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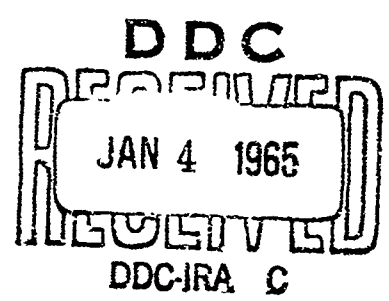
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Compatibility Among Work Associates in Isolated Groups

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Abstract

In the present study an attempt was made to identify correlates of work partner compatibility among 14 three- to six-man work groups located in isolated Antarctic stations. Using demographic and self-description data to construct group composition variables and sociometric data to derive compatibility criterion measures, work group homogeneity on age was significantly ($p < .01$) related to work group compatibility. An additional finding of significance ($p < .05$) was that a low level of compatibility existed among work associates who were equally high in their need to be interpersonally prominent as through leadership status. A general trend in the study was for group composition variables to be more related to compatibility during the winter than during the summer months, the time period of greatest confinement and isolation from the outside world.

Modifying an earlier position, Homans (1961) hypothesizes that interpersonal attraction covaries with frequency of interaction only when some degree of freedom exists for interpersonal choice. In some situations, such as those associated with formal work organizations, interpersonal choice is restricted through role structure, and compatibility among individuals may consequently be independent of interaction frequency. The implication of this for work groups is that considerations pertaining to interpersonal compatibility might be made at the time of personnel selection and assignment, especially for those situations in which compatibility is potentially a critical dimension of group behavior.

The interest in studying work group compatibility stems from the general notion that compatibility is positively correlated with task effectiveness of the group. Aside from certain controversy over defining effectiveness as it pertains to groups, recent summaries of studies relating group productivity to group cohesiveness do not reveal a simple positive correlation between these two facets of group behavior (Bass, 1960; Thibaut & Kelley, 1959). In a theoretical sense, however, a group composed of compatible or mutually attractive members should be better able to elicit member support for its goals, better able to realize effective communication within the group, and should be able to spend proportionately less of its time and energy resolving the group maintenance problems which arise from interpersonal tensions.

Assuming (a) desirability of having compatibility among individuals who must work together and (b) that frequency of interaction is insufficiently related to work group compatibility, problems of group assembly become important. Haythorn (1957), in summarizing research in this

area of study, draws attention to two considerations of relevance in group assembly, one having to do with the attributes on which the groups are to be composed and the second with the particular combinations of individuals on which greatest attention should be focused. With regard to the latter consideration, Roby (1956) emphasizes the importance of giving greatest attention to those subgroups of individuals who are expected to have the highest rates of work interaction. On the matter of attributes on which compatible subgroups of personnel are to be composed, there is general agreement that selection should be made of those values, attitudes, and other personal characteristics which seem most relevant and important for the group and its operation (Haythorn, 1957; Newcomb, 1956; Roby, 1954).

Once a sample of attributes has been selected, consideration must be given to the ways in which to combine these characteristics within the various subgroups in order to maximize compatibility. One hypothesis of group composition is that compatibility increases with an increase in similarity of values and attitudes among group members. In this context, Newcomb (1956) stresses the importance of perceived similarity, although several studies report a positive correlation between interpersonal attraction and actual similarity (Morton, 1959; Precker, 1952; Rosenberg, 1956).

Attribute similarity, however, may not always be the most effective state of composition for group compatibility. In discussing personality traits, Schutz (1961) differentiates between reciprocal and interchange compatibility, the former being a function of trait complementation and the latter being a function of trait similarity. In reference to Schutz's theory of interpersonal behavior (1958), an example of trait complementation would be the grouping of certain individuals who are high on "wanting control" with others who tend to be high on "expressing control." An example of composition by similar traits would be the grouping of individuals who are all comparably high or low on "wanting inclusion." Both the specific nature of the attribute and the roles to be fulfilled by the individuals must be considered in achieving the most effective type of composition.

Group composition and assembly techniques have particular relevance for situations requiring individuals to work and live together over prolonged periods of time in virtual isolation from the remainder of society. One such situation is that of the small Antarctic scientific research station manned for twelve continuous months by from twelve to thirty-five men. During their first six months station members have periodic face-to-face contact with individuals from outside the station; the men work out-of-doors and have relatively broader physical boundaries within which to move than they have during the second six months period. During these last six months,

activities are confined almost exclusively to the indoors and, except for occasional radio communication, the station members have no contact with anyone from outside the station.

The present study was undertaken to identify correlates of compatibility among work associates in the small Antarctic stations. Attention was focused upon those subgroups within stations which tend to have the highest rates of work interaction among their respective members. One hypothesis was that compatibility would be greatest among work associates who are most similar in status, interests, and general background. The assumption here was that individuals of a common set of past experiences and present orientations would be most likely to respond similarly to present situations and best able to share in communication. In the domain of personality, the individual's motivations pertaining to achievement and his need to be interpersonally prominent as through leader behavior were considered to be relevant and important attributes for these groups. Hypotheses pursued were that trait similarity among work associates would be most conducive to compatibility in regard to need for achievement while trait complementation (heterogeneity) would be more conducive to compatibility in regard to the need for interpersonal prominence. Additional consideration was given the possibility that correlates of compatibility among work associates might vary over time.

Method

Subjects. The sample of Ss consisted of 59 men each of whom had spent one year at one of three small Antarctic stations. Approximately 60% of the Ss were Navy enlisted personnel in the occupational fields of construction and radio communications; the remaining Ss were civilian personnel engaged in monitoring weather conditions (referred to in this study as weather) and various research programs in physics and earth sciences (referred to in this study as science). The average age for both Navy and civilian groups was 26 years with a range for the entire sample of from 18 to 43. Characteristic educational levels were 12 years for all Navy personnel, 15 years for civilian weather personnel, and 17 years for civilian science personnel.

Procedures. Prior to being assigned to an Antarctic station all Ss completed a biographical questionnaire and self-description inventory. The group composition variables were derived from these two sources. Data pertaining to work interaction and social compatibility were derived from questionnaires which Ss completed in the Antarctic both at the end of the first and last six-month periods.

Work Groups. Fourteen work groups were derived to be used as units of analysis in the present study. The groups ranged in size from three to six men. To form the work groups, Ss were initially clustered within station on the basis of common occupation or known role

relationships. Subsequent refinement of these occupational groups was made on the basis of work interaction data obtained twice during the Antarctic year by questionnaire. The men at each station indicated those persons with whom they most frequently worked, to whom they went for advice on work problems, and who came to them for advice on work problems. The 14 work groups were formed so as to maximize in-group choice as much as possible on the sociometric work questions.

Among the work groups derived, six were in the occupational field of construction, three in radio communications, three in weather research, and two in the fields of physical science. Although individuals varied in terms of the number of other individuals whom they named as closest work associates, and not all choices were mutual, the final work groups were quite cohesive insofar as work interaction was concerned. The work groups were formed in such a way that of all work interactions reported for the first six months, 84% were in-group choices, while 75% of the interactions were in-group choices during the last six months. Extent of interaction was obtained for each work group separately for the two time periods by ratio of the actual number of in-group choices to the maximum possible number of in-group choices. These ratios varied from .30 to 1.00 for the summer months, with a median ratio of .80, and from .33 to 1.00 for the winter months, with a median ratio of .76. In general, then, the work groups were homogeneous on occupational role and were characterized by frequent work interaction among members.

Group Composition Variables. Age and organizational rank (pay grade) were used as indices of status. Although correlated, particularly among Navy personnel, the two variables can be viewed as being conceptually different. An estimate of work group homogeneity on age was obtained through average age difference scores derived from all possible pairs within each work group. Work group homogeneity on rank was obtained by the ratio of the actual number of group member pairs of identical pay grade to maximum possible number of such pairs (C_2^n).

The social-cultural background of Ss was assessed through biographical questionnaire items pertaining to location and size of hometown, size of family, father's and mother's education, and father's occupation. Using coded responses to these items (Nelson & Gunderson, 1963), work group homogeneity on background was estimated by a ratio of the total number of actual agreements in response, across work group members and biographical items, divided by the maximum possible number of such agreements. The range of such ratios for all groups was from .22 to .58 with a median ratio of .39.

Current interests of Ss were determined through biographical items pertaining to frequency

of reading, number of hobbies pursued, membership in social and service clubs, frequency of sports participation, and frequency of church worship. Similar to the family background items, response categories were used with the interest items (Nelson & Gunderson, 1963). Work group homogeneity was again estimated by the ratio of the total number of actual agreements in response across persons and items divided by the maximum possible number of such agreements. The range of such ratios for all groups was from .26 to .80 with a median ratio of .34.

Although there were no personality data from standardized inventories available on the Ss, measures of need for achievement and need for interpersonal prominence were constructed from a self-description questionnaire. Ss were instructed to check the phrase or adjective most and least descriptive of self within each of 42 adjective quintets developed by Sharp and Harper (1953) for personnel selection research. As an outcome of a content analysis performed on the inventory by three professional judges, a set of 22 adjectives were selected for each of the two measures to be used in the study. Examples of achievement items were "hard worker," "ambitious," and "never say die"; examples of the measure of interpersonal prominence are "leader," "forceful," and "like to be with others." No more than one adjective per measure was contained in any one quintet. Adjectives descriptive of a trait were scored +1 if checked by S as most descriptive and scored as -1 if checked as least descriptive. Each S then received an algebraic sum score on each of the two measures. Split-half reliability estimates with odd-even items were .76 and .73 for the achievement and prominence measures respectively, corrected by Spearman-Brown formula. Work group homogeneity on each of the two measures was obtained through an average trait-difference score derived from all pairs of work group members. Small difference scores reflected trait homogeneity.

Compatibility Measures. The work group criterion measures of compatibility were obtained from questionnaires completed by Ss at the end of the first and last six-month period in the Antarctic. Among other questions of a sociometric nature, Ss were asked to name the five men at their station whom they found easiest to get along with over the past several months. It is assumed that Ss named only those persons with whom they were most compatible; many Ss named fewer than five persons while a few Ss named more than five. For each of the two time periods work group compatibility was measured by a ratio of the actual number of in-group compatibility choices divided by the maximum possible number of in-group choices [$N(N-1)$]. Compatibility ratios for the 14 work groups ranged from .23 to .85 in the summer period, with a median ratio of .48, and from .00 to .83 for the winter period, with a median ratio of .45. No group had perfect compatibility by the present criterion.

Data Analysis. All scores derived for the work groups on the aforementioned measures were converted to rank data, thus ordering the work groups from most to least homogeneous on personal attributes and most to least compatible on the compatibility criterion measures. Relationships among these data were analyzed by Spearman rank correlation technique (ρ) and Kruskal-Wallis H-test for analysis of variance among ranks (Siegel, 1956).

Results

Since group size and type of occupational role might have been influential in determining the rate of work interaction or degree of work group compatibility, analysis of variance among ranks was first used to test for differences in work interaction and compatibility for work groups of different size and different occupational fields. With regard to group size, half the work groups were composed of three men and the other half of from four to six men. Comparison of these two size groups suggested higher interaction rates among the smaller work groups during the summer period ($H = 3.579$, $df = 1$, $p < .10$); there was no difference during the winter period. Group size was not related to amount of compatibility during either of the two time periods. Comparison of the work groups within the four major occupational fields of construction, communications, weather, and science research yielded no significant differences in either work interaction rates or amount of compatibility for summer or winter time periods. Since one of the four occupational fields contained only two work groups, the significance of the analysis of variance H statistic was tested by a special sampling distribution approximation suggested by Kruskal and Wallis (1952).

Rates of interaction for the various work groups were quite stable from summer to winter periods, as evidenced by a correlation (ρ) of .74 between the two measures ($n = 14$, $p < .01$). The correlation between compatibility measures for the two time periods, however, was .35 ($n = 14$, $p > .20$), suggesting less stability on the dimension of compatibility than on that of work interaction. Thus, it was reasonable to evaluate separately the correlates of work group compatibility during the two six-month time periods of summer and winter. With the present groups and measures, compatibility and interaction rate were independent during both time periods, values of ρ being .00 and .02 for summer and winter, respectively.

The results of correlational analysis between group composition variables and the measures of work group compatibility are shown in Table 1. Work group homogeneity on age was significantly correlated ($p < .01$) with work group compatibility, but only for the winter time period. As suggested by their intercorrelations, age homogeneity also reflects rank and background homogeneity. Neither rank nor background homogeneity was significant by itself in relation to

Table 1
Rank Correlations (rho) Among Group Composition
and Group Compatibility Variables ^a

<u>Variables</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
1 Homogeneity of age		.74	.76	.42	.41	.07	.14	.68
2 Homogeneity of rank			.46	.47	.32	-.06	.27	.47
3 Homogeneity of background				.41	.30	.37	-.11	.43
4 Homogeneity of interests					.29	.07	.15	.19
5 Homogeneity of need for achievement						.55	.27	.34
6 Homogeneity of need for prominence							-.15	-.08
7 Level of compatibility, summer								.35
8 Level of compatibility, winter								

^aFor N = 14, rho .05 = .53 and rho .01 = .66.

compatibility. A trend in the results, particularly noticeable with age and background homogeneity, was for the group composition variables to be more highly related to compatibility during the last six winter months.

The hypotheses relevant to personality trait composition of the work groups were not supported except in trend. Work groups composed of individuals having comparable levels of need for achievement were only slightly more compatible than those composed of members having different levels on this need. In order to further evaluate the zero-order correlation of group composition on need for prominence with compatibility, inquiry was made into the possibility of an interaction effect between level and variance of that need. The 14 work groups were categorized into upper and lower halves on their average level of need for prominence and also into upper and lower halves on need homogeneity. This procedure yielded four nearly equal-sized experimental groups: homogeneous high average, homogeneous low average, heterogeneous high average, and heterogeneous low average. Compatibility ranks for summer and winter periods were then subjected separately to an analysis of variance among these four experimental groups. Differences among groups were found for the winter period only ($F = 7.930$, $df = 3$, $p < .05$). The most incompatible set of work groups were those with a homogeneous high average need for

prominence; the most compatible set of work groups were those with a homogeneous low need for prominence.

A final investigation was made of the relationship between work group compatibility and task performance. Using individual performance measures reflecting task motivation and effort which were derived from station supervisors' ratings (Nelson & Gunderson, 1963), an average performance score was obtained for each of the 14 work groups. Since the performance evaluations were based upon the total twelve-month period, a single estimate of work group compatibility was also formed for this analysis by averaging the compatibility scores for the two time periods. A Spearman rank correlation of $-.05$ was obtained between compatibility and performance as measured. To check for a possible non-linear relationship (such that moderately compatible groups might be most effective on task performance) the work groups were trichotomized on overall compatibility. Task performance ranks were then submitted to analysis of variance among these three sets of work groups. No significant relationship was revealed among these data. In further analysis, work group homogeneity on task performance was found to be somewhat related to compatibility ($\rho = .47$, $n = 14$, $p < .10$). Compatible work associates, then, tended to be similar in their work efforts. This finding is consistent with certain of the social comparison hypotheses advanced by Festinger (1954).

Discussion

The present results are interpreted as giving support to previous notions pertaining to group composition and compatibility. In the Antarctic stations, where there is close interaction among group members particularly for six months, similarity of age seems most conducive to compatibility among work associates. Conveyed in age similarity among the present sample of men are the characteristics of job experience, status, and family background similarity. Furthermore, groups composed of individuals all of whom are striving to assume group leadership and are socially aggressive tend to become less compatible over long periods of close interaction.

An important trend in the results is the fact that the major relationships between group composition variables and group compatibility existed during the last six-month period, a time during which the men at each station were most isolated from the outside world and confined quite dramatically to the physical boundaries of a few buildings and the social boundaries of a relatively small group of men. It is during this period of close interpersonal confinement that the station members have the opportunity to become acquainted on a more than superficial level. To the extent that individuals have had similar background experiences and tend to be

of similar station in life, their basic value systems would be expected to be more compatible than in the absence of such similarity, thus leading to more harmonious interpersonal relations. The fact that the present construct of interests, which might reflect values, was less related to compatibility than other variables during the winter months may in part be due to the fact that it reflected the rate of activity rather than the content of activity. Furthermore, the importance of such constructs in their relationship to compatibility can be subject to variation across populations. Rosenberg (1956), for example, found that attitude and interest similarity was related to compatibility more among military officers than among military enlisted personnel, suggesting perhaps a cultural difference in attribute relevance.

The relatively low correlation between compatibility estimates for the two time periods, as well as the corresponding differential relationships between group composition variables and compatibility, suggests environmental change in terms of what activities are performed and what personal characteristics are perceived as important for compatibility under varying environmental conditions. Roby (1956), in trying to develop compatible crews through a peer selection technique, found sociometric choice to be relatively unstable from training to operational situations. The bases of compatibility, in other words, may be quite different from one time to another depending upon the quality of the work environment. In addition to other facets of the work environment, an important aspect is that of role structure, as exemplified in variations of interaction style (i.e., sequential or parallel association) and in status differentiation. In the Antarctic station situation work groups tend to be of relatively informal role structure and status leveling, rather than differentiation, tends to be normative (Nelson, 1962). But in many organizational contexts, work groups are assembled on the basis of a more formal role structure inherently requiring heterogeneity in such variables as age, rank, and experience. Similarly, status differentiation is likely to be a norm in such groups. Compatibility within these types of work groups might be expected to be a function of something other than rank and age homogeneity unless the group were to fractionate into more homogeneous subgroups. Adams (1953), in working with air crews of this nature, found status congruency to be critical for compatibility. The most compatible crews were those for which the persons of highest rank were also oldest, most experienced, and perceived as most important in the crew.

In summary, understanding the basis of work group compatibility will probably be facilitated by greater knowledge about the various environmental qualities of the situation in which the group will operate. As pointed out by Sayles (1958) in his study of industrial work groups, consideration should be given to variations in group size, nature of the work area, hours of

work, goals of the group, and general style of interaction among group members. How these men are perceived by outsiders as well as by themselves, in terms of prestige and status, may also be of consequence for their internal compatibility. The extent to which roles are prescribed may also determine initial composition requirements pertaining to variations in rank and experience. This could then be expected to affect the basis of compatibility. In the final analysis, the approach to group compatibility, as one form of group effectiveness, should be pursued in the manner suggested by Dunnette (1963) for predicting individual effectiveness. Predictive validity can best be increased by controlling for variations in environmental conditions under which performance occurs and for variations in culturally different subgroups of individuals.

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