

Psychological changes of fifteen Chinese Antarctic Research Expedition members*

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Abstract Eysenck Personality Questionnaire (EPQ), Behavior Pattern Questionnaire (BPQ) and Social Responses Questionnaire (SRQ) were used to survey the psychological character changes on some members at Zhongshan Station in Antarctica in winter. We also observed changes on memory by using visual memory span. In addition, we measured indirectly the changes on their higher nervous activity flexibility by Drawing Test. The questionnaires yield the following results: (1) No statistical significance was found in the score of three factions of EPQ, but significant changes happened in a few cases. (2) The score of EPQ of type A had a tendency to drop. (3) Subjects had the tendency to turn to external control on their Locus of Control.

Different from the members' subjective feelings, memory test showed no significant change. The flexibility of higher nervous system activity declined temporarily during polar nights, and returned rapidly to normal level when this period passed. In summary, the results of questionnaires and tests prove to be helpful for winter members to be adapted to the Antarctic natural and social environment. It is the first time that mental activities of our winter members were tested. Relevant research is continuing.

Key words Zhongshan Station, Antarctica, character and psychological characteristics, personality

1 Introduction

In Antarctic, the harsh climate, severe coldness, violent storms, and the Antarctic polar days and nights bring great difficulties and dangers for people to live there. Nobody resides in the Antarctic continent. The extremely quiet natural environment which implies isolation and loneliness puts much pressure on people's endurance of body and mind. Now many governments and scientists in the world all have realized that it is urgent for man to improve adaptability in the extremely harsh Antarctic environment. During the year of 1987—1988 we have tested body and mental state of 22 members in Great Wall Station (Xue *et al.*, 1990), but nothing have been done in Zhongshan Station. Because the natural and social environments of Great Wall Station located in the subantarctic are

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quite different from that of the Antarctic continent, and the latter may have some pertinent features which solely exist in the mainland. It is supposed that the studies on minds and behaviors in Zhongshan Station may have more practical implications. Therefore we carried out psychological observations and measurements on twenty winter members in Zhongshan Station, attempting to find a way to maintain psychological balance and improve their adaptability in the Antarctic environment. We hope that this may give some suggestions for the Antarctic staff selection.

2 Subjects and time of tests

2.1 Subjects

The subjects are twenty winter members in Zhongshan Station. All of them are males, aged from 23 to 60 years old, averaging 36.93. All are married but one. They have lived and worked for one year in Zhongshan Station (located at 69°22'24"S, 76°22'40"E and 12553.160 km far from Beijing), coming from and back to the mainland of China by the JIDI vessel.

2.2 Test time

In order to get basic data as normal control, examinations and survey were carried out in Qingdao, China before the members set out to Antarctic in December 1990. The first data collection was done in March, 1991. The second was from the end of June to the beginning of July, which was just Antarctic polar nights and all members mainly worked indoors instead of outdoors. The third time for data collection was from the end of November to the beginning of December, when polar days came. At that time, temperature gradually rose and storms became less severe, and it gave chances for people to take part in outdoor activities. The last time to collect data was in the middle of June 1992 in Tianjin, China, when the member had been back to China for over two months.

3 Method, results and discussion

The subjects were given personality and mental tests for three times. Each time they were asked to fill out Eysenck Personality Questionnaire (EPQ) (Chen, 1983), Behavioral Pattern Questionnaire (BPQ) (Zhang, 1985), and Social Reaction Questionnaire (SRQ) (Wang, 1991).

Results indicated that there was no significant difference among the subscale scores of P (Psychosis), E (Extrovert-introvert), N (Neurosis) of EPQ (Table 1).

But some subjects did show character changes at different time-span. Results of EPQ showed that 9 subjects (60% of the total population) had manifest changes on their character when living in Antarctica. Subscale L is used for testing the subjects' level of lying and social innocence. Data listed in Table 1 showed that L score was significantly higher after the subjects being back to China than in Zhongshan Station in November, it may be related to the great changes of social environment. It deserves further investigation whether this difference has practical implications.

Table 1. Subscale scores of EPQ at different time-span

Subscale	Time-Span	Dec. 1990, Qingdao		Nov. 1991, Zhongshan St.		Jun. 1992, Tianjin	
		M	SD	M	SD	M	SD
P		4.933	1.948	4.266	2.048	3.800	1.948
E		12.733	4.106	12.000	4.016	11.666	3.517
N		8.933	4.711	8.200	5.268	7.800	4.805
L*		15.333	3.259	14.400	3.611	16.066	3.714

* "L":Lie; "M":Mean; "SD":Standard deviation; "P":Probability

3.1 Case analysis

Mr. Yan, 23 years old, Han nationality, healthy and acute, has no chronic disease. His blood pressure fluctuated greatly during summer training. The systolic pressure even reached above 140 mmHg (1 mmHg = 0.133 kPa) and diastolic pressure was above 95 mmHg sometimes, which showed the syndrome of 1 period high blood pressure. After observing him for several times in Zhongshan Station, we found that his syndrome was chiefly caused by two factors. One was his fear of physical examination. He was nervous whenever physical examination was mentioned. To avoid his high blood pressure being known, he was always rejecting blood pressure test, sometimes he made an excuse that he felt uncomfortable. However, sometimes he was very well. ("All is going well", said he). While he felt sick himself (such as catching a cold), he would lie on bed on daytime but became active just as if nothing had happened at night. His appetite was still good, and his actions were still acute. Besides, he watched TV at night from the beginning to the end. As a reticent person, he suffered from insomnia all the time. On the way to Antarctica he was reluctant to dine with others, but ate well while being alone. During working in the Antarctic Station, he was low-spirited for suspecting that someone was gossiping about him behind. Any verbal stimulus could make his blood pressure fluctuate, so others avoided contacting and speaking with him in case to stimulate him. When polar nights were over and polar days came, there was much time for group activities outdoors, he avoided labouring by the excuse of illness, and never accepted people to get together in the group dormitory where he reside. His clothes were never tidy. But nobody dared to persuade him in case of his repelling. On the way back to China, he disobeyed the security disciplines and did not care about public hygiene, however, he never forgot to put his own bowl in the freezer after dinner. He was often seen standing for a long time in a place alone where there were few passengers and seemed thinking of something. His actions often aroused others' attention, but it was not easy to inquire anything directly about him. From all the above descriptions, we can see that he had symptoms of personality disorders (stubbornness, suspicion, inferiority, feeling loneliness, narrow-mindedness, social interaction withdrawal and in need of bosom friends). Since the integrity of his mental activities had been somewhat affected, he could not adjust well to deal properly with interpersonal relations. It is not proper for a person with such social maladjustment to participate in the Antarctic research. This example is meaningful for selecting Antarctic research members in the future.

The result of BPQ (Table 3) showed no significant difference among the subscale

scores at different time-span, while every score in November (transition time of polar nights to polar days) was all lower than that of the base line (December 1990) and that of convalescence after returning (June 1992). According to the norm of BPQ, subjects with TH and CH over 35 are type A behavior pattern, and those with TH and CH less than 19 are type B behavior pattern, and the others are mid-type. Type A people, generally speaking, possess the character of impatience, unsteady emotions,

Table 2. Subscale scores of BPQ at different periods.

Subscale	Dec. 1990		Nov. 1991		Jun. 1992	
	M	SD	M	SD	M	SD
TH	13.066	4.986	12.466	4.133	12.800	4.888
CH	12.400	4.160	12.000	3.864	12.800	3.562
TH CH	26.800	7.295	23.800	6.881	25.600	6.322
L	4.733	2.515	4.200	1.641	4.733	2.205

"TH": Time hurry; "CH": Competence hostility.

irritability, seeking to do others down, suspicion or hostility, acute action and high time-pressure feeling. Meanwhile the behavioral characteristic of type B is just the opposite. As Table 4 showed there were three subjects who changed their initial type A character to type B or mid-type after one year life in Antarctica. In the members' opinion, this change may be related to the following facts. During their life time in Antarctica, time was pressing due to rapid change of season climates, they had to finish all tasks in time in summer, in case that the tasks was delayed and their safety was threatened. This time pressure is supposed to bring about psychological stress. However the major factor influencing the character change of winter members in Zhongshan Station is much different from that in Great Wall Station. For Zhongshan Station it is mainly natural environment (polar nights) and harsh climate that lead to psychological pressure. Excessive type A character was helpless to the research work and harmful to members' security.

Table 3. Changes on behavior type at different time-span (number of subjects).

time-span		Type A	Type B	Mid-Type
Year	Month			
1990	Dec.	3	2	10
1991	Nov.	0	3	12
1992	June	0	2	13

Results of SRQ were listed in Table 4, SRQ is used to test personal tendency of Locus of Control (LOC). The concept of LOC was first proposed by Rotter (Rotter, 1966). Its Questionnaire was revised and applied in China (Wang, 1991; Wang, 1993). LOC reflects individual's expectation about the outcome of an action. If a person is more inclined to attribute social event to himself, then he is introvert. On the contrary, if he feels that others or the outer factors should be responsible for the event, then he is extrovert. People's characteristic on LOC may directly play a role in their interpersonal

relationships. Meanwhile, LOC is closely related to mental health (Wang *et al.*, 1992). Therefore, study on Antarctic member's LOC may be helpful for us to understand and improve people's adaptivity under the harsh Antarctic conditions where a person has little control over the outer surroundings. We assume that the extrovert is easier than the introvert to be adapted to the natural and social environment of Antarctica.

Table 4. Rating results of Locus of Control (N=15)

Number of subject	Dec. 1990	Nov. 1991	June 1992
	Qingdao	Zhongshan Station	Tianjin
1	2	10	7
2	9	4	5
3	13	16	14
4	11	13	15
5	3	9	9
6	5	3	11
7	12	11	12
8	9	15	15
9	7	11	12
10	6	16	14
11	11	13	11
12	8	7	6
13	9	13	16
14	5	4	8
15	11	12	14
M±SD	8.07±3.214	11.13±3.667*	11.93±3.087**

* $t = -2.4360$ $P < 0.05$

** $t = -3.3609$ $P < 0.01$ (comparing with the base value)

Results showed that winter members' LOC becomes higher than the base value after one year of Antarctic life ($P < 0.05$) and the score kept on increasing even when they had been back to China. This suggested that members of the small group in the Antarctic tend to become more extrovert. Therefore they always attributed unfortunate events to the uncontrollable outer factors. This way of thinking may lower their mental stress and be helpful for them to get psychological balance. It was found that changes occurred on two-thirds of the subjects' LOC. It suggested that the extrovert may be adapted better to the Antarctic environment to some extent.

3.2 Tests on memory

Some people among the Chinese Antarctic Research Expedition members reported that their memory dropped during their working in Antarctic Station. If it was true, then important function of the brain must have deteriorated under the influence of Antarctic environment, and it may affect man's future life. This problem has aroused attentions of many Antarctic researchers from all over the world. To ensure Antarctic expeditioners' health and security, we gave tests on fifteen winter members' memory

by using visual test of memory span. A set of numbers were presented to subjects in a certain order by a computer. The maximum quantity of the numbers reproduced correctly is the memory span. The interval of number stimulus is one second. The report is considered a correct answer only when it conformed to the original order. We presented stimulus in the order of two digit number, then three-digit, then four and so on. Subjects were allowed to recite twice the number.

If the two recitements were both wrong, then the test would stop. If the number is eight-digit, then the memory span is seven. Visual test of memory span is one of the simplest and most practical way to test short-term memory. According to our result (Table 5), the Antarctic expedition members' memory ability had no significant change ($P > 0.05$). Man can change his behavior to adapt himself to new environment. This is the process of gaining new adaptive behaviors, and also the process of memory and learning. If man's memory deteriorated after entering the Antarctic area, then his life would be threatened. But no short-term memory deterioration was found in our study. Since memory is a complicated process of physio-psychological activities, further study need to be done to test whether other kinds of memory (i. e. immediate memory and long-term memory) are affected.

Table 5. Number memory span of winter members

Time		Place	Maximum		Error Time	
year	month		M	SD	M	SD
1990	Dec.	Qingdao	7.666	1.920	3.133	0.805
1991	March	Zhongshan Station	8.000	1.505	3.600	1.083
1991	July	Zhongshan Station	8.200	1.514	3.666	1.192
1991	Nov.	Zhongshan Station	8.266	1.842	3.733	1.062
1992	June	Tianjun	8.266	2.048	3.400	1.440

Another nervous process which linked closely with memory is higher nervous system flexibility. It can be reflected in human behavior. Some people can maintain their initial working efficiency under different condition while some people's efficiency may be affected. The former are able to be adapted well to new environment. So the change on working efficiency in different environment can be taken as one indicator for flexibility of higher nervous system activities. We used Drawing Test (Yang, 1987) to test subjects' working efficiency to reflect indirectly their flexibility of higher nervous system activities, subjects were asked to draw out one certain number totally within certain time from a table of numbers arranged randomly. Work efficiency was measured by the correct and incorrect number drawn out and the number that subjects failed to report. From the result (Table 6) we know that correct numbers drawn out decreased during polar nights and returned to original level, even increased, during polar days (comparing to that of December 1990). Although our sample was not large, the results showed no variation in different areas. The flexibility somewhat was temporarily affected during the polar nights, then it restored almost to the original level. The phenomenon mentioned above that memory was reported to fall may be caused by decrease of the information received

newly and reinforcement of the information restored originally when people arrived in the Antarctic area. With the flight of time the original information was lost to a certain extent. Once being away from the special environment people can rapidly make alive the old information.

Table 6. Flexibility test of high nervous system activities (number of subjects)

Time		Flexible	Mid-level	Inflexible
Month-Year	Place			
Dec. 1990	Qingdao	6	0	7
March 1991	Zhongshan Station	8	0	5
July 1991	Zhongshan Station	3	3	7
Nov. 1991	Zhongshan Station	9	1	3
June 1992	Tianjin	5	3	5

4 Summary

(1) We used three questionnaires to test the character changes of Chinese Antarctic winter members in Zhongshan Station. Results showed that in order to adapt themselves to the harsh Antarctic environment, they changed their character to a certain extent.

(2) Winter members' short-term memory and flexibility of higher nervous system activities were tested by visual memory span and Drawing Test. Results showed that there was no significant change of short-term memory in winter research. The flexibility of higher nervous system activities temporarily declined in winter and returned to normal level when summer came.

(3) The long-term influence on character and some psychological characteristics are worth studying. Some related works are continuing.

(4) Our researches supply basic data for further studies and make a reference for Antarctic staff selections.

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