zhongshan Station (69°22'24"S, 76°22'40"E) is located in Antarctica (within the Antarctic Circle). The harsh climate, extreme light-dark circle and the vast distance from other stations make it necessary for expeditioners there to adapt to more extreme conditions. However, according to our results, the geographical environment and team characteristics had a greater physiological influence, while individual differences had a greater psychological influence, matching the results of the analytic hierarchy process on 20 Australian Antarctic expeditioners' cell-mediated immunity data by Wood et al.^[15]

This study also confirmed the result that leadership effectiveness explained 77% of the total variation when studying the influence of leadership effectiveness, gender composition and age structure on team atmosphere of Antarctic winter-over teams^[14]. It is interesting that the chef was the second most influential role, ranking next to the station leader in Chinese Antarctic winter-over teams. The responsibility of catering for the whole team and satisfying the preferences of multiple people requested more efforts from the chef than from other team members. Complaints and dissatisfaction regarding meals may affect emotions, health, and interpersonal relationships of the team members or even the success and failure of the entire winter-over team. Therefore, the chef has a crucial impact on both individual and team levels. In this field, the importance of non-leading key figures in a winter-over team has never been discussed before. Thus, in such extreme environments, to avoid factors associated with possible negative influences on the whole team, professional skills, personality and psychological competence should be carefully examined when selecting all members of the expedition team.

Although problems existed, eventually all of the interviewees adapted to Antarctica and successfully accomplished their tasks without causing serious incidents or accidents^[2,4,16]. In addition, three of the five (60%) team members, when asked, indicated that they would like to work in Antarctica again. Thus, based on an integrated view, Chinese Antarctic winter-over expeditioners can adapt well.

3.2 Coping strategies for Antarctic expeditioners' winter-over life

On a personal level, diversion and distraction were two of the most common personal coping strategies because of the pleasure people often experience during entertainment and

sports. Pressure and unease can be relieved when people experience pleasure, especially in Antarctica. Additionally, reconstructing positive cognitive views and maintaining a calm attitude were methods that resolved difficulties in Antarctica.

On the team level, helping expeditioners to relax, adjust and enjoy entertainment via cultural and sports activities was the most important coping strategy. Reflecting upon the importance of team support in wintering, researchers concluded that sharing, group activities and external affairs could also promote team members' communication and friendship and subsequently avoid negative emotions and conflicts. It should be noted that Internet access has been available in the Great Wall Station and the Zhongshan Station since January 2009. Access to the Internet completely changed the isolated condition of the stations and made the expeditioners feel mentally closer to their families. It fundamentally reduced the sense of isolation since the internet brought an abundant amount of information and expanded the access to social support. However, the increase in information may also bring negative effects. Being powerless regarding bad news at home may cause psychological distress, and the diversity of information requires better management of the station. Therefore, the influence of the Internet on winter-over life needs further research.

The emotional atmosphere of the entire team was much more influential than the objective environment on team process and performance in this extreme environment^[17]. From the view of coping strategies, this research confirmed that building a cooperative culture can help expeditioners adapt to Antarctica.

3.3 Limitations and prospects for future research

This research summarized the main problems Chinese Antarctic expeditioners encounter in wintering and major factors that affect the well-being of the expeditioners. The researchers proposed a framework of coping strategies, which provides the theoretical basis for a comprehensive understanding of winter-over life in the Antarctic. In-depth interviews and qualitative analysis provided the opportunity to study the physiological expressions and psychological aspects of winter-over life. The presented research confirmed part of previous research findings, but also revealed unprecedented results and special problems that deserve more concern. This research also provided important insights into human adaptation to extreme environments related to other professionals such as aviators and astronauts.

This study has two limitations. First, this research was based on retrospective interviews. All the interviewees had left Antarctica over one year ago, which may have led to memory bias on related events and feelings about life in Antarctica. For example, as opposed to published foreign

studies, Chinese interviewees reported more positive events and less interpersonal conflicts and problems. This 'filtered' report bias may reduce the amount of reported problems, but it does not influence the conclusions related to problem categories. Second, due to the limited number of Chinese Antarctic expeditioners and the impossibility of random selection, research samples were extremely restricted. Future studies should focus on expanded samples, in-depth observation, longitudinal studies and detailed quantitative studies.

4 Conclusion

The following conclusions may be drawn from this study, albeit requiring further research:

(1) Major problems of Antarctic expeditioners' winter-over life can be classified into four categories: physiological, emotional, interpersonal and task-related.

(2) Important factors that affect Antarctic expeditioners' winter-over life can be divided into personal factors and organizational factors.

(3) Antarctic winter-over expeditioners cope most effectively with wintering life organizationally and personally, using 'Proactivity in problem solving' and 'Diversion and distraction'.

Acknowledgments Thanks for the support of the Chinese Arctic and Antarctic Administration, SOA and the interviewees' cooperation and sharing. The first author appreciated Prof. Donald H. Saklofske at the University of Calgary and Mr. Taiyi Yan for their efforts in making the paper more readable in English.

References

- 1 Yan G G, Ye Q. Psychological Researches on Antarctic Expeditioners. *Advances in Psychological Science*, 2009, 17(1): 227-232 (In Chinese)
- 2 Suedfeld P, Weiss K. Antarctica: Natural laboratory and space analogue for psychological research. *Environment and Behavior*, 2000, 32: 7-17
- 3 Sandal G M, Lean G R, Palinkas L A. Human challenges in polar and space environments. *Review of Environmental Science and Biotechnology*, 2006, 5: 281-296
- 4 Palinkas L A. Effects of physical and social environments on the health and well-being of Antarctic winter-over personnel. *Environment & Behavior*, 1991, 23: 782-799
- 5 Leon G R. Individual and group process characteristics of polar expedition teams. *Environment and Behavior*, 1991, 23: 723-748
- 6 Palinkas L A, Cravalho M, Browner D. Seasonal variation of depressive symptoms in Antarctica. *Acta Psychiatrica Scandinavia*, 1995, 91: 423-429
- 7 Palinkas L A, Houseal M. Stages of change in mood and behavior during a winter in Antarctica. *Environment and Behavior*, 2000, 32: 128-141
- 8 Sandal G M. Coping in Antarctica: Is it possible to generalize results across settings? *Aviation, Space, and Environmental Medicine*, 2000, 71: 37-43
- 9 Décamps G, Rosnet E. A longitudinal assessment of psychological adaptation during a winter-over in Antarctica. *Environment and Behavior*, 2005, 37: 418-435
- 10 Peri A, Scarlata C, Barbarito M. Preliminary studies on the psychological adjustment in the Italian Antarctic summer campaigns. *Environment and Behavior*, 2000, 32: 72-83
- 11 Musson D M, Sandal G M, Harper M L, et al. Personality testing in Antarctic expeditioners: cross cultural comparisons and evidence for generalizability, 53rd International Astronautical Congress, The World Space Congress, 2002
- 12 Musson D M, Helmreich R L. Personality determinants of professional culture in astronauts and analogue populations, Human Factors Research Project, Presented to the Faculty of the Graduate School of The University of Texas at Austin, 2003: 49-115
- 13 Aspa Sarris. Personality, culture fit, and job outcomes on Australian Antarctic Stations. *Environment and Behavior*, 2006, 38: 356-372
- 14 Schmidt L L, Wood J, Lugg D J. Team climate at Antarctic research stations 1996-2000: leadership matters. *Aviation, Space, and Environmental Medicine*, 2005, 75: 681-687
- 15 Wood J, Schmidt L, Lugg D, et al. Life, survival, and behavioral health in small closed communities: 10 years of studying isolated Antarctic groups. *Aviation, Space, and Environmental Medicine*, 2005, 76: B89-B93
- 16 Wood J A, Hysong S J, Lugg D J, et al. Is it really so bad? A comparison of positive and negative experiences in Antarctic winter stations. *Environment and Behavior*, 2000, 32: 84-110
- 17 Suedfeld P, Steel D G. The environmental psychology of capsule habitats. *Annual Review of Psychology*, 2000, 51: 227-253