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Attitude Changes in Small Groups Under Prolonged Isolation¹

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Since the onset of the IGY program in 1957, the United States has maintained and operated several stations in the Antarctic for the purpose of collecting scientific data. In addition to civilian scientists, each station has been staffed with a complement of naval personnel who are charged with the responsibility of maintaining logistic support. All of the men wintering-over at each station have been volunteers, have had little if any previous acquaintanceship with one another, and have been assigned to their respective stations predominantly on the basis of their ability to fulfill certain task requirements which were crucial for operation of the station.

The physical setting within which the men live is rugged; temperatures drop to as low as -104 degrees Fahrenheit, winds up to 140 knots can prevail, and altitudes range up to 10,000 feet above sea level. During the Antarctic summer months, when sunlight is nearly continuous, construction and repair tasks must be performed at every station in addition to the collection of scientific data.

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These tasks must be accomplished if the group is to survive the bleak winter. With the advent of Antarctic winter, a period of from approximately two to six months of continuous darkness, depending upon geographical location, the men at each station are forced indoors for most of their activities. For the remainder of the winter the men live and work together in virtual confinement; there is no way to evacuate men or to receive additional supplies; the only contact with the outside world is by radio communication; the groups are isolated.

On the basis of personal experience (Siple, 1959) and from interviews with expedition participants (Mullin and Connery, 1959; Rohrer, 1959), accounts have been given of the problems and life patterns of men living under such conditions. Based upon two years of questionnaire data,³ the present research is concerned with the description of attitudes among men who have wintered over at small Antarctic stations. Comparisons are made of attitude levels among expedition groups at particular time periods and of changes in attitude levels over extended time periods. The major purpose of the study is to investigate the generality of attitude patterns and change among Antarctic small station groups.

Procedure

Attitude Inventory. Over a two year period, with different men each year, approximately 300 men completed an attitude questionnaire both at mid-winter, after six months of living in the Antarctic, and at post-winter approximately four months later.

³ The questionnaires were administered as part of the assessment program conducted by the Neuropsychiatric Branch, Professional Division, Bureau of Medicine and Surgery, Department of The Navy.

The questionnaires contained a total of 119 items oriented towards a man's feelings about living conditions, motivational problems, and relationships with the men in his immediate group.⁴ Responses were given on a continuous five-category rating scale. Rather than treating the items individually or as a total inventory, clusters of attitude items were derived for study.

To form attitude clusters, one psychologist grouped all items by similarity of content or orientation; items which did not appear to cluster with other items were excluded. Ten item clusters were thus formed and each given a descriptive label.⁵ A second psychologist was then instructed to assign each item to one of the named clusters, omitting those items which appeared unrelated to any cluster. This task was accomplished with eighty-four percent agreement between the two judges. The following ten attitude clusters, composed of a total of 80 items, were finally accepted for use in the present study: physical adjustment, expedition motivation, trust in organization, personal usefulness, boredom, compatibility of group members, group teamwork, group efficiency, group achievement, and equalitarian atmosphere within the group. Appendix A contains the items included in each cluster.

⁴The questionnaires were the Attitude Study and Group Behavior Description constructed by Herbert Zimmer, 1957.

⁵One cluster pertaining to food and eating habits was omitted.

The Spearman-Brown technique was used to obtain internal consistency reliability estimates for each cluster, mid-winter and post-winter administrations treated separately.⁶ Internal consistency values ranged from .64 to .83 for the mid-winter administration and from .65 to .87 for the post-winter administration. Since many items also correlated with items in other clusters, the magnitude of the obtained internal consistency estimates was compared with internal consistency estimates of ten experimental clusters formed by random grouping of items. Using Fisher's z transformation, the average item intercorrelations for content-derived clusters were significantly greater than those of the randomly-derived clusters ($p < .01$). The derived clusters, then, were considered both psychologically and statistically meaningful.

Once formed, the clusters were intercorrelated, again for each administration separately. Comparing the intercorrelations for the two questionnaire administrations, only two of the forty-five sets of intercorrelations differed significantly. By ranking the forty-five cluster intercorrelations on magnitude, a rho value of .974 ($p < .01$) was obtained between the two administrations. Since the two correlation matrices were comparable, an average of the two intercorrelations between each pair of clusters was obtained using Fisher's Z transformation. These data appear in Table 1.

Attention then focused upon the problem of comparing expedition groups in terms of similarities and differences in attitudes.

⁶Based upon Pearson product-moment intercorrelations of items.

Table 1

Average Pearson Product-Moment Intercorrelations of Ten Attitude Clusters.^a

Attitude Clusters	A	B	C	D	E	F	G	H	I	J
A: physical adjustment		37 ^b	28	27	-10	21	16	09	07	12
B: expedition motivation			40	59	-30	30	24	12	14	27
C: trust in organization				50	-21	47	47	36	44	42
D: personal usefulness					-38	38	32	24	34	35
E: boredom						-29	-29	-14	-20	-20
F: group member compatability							78	55	64	57
G: group teamwork								62	74	57
H: group efficiency									64	21
I: group achievement										27
J: equalitarian atmosphere										
$r^{(H)}$: internal consistency	70	84	76	82	70	85	82	74	78	64
r_{tt} : test-retest reliability	71	81	70	71	51	55	51	58	54	55

^a For N=300, $r_{.05} = .113$, $r_{.01} = .148$

^b Decimals are omitted.

Subjects. Six expedition groups were selected for the present study. The groups represented three different small stations in each of two years. A brief description of each group is presented in Table 2.

Table 2

Characteristics of Six Antarctic Expedition Groups

Station Year	I		II		III	
	x	y	x	y	x	y
Number of men	23	22	27	28	39	40
% Civilian	52	45	28	39	23	25
% Enlisted	44	50	64	54	64	63
% Officer	04	05	08	07	13	12
Average age	28	a	26	28	27	27
Avg. years job exper.	8	a	6	8	7	7

^a No data available.

Results

The study of attitudes was conducted with two major analyses. First, how similar were the groups in attitudes held by their members at each time period? Second, what attitude changes occurred for the members of each group between the mid-winter and post-winter time periods?

Similarity of group attitudes within time period. The first question under consideration was how similar the different groups were in terms of attitudes held at mid-winter and again at post-winter. Analyzing attitude variance first, Bartlett's test of homogeneity indicated that the groups were not homogeneous in variance on any of the clusters except one; attitudes of boredom were of homogeneous variance at post-winter administration.

In order to determine the extent to which group variance levels (as indices of intra-group disagreement on an attitude) were consistent over different attitude clusters, groups were ranked on variance magnitude for each cluster at both administrations. The coefficient of concordance (W_c) revealed consistent rank order over clusters with values of .431 ($p < .01$) and .327 ($p < .01$) for the mid-winter and post-winter administrations respectively. That is, groups with greatest variance on one attitude cluster tended to have greatest variance on other clusters. The rank order of groups on variance level did change however, between the mid-winter and post-winter administrations. Only for group member compatibility did groups maintain a relatively constant rank order on variance over time ($\rho = .77, p = .10$). In general, then, the extent to which the members of any group shared a common level of attitude was not consistent from mid-winter to post-winter.

To test the homogeneity of group attitude means, a simple analysis of variance design was employed, comparing groups on each attitude cluster at both mid-winter and post-winter periods. Results of this analysis appear in Table 3. During mid-winter, groups differed in level of attitude favorability on all but one attitude area; groups were homogeneous regarding the extent to which they had adjusted to the rigors of climate and physical conditions. By the end of the winter, just prior to leaving the Antarctic, groups were homogeneous in regard to attitudes of personal usefulness and boredom as well as physical adjustment; in terms of motivation and attitudes about one's group, inter-group differences prevailed throughout the winter.

As with attitude variance, groups were ranked on attitude means for each cluster at each administration. Again, utilizing coefficients of

Table 3

Simple Analysis of Variance Results Comparing Six Groups on Attitude Areas.^a

Cluster	Mid-winter					Post-winter				
	df _B	df _W	MS _B	MS _W	F	df _B	df _W	MS _B	MS _W	F
A: physical adjustment	5	147	14.92	17.16	0.87	5	123	30.90	18.44	1.88
B: expedition motivation	5	147	156.64	25.32	6.19**	5	123	89.54	26.74	3.35**
C: trust in organization	5	147	122.24	14.06	8.69**	5	123	148.56	15.71	9.46**
D: personal usefulness	5	147	158.92	27.99	5.68**	5	123	235.92	105.72	2.23
E: boredom	5	147	26.20	9.36	2.80*	5	123	44.96	45.35	0.99
F: group member compatability	5	146	337.94	94.90	3.56**	5	117	265.98	104.04	2.56*
G: group teamwork	5	146	208.84	18.19	11.49**	5	117	195.10	21.09	9.25**
H: group efficiency	5	146	176.86	15.27	11.58**	5	117	137.14	12.54	10.94**
I: group achievement	5	146	102.00	7.72	13.21**	5	117	93.95	8.74	10.75**
J: equalitarian atmosphere	5	146	207.44	18.92	10.97**	5	117	131.52	30.25	4.35**

^aDifferences in df_W between clusters A-E and F-J, and between the two time periods were due to incomplete data for several individuals; the two sets of clusters were derived from two questionnaires.

*F Significant at the .05 level of confidence.

**F significant at the .01 level of confidence.

concordance, results indicated the tendency for groups to maintain relatively constant rank order on attitude favorability over different attitude areas; values of W_c were .417 ($p < .01$) and .508 ($p < .01$) for mid-winter and post-winter periods respectively. In contrast to the results obtained with attitude variance, groups also maintained relatively constant rank order on attitude means over the four-month period (test-retest correlation of clusters yielded rho values of from .77 to 1.00, $p \leq .10$). For only three attitude areas did group rank order change over time, these being attitudes about physical adjustment, trust in organization, and boredom.

Within group attitude change. Tables 1 and 2 of Appendix B contain the results of analysis of change in means and variances for each group on each attitude cluster. Student's t test for matched groups was used throughout; for clusters on which variance change was significant, difference between means was assessed using critical t values derived by the method suggested by Cochran and Cox (Experimental Designs, 1950, section 4.14). From inspection of the results, the following inferences were drawn.

1. Groups varied in the number and nature of attitude areas on which there was significant change. None of the groups changed significantly on every attitude cluster; for none of the attitude clusters was there a significant change for every group. Significant changes were most frequent on attitudes related to group characteristics, such as compatibility, teamwork, and group achievement.

2. In terms of direction of change, attitude levels or means tended to change towards less favorability; attitude variances tended to increase over time.

Discussion

Antarctic small station groups differ in their attitude patterns both within and between time periods. During both mid-winter and post-winter periods the groups were significantly different on attitude means, or level of favorability, and on the extent to which their members shared a common attitude level. By mid-winter, after already having spent six months in the Antarctic, groups were similar in terms of their members' feelings about physical adjustment to Antarctic conditions. And, by the end of the winter, with anticipation of leaving the Antarctic and with greatest work demands past, the members of all groups shared a feeling of less personal usefulness and greater boredom. Groups remained different through the last four months of the expedition in terms of their members' motivational states and feelings about the group, such as compatibility.

Variations in group composition could certainly be expected to partially account for differences in motivation and attitudes towards one's group. Size alone of the group could very well affect the feelings of mutual compatibility of members.

Differences in demands posed by the physical environment at the different stations could also affect group attitudes. A problem with heating conditions, a sudden lack of supplies, or a particular task demand could occur in any one group and not the others, differentially affecting attitudes regarding those areas of behavior. But the physical demands are apparently less influential on attitudes than the interpersonal demands, as evidenced by the greater group differences on attitudes pertaining to one's group.

The results indicated a lessening of favorable attitudes towards the end of the Antarctic experience. The general increase in attitude variance, however, suggests that while some individuals within each group became less favorable in attitude, these relatively negative feelings were not shared by all group members. For both individuals and groups, those who held more favorable attitudes during mid-winter continued to hold the relatively more favorable attitudes by the end of the winter. To the extent that such individual differences in attitude are relatively stable, there is a potential application of these results to the process of personnel selection. Similarly, to the extent that group differences in attitude tend to remain stable, the results seem relevant to the study of group composition and formation. Further understanding of the Antarctic small stations will be advanced through the accumulation of additional behavioral data acquired independently of attitude measures. Heretofore, such data have generally been incomplete or not collected at all. Group differences revealed through attitude patterns in the present study direct particular attention to such additional lines of inquiry as: the composition and cultural complexity of the group, task and non-task interaction patterns within the group, leadership style, sequential event structure other than interaction patterns, and both individual and group performance measures.

Summary

Groups of military and civilian personnel who manned Antarctic scientific stations during two years were studied to determine differences among groups at mid-winter and at the end of winter on ten attitude scales. Groups differed on almost all scales at both time periods, and the greatest magnitude and consistency of change between the time periods was on attitudes pertaining to group member compatibility and teamwork. Results suggested that prediction of attitude levels of individuals and groups in Antarctic settings may be feasible; attention was directed briefly to the possible effects of variations in group composition and complexity, physical facilities, and interaction patterns on group attitudes. Attitude measurement appears to be a useful tool for the study of small groups under conditions of prolonged isolation.

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APPENDIX A

A. <u>Physical adjustment</u> : feelings of adjustment to climatic and living conditions.	<u>Estimate of Item-Total Correlation^a</u>
Does your Arctic clothing tire you out quickly?	.54
Does your Arctic clothing interfere with the performance of your job?	.53
Does extreme cold weather bother you?	.52
Have you had any pains as a result of the cold?	.50
Does your Arctic clothing make you uncomfortable?	.48
When I return from this Antarctic expedition I will be physically as well as I was before I left.	.42
Do you like cold weather?	.41
Does your clothing give you sufficient protection from the cold?	.37
B. <u>Expedition motivation</u> : expressed interest in remaining or returning on Antarctic expeditions.	
Do you wish you had never come to the Antarctic?	.69
Do you wish you were back in the U. S.?	.69
If you had it to do over again would you rather come on this expedition or carry out some other job elsewhere?	.69
Would you like to go on another Arctic or Antarctic expedition after you return from this one?	.69
Do you wish you could stay in the Antarctic longer than now planned?	.66
What proportion of expedition members do you think would really prefer to stay in the States?	.59
Do you wish you could be home for just one day?	.57

^a Based upon each item's correlation with other items in the cluster.

C. <u>Trust in Organization:</u> confidence and trust in general authority and expedition organization.	Estimate of Item-Total Correlation
Do you feel that most of the leaders of this expedition are well qualified for the positions they hold?	.64
From what you have seen so far, how well do you think this Antarctic expedition has been organized?	.63
The people in charge of this Antarctic expedition will do all they can to see that we are well cared for.	.59
Do you have as much confidence in the medical care available on the expedition as in that available in the States?	.58
If you became seriously ill in the Antarctic, do you think you could get adequate help?	.58
Do you think you could be found if you were lost in the Antarctic?	.57
D. <u>Personal Usefulness:</u> feeling that personal job is important and that personal gain will be derived from participation.	
Do you think your mission is important enough to justify your spending all this time in the Antarctic?	.69
How much of the knowledge and experience you gain on this Antarctic expedition do you think you will be able to use in one form or another after you return?	.68
Do you think that taking part in this Antarctic expedition will further or hinder your career?	.65
Would you advise a friend who was considering joining a polar expedition to apply for the job you have on this expedition?	.64
I would just as soon have my present job as any other assignment that I know about.	.62
To what extent do you think you will engage in activities in any way related to this Antarctic expedition after you return from it?	.63
Do your present duties employ your abilities in the best possible way?	.55

E. <u>Boredom:</u> expressed boredom, lack of things to do, time drag.	<u>Estimate of Item-Total Correlation</u>
Do you find yourself in need of something to do in your spare time?	.59
Are you bored?	.59
Does time pass too slowly?	.57
Do you wish for more excitement?	.52
Would you like to have more work to do?	.47
Do you wish you had more time to do all the things you want to do?	.45

F. <u>Compatibility</u> : perception of group members as mutually congenial and preferred as personal friends.	<u>Estimate of Item-Total Correlation</u>
The members of my group are the kind of people I like to spend a lot of time with.	.57
There is a pretty good feeling between us here.	.57
This group is pretty happy.	.55
Members of the group bicker with each other.	.53
Are there a lot of personal friends among the members of your group?	.52
This group has more than its share of odd-balls.	.52
This would be a better group if we could eliminate a few members.	.50
It is hard to get a bunch of guys to agree on anything.	.50
Members of this group have many common interests.	.50
Do you enjoy your daily contacts with the present members of your group as well as other groups you have been in?	.49
I would rather be with my present group than with any other group that I know about.	.49
One or another of the guys is rubbing somebody the wrong way.	.49
Although we are together, no one says much.	.49
We do little things just to make somebody happy.	.48
Several other men in my group are interested in the same things that I am.	.44
It does not take much to get an argument started here.	.41
It's easy to get a good bull session going.	.37
At times I would rather be alone than with my group.	.36
Is there anyone in your group that is (or that you would like to have as) a very close friend?	.36

G. <u>Teamwork</u> : perception of group members as cooperative and each carrying his share of the work.	<u>Estimate of Item-Total Correlation</u>
Members of this group work well together as a team.	.69
Everybody pulls together to get a job done.	.68
Some of the men are shirking their duty.	.64
Do members of your group tend to think only of themselves, even on matters that affect all of you?	.60
At times part of the group is working at cross purposes with other parts of the group.	.60
Some do all the work here and others take all the credit.	.60
Somebody is ready to give you a hand, even without your asking.	.60
H. <u>Group efficiency</u> : perception of group as well organized, having concise goals, and scheduled activities.	
This group is confused and disorganized.	.63
Everything we do is planned well ahead of time.	.61
Some members of the group don't really know what they are here for.	.57
Not everyone has a clear idea of what job he is supposed to be doing.	.57
Everybody here follows a strict schedule of activities every day.	.52
We need fewer chiefs and more Indians here.	.50
We have to account for how we spend our time.	.36

I. <u>Group achievement</u> : perception of group accomplishment and members' pride in same.	<u>Estimate of Item-Total Correlation</u>
We take a lot of pride in what this group has been able to achieve.	.70
This group does not accomplish much.	.68
It is pretty easy for this group to get something done.	.67
Everyone here would feel ashamed if we did not accomplish our mission.	.62
J. <u>Equalitarian atmosphere</u> : perception of mutual respect, status leveling, and democratic procedures within group.	
Everyone here can have his say.	.48
The group <u>as a whole</u> makes important decision.	.47
Everyone's opinion here counts as much as the next man's.	.47
Decisions are made by a few members of the group.	.46
Everyone has a lot of respect for everyone else in my group.	.42
Many in this group are afraid to say what they really think.	.41
We all call each other by our first names.	.39
Privileges are determined by rank.	.35
We toss a coin or draw straws for assignments.	.28

Appendix B.

Table 1

Attitude Cluster Means for Six Groups in Each of Two Time Periods. Significant Differences between Means, within Group between Time Periods, Indicated as Result of Student t-test.

Attitude Cluster ^b	Time	Groups ^a						Possible Range
		xI	yI	xII	yII	xIII	yIII	
Physical Adjustment	1	19.50	17.29	17.37	17.82	17.24	18.46	8.00 -
	2	18.92	19.73**	17.33	17.42	17.15	19.69	40.00
Expedition Motivation	1	14.57	17.36	17.96	15.96	21.82	18.86	7.00 -
	2	16.00	18.09	17.93	19.04**	23.73**	19.15	35.00
Trust in Organization	1	14.07	13.57	14.89	15.54	19.42	14.73	6.00 -
	2	17.00**	13.46	15.89	17.04*	21.81**	17.15	30.00
Personal Usefulness	1	14.86	15.21	15.15	17.18	21.06	18.73	7.00 -
	2	15.77	16.18	15.81	20.00**	23.88**	20.27	35.00
Boredom	1	20.36	22.64	21.41	22.07*	20.79**	19.92	6.00 -
	2	21.08	22.27	20.30	21.08	18.96	18.11	30.00
N	1	14	14	27	28	33	37	
	2	13	11	27	26	26	26	
Group Compatibility	1	49.47*	41.86**	45.26**	47.68**	56.47	50.75**	19.00 -
	2	56.00*	47.00	51.63**	54.00**	57.46	57.62**	95.00
Group Teamwork	1	19.33	13.29**	14.74**	16.11**	21.31	18.25**	7.00 -
	2	23.22	15.91	17.18	19.15	22.31	23.75	35.00
Group Efficiency	1	23.07	17.79**	18.82	18.86	22.12	24.25	7.00 -
	2	24.56	18.82**	19.04	19.92	22.85	24.71	35.00
Group Achievement	1	10.67	6.21**	7.11**	8.32**	11.19	10.78	4.00 -
	2	12.56	8.00**	8.11**	10.15**	12.12	12.71**	20.00
Equalitarian Atmosphere	1	26.87	22.43	28.67	25.50**	31.84	26.08**	9.00 -
	2	26.44	24.82	30.18	29.38	33.04	29.46	45.00
N	1	15	14	27	28	32	36	
	2	9	11	27	26	26	24	

^a x and y refer to Deep Freeze years; I, II, and III refer to stations.

^b The lower the mean, the greater the attitude in the defined direction; i.e., greater motivation, etc.

* Significant at the .05 level of confidence

** Significant at the .01 level of confidence

Attitude Cluster Variances for Six Groups in Each of Two Time Periods. Significant Differences between Variances, within Group and between Time Periods, Indicated as Result of F test.

Attitude Cluster	Time	Groups ^a					
		xI	yI	xII	yII	xIII	yIII
Physical Adjustment	1	23.66**	10.22	15.16	18.30	11.06	23.31
	2	9.24	12.02	18.16	23.70	7.02	22.06
Expedition Motivation	1	12.42	19.48**	28.04	27.45*	25.46	31.18
	2	12.83	28.69	25.53	35.80	18.05	22.62
Trust in Organization	1	7.46*	9.95	7.87	16.33	20.38	15.09
	2	15.00	7.87	11.41	20.36	20.88	14.62
Personal Usefulness	1	19.52	20.48**	15.21	23.85**	37.06	39.93
	2	18.36	37.96	17.54	43.84	31.94	42.12
Boredom	1	8.56	6.55	6.94	7.92**	9.54	13.96
	2	11.41	5.02	9.52	12.95**	10.92	12.74
N	1	14	14	27	28	33	37
	2	13	11	27	26	26	26
Group Compatibility	1	46.40	26.13**	24.53**	83.19**	69.74**	82.35
	2	57.74	74.60	50.55	138.39	166.59	88.08
Group Teamwork	1	12.38	11.30	10.74	17.73	22.22	25.33
	2	27.20	15.49	8.85	22.37	29.26	24.98
Group Efficiency	1	26.07	10.18	7.92	19.09**	11.98	18.25
	2	17.53	8.96	6.34	6.88	15.66	22.13
Group Achievement	1	12.38	3.72	3.33	8.30	9.32	8.75
	2	7.78	5.60	1.95	8.29	12.50	15.26***
Equalitarian Atmosphere	1	6.98**	13.03	13.92*	17.89**	25.23	21.85
	2	22.28	20.77	22.92	43.77	39.48	20.69
N	1	15	14	27	28	32	36
	2	9	11	27	26	26	24

^a x and y refer to Deep Freeze years; I, II, and III refer to stations.

* Significant at the .05 level of confidence.

** Significant at the .01 level of confidence.