DOCUMENT RESUME

ED 287 997   CE 048 768

AUTHOR   Driskell, James E.; And Others
TITLE   A Taxonomy for Composing Effective Naval Teams. Final
                  Report.
INSTITUTION   Naval Training Systems Center, Orlando, FL.
REPORT NO   NAVTRASYSCEN-TR87-002
PUB DATE   Mar 87
NOTE   51p.
PUB TYPE   Reports - Research/Technical (143)

EDRS PRICE   MF01/PC03 Plus Postage.
DESCRIPTORS   Adult Education; Cooperation; Educational Research;
                  *Group Dynamics; *Interpersonal Competence; *Job
                  Performance; *Military Training; Models; *Personality
                  Traits; Team Training; *Teamwork
IDENTIFIERS   Navy

ABSTRACT
          Since teams perform a majority of mission-critical
Navy tasks, a significant applied research problem is how to compose
maximally effective task teams. Two problems have traditionally
hindered the attainment of this goal: how to compose teams on bases
other than ability or technical skill and how to classify team tasks,
so that predictions can be made regarding performance in specific
task environments. Recent research regarding the structure of
personality suggests the possibility of composing groups in a more
systematic way. Factor analytic studies of the trait vocabulary
suggest some consensus that personality can be classified in terms of
six broad dimensions: intellectance, adjustment, prudence, ambition,
sociability, and likability. A means of classifying team tasks is
also necessary to evaluate the relationship between personality and
team performance. This is critical because the relationship of
personality and team effectiveness depends substantially on the
properties of the team task being performed. A task typology has been
developed that is compatible with this model of personality. Putting
this system for classifying task environments together with the new
perspective on personality structure allows specific predictions to
be made regarding team composition and team performance. Those
predicted relations provide clear guidelines for selecting and
training Navy team members. (YLB)

ED287997

A TAXONOMY FOR COMPOSING EFFECTIVE NAVAL TEAMS

JAMES E. DRISKELL
EDUARDO SALAS

HUMAN FACTORS DIVISION
NAVAL TRAINING SYSTEMS CENTER

AND

ROBERT HOGAN
UNIVERSITY OF TULSA

MARCH 1987
FINAL REPORT

PREPARED FOR

0687j

CE 048768

BEST COPY AVAILABLE

Executive Summary

A majority of mission-critical Navy tasks are performed by teams, e.g., ASW teams, SEALS, damage control teams, and weapons fire crews. A significant applied research problem is how to compose maximally effective task teams—teams that are productive, cohesive, and resistant to performance degradation under stress. Two problems have traditionally hindered the attainment of this goal. The first concerns how to compose teams on bases other than ability or technical skill (it is assumed that individual training insures minimum proficiency in the skills relevant to team tasks). The second concerns how to classify team tasks, so that predictions can be made regarding performance in specific task environments. This is important because the factors that determine effective performance for ASW teams may not be the same for Navy anti-terrorist teams.

Personality variables have often been used to compose teams, but usually in an ad hoc manner. Recent research regarding the structure of personality suggests it is now possible to compose groups in a more systematic way. Specifically, drawing on factor analytic studies of the trait vocabulary conducted over the past 25 years, there is some consensus that personality can be classified in terms of six broad dimensions: Intellectance, Adjustment, Prudence, Ambition, Sociability, and Likability. Still necessary to evaluate the relationship between personality and team performance is a means for classifying team tasks. This is critical because the relationship of personality and team effectiveness depends substantially on the properties of the team task being performed. Therefore a task typology is developed that is compatible with this model of personality.

Putting this system for classifying task environments together with the new

perspective on personality structure allows specific predictions to be made

regarding team composition and team performance. Those predicted relations,

in turn, provide clear guidelines for selecting and training Navy team members.

TABLE OF CONTENTS

LIST OF FIGURES

A TAXONOMY FOR COMPOSING EFFECTIVE NAVAL TEAMS

INTRODUCTION

Few occupations require the match between the right person to the right job as does the military, where effective performance can in fact be a matter of life or death. The military promotes effective task performance primarily through personnel selection and training. Selection is based largely on tests of ability and aptitude. Little is known, however, regarding the nontechnical factors that determine team performance above and beyond individual technical competency. These nontechnical aspects of task performance are as critical as the more traditional technical skill factors—witness the high ability student who does not perform. Moreover, training tends to focus on individual skill acquisition and to ignore individual differences, as well as team-level variables. Consequently, very little is known about the determinants of, or how to train or manage, effective teams.

Two problems are identified that must be solved before one can compose maximally effective teams (i.e., teams that are less vulnerable to performance degradation under stress, more productive). First, a reliable means for classifying the personalities of team members must be developed. Assuming that all team members must meet minimum standards of individual proficiency, the most promising team composition variables are nontechnical attitudinal and dispositional factors. The first task, therefore, is to classify team members according to these key dimensions of nontechnical team performance. The second task is to develop a means for classifying team tasks. Leadership research since the 1950's illustrates the futility of trying to specify

performance across all task domains. The demands on an effective Explosive Ordnance Disposal (EOD) team are not necessarily the same as those on a Combat Information Center (CIC) or weapons fire team. To classify team tasks requires a taxonomy that allows predictions to be made about these specific task environments.

The proposed taxonomy will contribute to the technology base regarding the determinants of team performance, but more importantly, it will allow the prediction of optimum group composition for specific Navy teams. This research program has the advantage of being systematic; crossing a systematic taxonomy of team tasks with a systematic taxonomy of behavioral dispositions. The result will be a specific methodology for predicting effective team performance on the basis of which one can select and train team members. This proposed taxonomy is useful both for its scientific innovation and for its application to specific Navy needs. Preliminary research (Biersner and Hogan, 1984) has successfully predicted performance in Navy groups working in the Antarctic and in Explosive Ordnance Disposal (EOD) training (Hogan, Hogan, and Briggs, 1984).

Objective. The objective of this research is to develop a methodology for composing effective Naval teams. This requires the following: a) the explication of personality trait dimensions that are relevant to task performance; and b) the development of a taxonomy of task environments. By linking a system for classifying team task environments with new data on personality structure, specific predictions are made regarding the relationship between personality and team effectiveness.

8

REVIEW OF THE LITERATURE

Teams accomplish the majority of the Navy's mission-critical tasks. Teams offer a number of distinct advantages over individuals in task performance, including the ability to pool resources and expertise and the ability to replace or compensate for missing members. However, team performance, which involves coordinating, transmitting, and evaluating multiple task inputs, also seems to be particularly vulnerable to degradation under the sometimes stressful conditions of the military environment. Furthermore, performance decrements based on individual task behavior are amplified at the level of team performance. The problem, then, is to ensure effective team performance. Enhancing team performance is inherently more complex than enhancing individual performance, but both issues are critical to Navy operations.

Team Performance. Effective groups are composed of effective people. The extent to which group composition determines group performance will be qualified by such factors as intergroup relations, group structure, task demands, and group process effects. A team composed of underachieving incompetents will be hard pressed to excel on most tasks, whereas a well-adjusted, skilled, and motivated work team is more likely to succeed in the face of major obstacles.

Social psychologists have studied small group behavior since the turn of the century—cf. Durkheim (1893), Ross (1908), Triplett (1898). Much of this research has focused on group-level variables such as communication patterns. One useful method for studying team performance examined the impact of

9

individual variables such as status, skills, and personality on team performance. If one can assume that certain "types" of people will perform more effectively on certain team tasks than others, then it should be possible to compose task groups with members who differ along well-defined parameters of individual differences and examine the effects of this difference on such team outcomes as cohesiveness, performance decrement under stress, and task effectiveness. Such research is interesting not only in its own right, but also because it has applications in industry, the military, and other settings where teams carry out real world tasks.

The notion that member personality can influence team performance appeals to an increasing number of researchers. For example, Hackman and Morris (1975) note that personality may have both positive (enhancing and facilitative) and negative (detrimental and degrading) effects on group performance, although they don't specify the mechanisms involved in producing such effects. Denson (1981) believes that "personality variables" such as dogmatism, tolerance of ambiguity, and locus of control influence team performance. Finally, Ridgeway (1983), in a recent discussion of task groups and productivity, suggest that effectiveness "...emerges from the interaction of skills and personalities of the members, the nature of the task, the groups' structure and norms, and the influence of the outside environment" (p. 281). There is, in addition, some evidence to support these theoretical claims. For example, Driskell (1982) found that team members use personality characteristics to define the status hierarchy in task groups in the same way that they use race, sex, and other individual characteristics. Aronoff,

10

Messe, and Wilson (1983) show that persons who need to test their own competency prefer more egalitarian group structures. Further, they find that the degree of congruency between group structure and group member personality affects the productivity of the group.

These findings notwithstanding, the dominant theme in the empirical literature is complexity if not actual confusion, much activity but little factual convergence. Mann (1959) noted that the influence of personality on team performance was one of the most heavily researched topics in group psychology. Sorenson (1973) makes a similar observation, noting that this work has produced an extensive but not highly cumulative research tradition. Whyte (1941) remarked in his study of gang behavior that "I doubt whether an analysis in terms of personality traits will add anything to such an explanation of behavior" (p. 661). Forty-five years later, Kahan, Webb, Shavelson, and Stolzenberg (1985) concluded their review of this topic with the remark that "It does not appear promising at the present time to use personality measures in determining group composition "(p.28). There seems to be a discrepancy between what is intuitively believed to be the case and what is empirically supported.

There is an important difference between inquiring about the determinants of group behavior in general and the determinants of group effectiveness in particular. The latter problem seems to come up in 10 year cycles. For example, Hoffman (1965) called for research testing ways to promote group effectiveness. Hackman and Morris (1975) lamented the fact that, despite decades of group research, we still know little about why some groups are more effective than others. For a variety of practical and theoretical reasons,

the need to understand how to compose effective task groups is more important today than ever.

Despite the ambiguous evidence, we too believe that personality affects team performance, but these effects may only be observed under certain well-defined conditions. The purpose of this paper is to specify in more detail what these conditions may be, the conceptual reasons for their occurrence, and the applications of this formulation for the composition of Navy teams. The first issue to be addressed is why there has been so little progress in this area of research.

Sources of Confusion in Previous Research. At least three factors have contributed to the ambiguity of evidence surrounding the role of personality in promoting team effectiveness. The first concerns the traditional emphasis of personality psychology on psychopathology. Most theories of personality come from psychiatry and clinical psychology, and a good deal of early applied personality research focused on detecting psychopathology. Because of this emphasis, many people equate personality with a set of neurotic structures assumed to underlie behavior; and this in turn, orients personality-based group research in less than optimal ways. For example, Collins (1985) describes a multi-model approach (including psychological tests, behavioral observation, and physiological measures) for selecting astronaut candidates. Collins notes, however, that by excluding people on the basis of psychopathology, little has been learned about how to identify people with the potential for exceptional performance. Thus, he states, there is no present research designed to define the desirable characteristics of an optimum space crew. On the one hand, this psychopathology-based screening approach has been

12

successful--there have been no cases of acute breakdown in the U.S. space
program. However, the problems related to actual task performance that have
occurred, some quite serious, remain unexplained. After almost a century of
research, considerably more is known about the characteristics of undesirable
individuals than about the talent, competence, and effectiveness. As Hogan,
et al. (1985) note, the absence of psychopathology does not guarantee the
presence of competence. Traditional personality research has emphasized the
assessment of maladaptive behavior and tended to ignore the characteristics of
effective task performers in normal populations.

A second reason for the slow accumulation of findings regarding the effects
of personality on team performance may be that, until recently, there was
little consensus among personality psychologists regarding how personality
should be defined and, therefore, how it should be measured. In a review of
research conducted prior to 1957, Mann (1959) noted that over 500 different
measures of personality were used in studies of group performance. Mann
referred to this research, which included variables as different as oral
sadism and adventurous cyclothymia, as "test rich and integration poor"
(p. 242). Stogdill (1948, 1974) noted in examining leader characteristics,
that the bulk of research regarding personality and group performance has
produced little more than a maze of inconsistent findings. These findings
suggest two possibilities (cf. Shaw, 1981): either the number of trait
dimensions is very large and attempts to organize these dimensions may be
futile, or different researchers may be applying different names to the same
trait dimensions. It is believed here that the latter is the case.

A third reason for the lack of consistent findings regarding personality and group performance lies in the fact that early research largely ignored the role of the task in determining group performance. As Morris (1966) points out, the group task always mediates tne effects of personality on group performance. Roby (1963) notes that any major advance in small group research will depend on specifying task properties, and Hackman and Morris (1975) suggest that it is almost useless to speak of predicting group performance without specifying the type of task. Leadership research prior to the 1950's provides a good example of this general point. Researchers were consumed with the search for certain traits which would characterize leaders regardless of the group's task (see Chemers, 1983). However, the strategy of searching for leadership traits across all task domains was not productive; Homans (1974) describes the results as meager and ambiguous. In a classic review, Stogdill (1948) noted that to understand the emergence of leadership, one must consider the relationship between personality and the task situation. The type of individual who will perform best in a leadership role depends on the task confronting his or her group. Consequently, the type of team task must be considered in order to investigate the effects of personality on group performance in a systematic manner. Yet, as Hackman and Morris (1975) observe, no fully satisfactory method for classifying group tasks has yet been developed.

In sum, three factors have impeded progress in examining personality and group effectiveness. The first is an emphasis on the psychopathological aspects of personality, an emphasis that has few implications for understanding task group effectiveness. The second is a lack of consensus regarding how personality should be operationally defined; as Cartwright and

14

Zander (1953) succinctly put it, "personality traits are still poorly conceived and unreliably measured" (p. 537). The third is the failure to specify adequately personality effects in the context of specific task environments.

In the following sections, a model for conceptualizing team effectiveness is discussed. Next, a method for classifying personality and selectively review research relating to the proposed categories is presented. Finally, a method for classifying team tasks and an attempt to specify the relation between personality and group performance in terms of a set of derived hypotheses is suggested.

The Determinants of Team Effectiveness. As an orienting strategy for examining the determinants of team effectiveness, a meta-theoretical model adopted by Gladstein (1984), Hackman and Morris (1975), McGrath (1964), Ridgeway (1983), Shiflett (1979), Steiner (1972), and others is presented in Figure 1. This model illustrates the relation between input factors, group interaction process, and group performance outcomes.

Steiner (1972) notes that a task group begins with a set of input factors that reflect the group's "potential" for productivity. Because these factors determine a group's potential productivity, they are significant points of intervention at which to begin examining group performance. Three levels of input factors are identified:

1. Individual-level factors—these include member skills, knowledge, personalities, and status characteristics.

2. Group-level factors—these include group size, group structure, group norms, and cohesiveness.

3. Environmental-level factors—these include the nature of the task, the level of environmental stress, and reward structure.

POTENTIAL
(Input Factors)

PROCESS

OUTCOME

INDIVIDUAL-LEVEL
FACTORS

Group Member
Skills, Status,
Personality

GROUP-LEVEL
FACTORS

Group Structure
Group Norms
Group Size

ENVIRONMENT-LEVEL
FACTORS

Task Characteristics
Reward Structure
Level of Environmental
Stress

GROUP
INTERACTION
PROCESS

PROCESS
GAIN

PROCESS
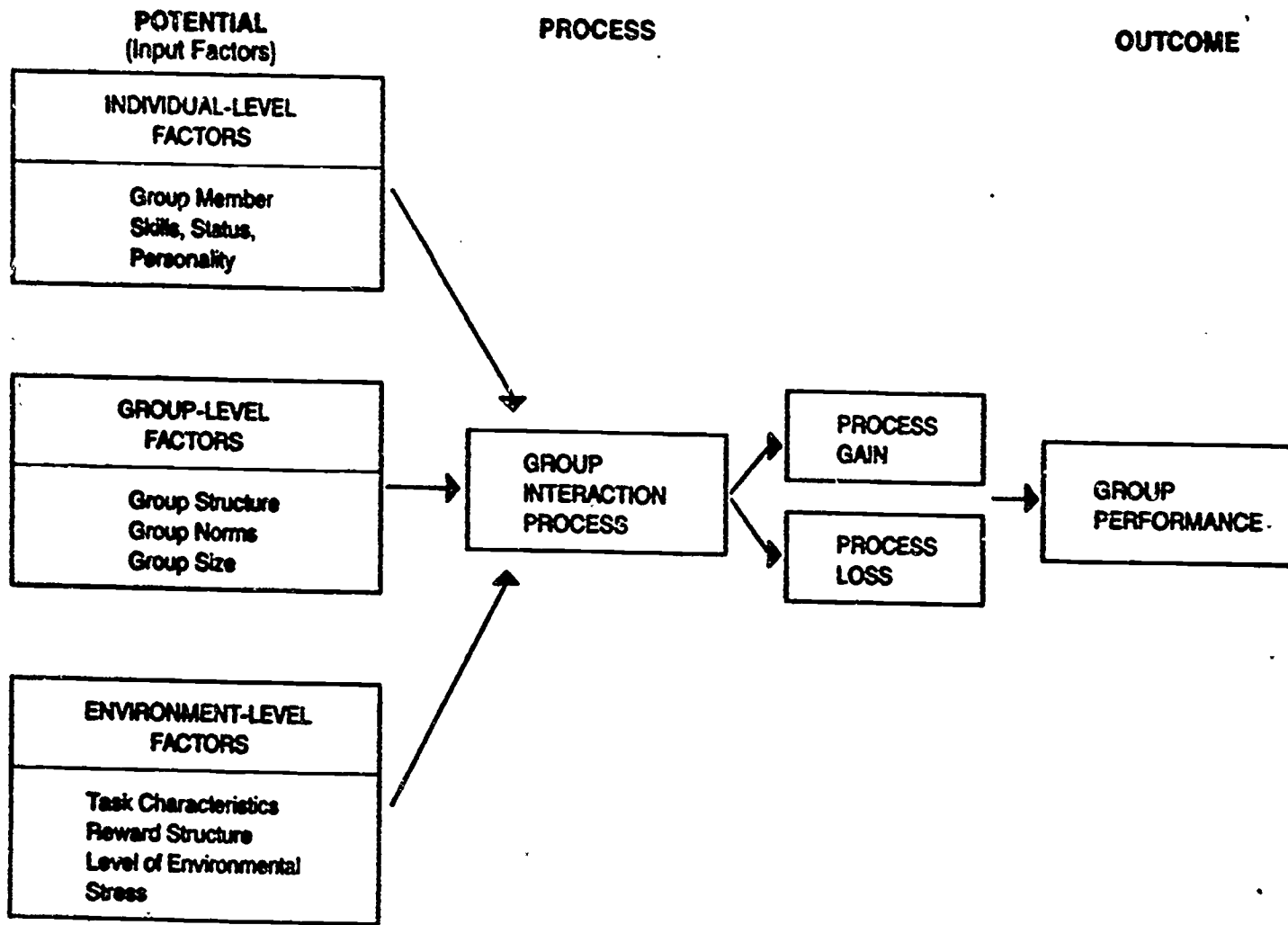LOSS

GROUP
PERFORMANCE

Figure 1.   Group Performance Model

16

A group's potential productivity, however, does not always translate into performance. Steiner regards the difference between potential and actual performance as a function of group process--i.e., factors that members do not bring to the group, but which emerge out of group interaction. Process factors include coalition formation, communication structures, and task performance strategies. The interaction of group input factors and group process may lead to process gain or process loss. Steiner focuses exclusively on process loss--losses due to faulty group processes that inhibit a group from reaching its potential. The reduced group performance caused by social loafing (Latane, Williams, and Harkins, 1979) is an example of process loss. The degree of congruence between individual personality and group structure also moderates productivity and is another example of process loss (Aronoff, Messe, and Wilson, 1983). Conversely, some input conditions can promote process gain, which Collins and Guetzkow (1964) call "assembly bonus effects." Thus, group interaction may produce performance beyond that expected on the basis of group input factors; as when a group capitalizes on the opportunity to pool resources and correct errors, and outperforms even its most competent member (Hill, 1982).

This model suggests a number of issues that may be examined in studying group performance--the effect of input factors, the interaction of input factors with group process, and the interaction of group process variables. Two specific questions emerge in the context of considering how personality affects group performance. The first concerns how to compose groups on the basis of personality so as to maximize their potential effectiveness. Here personality is viewed as an input variable--the question is how to compose groups in order to maximize the resources available to it. The second

question concerns the role of personality vis a' vis process loss: how can a group minimize process losses that occur with team interaction? Here research is concerned with the effects of personality mix or complementarity that arises out of group interaction. Haythorn (1968), Hoffman and Maier (1961), and Schutz (1958) have studied this problem.

Personality affects group performance both as an input variable and in interaction with process considerations. It is important to distinguish the effects of one from the other. One can make predictions about a team composed of ambitious (i.e., energetic and hard working) people based on what one believes to be true about such people, or one can make predictions based on what one believes to be true about the effects of trait similarity on team performance, where the trait in this case is ambition, Haythorn's (1968) review deals with the second issue; in this report the concern is with the first.

One may evaluate personality traits as input factors through their effect on three mediating variables. According to Hackman and Morris (1975), these variables link input factors with output measures and explain a major portion of the variance in group performance. The variables are as follows:

1. The effort group members exert on a task.

2. The knowledge and skills group members have to apply to a task.

3. The task performance strategies used to accomplish a task.

Each of these variables is in fact quite complex. For example, the effort a team applies to a task is a function of individual characteristics, group norms, and task and reward structure, as well as group process variables such as communication structure. Moreover, one can expect personality to impact these three summary variables differentially.

18

The _effort_ each individual expends on a task and the differential coordination and application of that effort should be strongly influenced by personality, in relation to the type of task. For example, the trait of Intellectance may predict performance on a problem-solving task that requires generating ideas, but it may not predict performance on a social task requiring interpersonal skills; in the latter case, a "high intellectance" member may be less able to coordinate his or her efforts on a social task and may be unwilling to extend the needed effort.

The mediating variable of _knowledge and skills_ is most strongly predicted by the talent of individual members. Nontheless, intellectually motivated, well-adjusted, achievement-oriented group members will, in general, bring relatively higher levels of skill to bear on any particular task. Finally, the category of task performance _strategies_ should also be strongly affected by personality. For example, a "high intellectance" person may be familiar with the strategies appropriate to a problem-solving task because he or she has experience with similar tasks, whereas a "low intellectance" group member may never have developed appropriate schemas for problem-solving tasks.

The group performance model in Figure 1 allows us to examine more closely how personality as an input factor affects group performance and influences the three mediating summary variables of effort, knowledge and skills, and task performance strategies. It is also clear that this influence depends on the personality trait involved and the type of task under consideration.

TAXONOMY

Personality and Team Performance. There are almost as many definitions of personality as there are personality psychologists--not a pretty picture for those who value conceptual clarity. One way to cut through this definitional morass is to adopt a lesson from analytic philosophy (Wittgenstein, 1953) and

ask how the term is used in ordinary language. MacKinnon (1944) points out
that there are two primary uses of the word in English, and they correspond to
the German terms persönlicheit and personalityät.

Personality in the first sense (P1) refers to a person's social reputation,
to his or her unique social stimulus value; it is a purely external view of
personality. Personality in this sense is conferred or socially bestowed and
is only imperfectly related to individual intrapsychic processes--"personal
traits are functions of social situations" (Dewey, 1922, p. 16). Personality
in the second sense (P2) refers to the structures (hopes, fears, aspirations,
motives, complexes--intrapsychic process) within a person that explain why
that person creates his or her unique social reputation (see Hogan, 1985).
Both definitions are meaningful, but they serve different scientific
purposes. It is a matter of considerable importance that the distinction
between P1 and P2 be maintained and that writers be clear about which
definition they are employing.

In this report the word is used in the P1 sense (personality as social
reputation) because the properties of P1 are well suited to present purposes.
P1 is objective; one can estimate the amount of agreement among observers
regarding the nature of a person's reputation by means of Q sorts (Block,
1961), adjective checklists and rating forms. Moreover, P1 is encoded in
terms of trait words, which provide a vocabulary of great subtlety and
richness to express a person's reputation. P1, as reflected in trait words,
can be used to anticipate a person's behavior. Reputations are crudely
predictive; knowing a person's reputation considerably reduces our uncertainty
about his or her future behavior. Finally P1 has a well-defined and
agreed-upon structure.

20

Factor analytic research has converged on the view that the universe of trait terms can be expressed in terms of three to six broad dimensions (the six can be recombined into the three and vice versa): Intellectance, Adjustment, Prudence, Ambition, Sociability, and Likeability. These six dimensions are described in Figure 2, and cognates are presented to illustrate related trait categorizations.

Any single individual or composite of individuals can be described in terms of these dimensions (cf. Goldberg, 1981; Peabody, 1984; McCrae & Costa, in press). The foregoing line of factor-analytic research provides us with a common vocabulary for describing and measuring personality. More importantly, it is possible to forecast important aspects of everyday behavior with them, including job performance (Hogan, 1986). For these reasons, we use the word personality to refer to a person's social reputation as described by peers and colleagues and encoded in the six dimensions listed in Figure 2. A review of the relevance of these dimensions to group performance follows:

A. Intellectance. Persons at the low end of this dimension are described by those who know them as narrow-minded, unimaginative, and conservative; persons at the high end are described as intellectually motivated, curious, and imaginative. There is little research relating intellectance as a personality trait to group performance. There are studies, however, that examine the relation between the measured intelligence of group members and group performance, and the intellectance trait correlates moderately (.30 to .50) with measured intelligence.

Mann (1959) surveyed 196 studies investigating the effect of intelligence on leadership; 88% of these showed a positive relationship, with correlations ranging between .10 and .25. A number of studies find that intelligence is associated with leadership in groups (Stogdill, 1948; Bass and Wurster,

TRAIT	INTELLECTANCE	ADJUSTMENT	AMBITION	PRUDENCE	SOCIABILITY	LIKEABILITY
DESCRIPTORS	Bright, creative vs. dull, un-imaginative.	Stable, self-confident vs. anxious, moody.	Achievement-oriented, energetic vs. apathetic, unassertive.	Conscientious, conforming vs. impulsive, risk-taking.	Outgoing, af-filiative vs. shy, intro-verted.	Warm, friendly vs. cold, critical.
COGNATES						
Mann, 1954	Intelligence	Adjustment	Dominance	Conservatism	Extraversion	Interpersonal sensitivity
Tupes & Christal, 1961	Culture	Adjustment	[Extraversion Ascendency]	Impulsivity	[Extraversion Ascendency]	Agreeableness
Gough, 1975	Intellectual Efficiency	Sense of well-being	Dominance	Socialization/self-control	Sociability	Empathy
Costa & McCrae, 1985; Norman, 1963	[Openness to experience]	Neuroticism		[Openness to experience]	Extraversion	

Figure 2. Trait Dimensions

22

1953). Others report a significant relation between leader intelligence and team effectiveness (Greer, Galanter, & Nordlie, 1954; Havron & McGrath, 1961). On the basis of this earlier research, we conclude that group leaders may be more intelligent than nonleaders although the differences are usually small (cf. Simonton, 1985).

Several researchers report a positive relationship between group member aptitude and group performance. Kabanoff and O'Brien (1979) found that high ability groups were more productive than low ability groups on a creative task. Bouchard (1969) reports that intelligence predicted group performance on a creative task. Terborg, Castore, and DeNinno (1976) found that groups composed on the basis of high SAT scores and grade point averages outperformed low ability groups. In a study of intact military groups, Tziner and Eden (1985) found that individual aptitude had a significant effect on performance effectiveness. On the other hand, O'Brien and Owens (1969) report that team member's scores on the Army General Classification test were not related to performance on interactive tasks, although they were associated with performance on co-active tasks.

Despite the overall positive effect of intelligence on group performance, several researchers have noted that the effect depends on the group's task. Intelligence may be less important for group performance on a routine mechanical or social task than for a problem-solving task (See Gibb, 1969; Cattell & Stice, 1954).

B. Adjustment. Persons at the low end of this dimension are described by persons who know them as anxious, moody, and self-doubting; persons at the high end are described as confident, stable, and productive. Mann (1959) and Heslin (1964) both conclude that adjustment is one of the best predictors of

group performance. Mann reported that 80% of the results he reviewed showed a positive relationship between adjustment and leadership status. Haythorn (1953), using the 16PF, found that emotional stability was positively related to group effectiveness, as rated by outside observers (r=.48). Haythorn also found a significant relationship between adjustment and orientation towards job completion (r=.43). Greer (1955) observed that nervousness and paranoid tendencies in Army team members were negatively related to group effectiveness. In a study of group creativity, Bouchard (1969) found that the first five scales of the California Psychological Inventory (which he called Interpersonal Efficiency but which reflect Adjustment) were significantly related to performance on creative (brainstorming) and problem-solving tasks.

Adjustment is also consistently correlated with leadership ratings. Cattell and Stice (1954) found that the absence of anxiety and nervous tendencies distinguished leaders from nonleaders. Richardson and Hanawalt (1952) reported that leaders were more self-confident and better adjusted than nonleaders, and Holtzman (1952) found that adjustment and leadership ratings correlated .67 to .86 in small groups.

C. Prudence. Persons at the low end of prudence dimension are described by those who know them as impulsive, nonconforming, and careless; at the high end, they are described as planful, conforming, and reliable. Hendrick (1979), examining conformity and group problem-solving, found that group members with a concrete (conforming) cognitive style took twice as long to complete a group puzzle-solving task as more abstract (nonconforming) groups. Bass (1954), and Hollander (1954) reported significant negative correlations between authoritarianism and leadership performance. Mann (1959) also notes a negative association between conservatism and leadership, based on studies

24

showing that authoritarian persons are rated lower on leadership than

nonauthoritarians. Altman and Haythorn (1967) found among Navy teams that low

dogmatism groups outperformed high dogmatism groups on abstract as well as

actual Navy combat team tasks. In contrast with the foregoing, Haythorn

(1953) found that conservatism (bohemiamism vs. practical concernedness) was

positively related to group productivity, and Stogdill (1948) reports a

positive relationship between responsibility and leadership.

D. Ambition. Persons at the low end of the ambition dimension are described

by those who know them as lazy, apathetic, and unassertive; at the high end,

persons are described as energetic, and achievement-oriented. Results suggest

a generally positive relationship between group member ambition and group

performance. French (1958) found that groups composed of high

achievement-oriented members were more efficient than those composed of low

achievement-oriented members under task-oriented conditions. Schneider and

Delaney (1972) reported that groups with high achievement-oriented members

solved complex arithmetic problems fast ¬ than did low achievement-oriented

groups. Zander and Forward (1968) reported that high achievement-oriented

group members were more concerned about group task success than were low

achievement-oriented members.

Consistent with this, Altman and Haythorn (1967) found that dominance was

related to task group performance. Watson (1971) reported that dominance

predicted the amount of group participation as well as task orientation.

Similarly, Bouchard (1969) found that dominance predicted group performance on

a brainstorming task. Aries, Gold, and Weigel (1983) noted that dominance

predicted 40% of the variance in dominance-oriented behavior (i.e., acts

initiated, time talking) in same-sex task groups. Finally, Shaw and Harkey

(1976) report a positive association between leadership orientation and performance. In our view, all of these studies concern the construct of ambition, even though the nomenclature (dominance, leadership, achievement-orientation) changes across investigators.

Not surprisingly, several studies report a significant relationship between dominance and the tendency to assume a leadership role in groups (Megargee, 1969; Smith & Cook, 1973; Haythorn, 1953). Haythorn (1953) also found that groups with high dominance leaders performed better; similar results are reported by Ghiselli and Lodall (1958) and Smelser (1961). Although some researchers report a relation between achievement motivation and leadership (Bass, 1960; Weiner & Rubin, 1969), the support for this finding is more equivocal. For example, Vertreace and Simmons (1971) found no relationship between attempted leadership and achievement motivation. Again, Hollander and Julian (1969) conclude that one reason for these inconsistent findings is a failure to consider the interaction between personality and characteristics of the task situation.

E. Sociability. Persons at the low end of this construct dimension are described as quiet, unassuming, and shy; persons at the high end are described as uninhibited, outgoing, and affiliative. Bouchard (1969) found that sociability was consistently related to performance on group creative and problem-solving tasks. Greer (1955) also reported a positive relation between social activeness and group effectiveness. Similarly, Gurnee (1937) found that groups composed of nonsocial members made more errors on a maze task.

26

A number of studies have found that extraversion is related to group performance. Morris and Hackman (1969) found a significant relationship between participation and leadership. Riecken (1958) found that the more talkative group member was more effective at generating task-oriented solutions. Sorrentino (1973) reported a significant correlation between quantity of verbal interaction and other group member's ratings of task-leadership ability. Gray, Richardson, and Mayhew (1968) found a significant relationship between performance output and influence on the group task.

Other indices of extraversion are shown to lead to positive evaluations in a group (for a review, see Berger, Webster, Ridgeway, and Rosenholtz, 1984); these include: rate of speech (Apple, Streeter, & Krauss, 1979; Smith, Brown, Strong, & Rencher, 1975; Ryan & Giles, 1982), fluency (Miller & Hewgill, 1963) Sereno & Hawkins, 1967), latency or lack of hesitation (Willard & Strodtbeck, 1972; Lamb, 1981), gaze or eye contact (Kleinke, Bustos, Meeker, & Straneski, 1973; Mazur et al., 1980; Ridgeway, Berger, Smith, 1985), and nonverbal behavior such as choosing the head of the table (Nemeth & Wachtler, 1974; Hare & Bales, 1963).

F. Likability. Persons at the low end of this construct dimension are described by others as cold, critical, and tactless; persons at the high end are described as warm, tolerant, and friendly. Research shows that positive relations in a group may be socioemotionally pleasing; for example, Stogdill (1974) found that person-oriented leadership tended to enhance group satisfaction. However, the degree to which likability enhances group performance is less obvious. For example, McGrath (1962) composed three-man rifle teams according to interpersonal orientation and found no differences in

27

performance. Tjosvold (1984) found no direct affect of leader's warmth/coldness on team task performance, although there were significant effects on group member satisfaction, attraction, and leader's _perceived_ effectiveness. In examining B29 aircrews in Korea, Berkowitz (1956) observed no direct relationship between liking and crew effectiveness. Similarly, Tziner and Vardi (1982) found no effect of liking (sociometric choices) on the performance of military tank crews. Haythorn (1953) reported no significant relation between group member sociometric rating and group productivity. Terborg et al. (1976) used a three-person land surveying task, and found that liking (attitude similarity) has no effect on group performance.

Some studies suggest that liking may even degrade team performance. Adams (1953) used a sociometric rating of status congruency (which is significantly related to crew intimacy and harmony) and found, in bomber crews, that this measure was inversely related to technical performance. Weick and Penner (1969) also found team performance to be inversely related to liking. Stimson and Bass (1964) found that relationship-oriented subjects were less successful than more task-oriented group members on an intellectual team task. Thus, high socioemotional cohesiveness, or even group member expression of affect, may be unrelated to team performance when a socioemotional element is not part of the team task. Guzzo and Waters (1982) found, consistent with this view, that groups produced the highest quality task decisions when they postponed the expression of affect during task performance. This finding suggests that sr .ioemotional activity distracts, or diverts attention from task activity (assuming the task lacks a social component). Thus, likability may only predict group performance when the task structure makes interaction and socioemotional interchange a requirement of task completion.

The foregoing review suggests that the core personality dimensions are relevant to group performance; it also shows that attempting to specify the effect that they may have on group task performance is risky. For example, intellectance may be less associated with group performance on a mechanical or social task than on a problem-solving task (see Gibb, 1969; Cattell & Stice, 1954). Williges, Johnston, and Briggs (1966) noted that when a task requires no verbal or interpersonal interaction, sociability may have little impact on performance. In analyzing the determinants of group effectiveness, Hackman (1983) noted that "relationships obtained appear to depend substantially on the properties of the group task being performed" (p. 7). The foregoing review should be qualified in each case by the nature of the group task, because the relationship between personality and group performance depends on the type of task involved. Consequently, to evaluate this relationship further a classification of group tasks is needed.

Task Classification. There have been a number of attempts to classify group tasks. It is useful to distinguish between task typologies and task dimensions. Task typologies sort tasks into exclusive categories; e.g., simple vs. complex (Shaw, 1964); disjunctive, conjunctive, or additive (Steiner, 1972); and production, discussion, or problem-solving tasks (Hackman, 1968). These categories are rarely interchangeable because they differ in terms of the dimensions used to distinguish tasks. For example, Hackman's typology is based on the performance processes involved in a task, Steiner's is based on how members contribute to the group task, and Shaw's is based on task difficulty. Moreover, there is some disagreement about the optimum number of categories that can be used meaningfully to describe group tasks; estimates range from 5 (Shaw, 1973) to 14 (Hemphill & Westie, 1950).

The personality trait classification presented in Figure 2 refers to features of actors' behaviors that are used to describe them; a task typology compatible with this model should be developed along the same dimension. Sorting group tasks according to the behaviors or activities required of members to complete them is proposed here: in McGrath's (1984) terms, according to the task as a set of behavior requirements. The resulting six task categories are presented in Figure 3, and defined in the following.

a. Mechanical/Technical. These tasks involve the construction, operation, maintenance, or repair of things—machinery, buildings, or equipment. The tasks are practical, and require technical as opposed to social skills. Typical groups involved in Mechanical/Technical tasks include weapons fireteams, damage control teams, P3 Tacco-pilot-loader tasks, SEALS and SEABEES.

b. Intellectual/Analytic. These tasks involve the generation, exploration, and verification of new knowledge—scientific, medical, artistic, or philosophical. The tasks tend to be abstract or theoretical and require analytical and intellectual as opposed to social skills. Typical intellectual tasks include staff interactions, wargaming, and accident investigation teams.

c. Imaginative/Aesthetic. These tasks involve the invention, arrangement, and production of various products in accordance with certain rules of form. The tasks may be either practical or theoretical and require imaginative and aesthetic as opposed to social skills. Typical groups include military bands, photographers, drill teams, and precision flying teams.

30

TASK	MECHANICAL/ TECHNICAL	INTELLECTUAL/ ANALYTIC	IMAGINATIVE/ AESTHETIC	SOCIAL	MANIPULATIVE/ PERSUASIVE	LOGICAL/ PRECISION
DESCRIPTORS	Construction, operation, maintenance of things.	Generation, exploration, or verification of knowledge.	Invention, arrangement, or production of expressive products.	Training, assisting, or serving others.	Organization, motivation, or persuasion of others.	Performance of explicit, routine tasks or tasks requiring attention to detail.
COGNATES						
Carter, Haythorn, & Howell, 1950	Motor coopera- tion/mechanical assembly	Reasoning/ intellectual construction	---	---	Discussion	Clerical
Guilford, Christensen, Bond, & Sutton, 1954	Mechanical	Scientific	Aesthetic	Social	Business	Clerical
Holland, 1959	Motoric	Intellectual	Esthetic	Supportive	Persuasive	Conforming
Holland, 1966	Realistic	Intellectual	Artistic	Social	Enterprising	Conventional
McCormick, Finn, & Scheirs, 1957	Manual	Mental	Artistic	Personal Contact	---	Precision
Hackman, 1968	---	Problem- solving	Production	---	Discussion	---
McGrath, 1984	Performances/ contests (execution)	Planning/ decision- making	Creativity	---	Cognitive conflict/mixed motive (negotiation)	Intellective

Figure 3. Task Classification

31

d. <u>Social</u>. These tasks involve training, assisting, and serving other people. The tasks tend to be applied and to require supportive social skills. Typical groups involved in Social tasks include recruiting teams, training teams, aviation medical safety teams, psychological service, MEDEVAC teams, and drill instructors.

e. <u>Manipulative/Persuasive</u>. These tasks involve organizing, motivating, and persuading other people. The tasks tend to be general, open-ended, and practical, and they require persuasive and manipulative social skills. Typical groups may include shipboard bridge teams, hostage negotiating teams, long range and strategic planning teams.

f. <u>Logical/Precision</u>. These tasks involve vigilance, monitoring, and record keeping. The tasks tend to be technical, practical, and impersonal and require prolonged attention to detail rather than social skills. Typical groups may include C3 (Command, Control and Communication) teams, AWACs crew, and airborne countermeasures crews.

This classification system is by no means proprietary. In fact, Figure 3 demonstrates a compelling similarity among attempts to classify tasks along this dimension. One of the earliest papers (Carter, Haythorn, and Howell, 1950) attempted to evaluate the relationship between leadership ability and task type. McCormick, Finn, and Scheips (1957), analyzing job requirements, found only seven factors were needed to characterize a sample of 4,000 jobs from the Dictionary of Occupational Titles (five of which are represented in Figure 3). Holland's (1966) model has been used to describe task environments as well as vocational interests. The most developed of these typologies has been presented by Holland (1966, 1985) and McGrath (1984).

The implication is that different types of tasks require specific behaviors. Furthermore, evidence suggests that tasks can be quickly and reliably classified in this manner (Gottfredson, Holland, & Ogawa, 1982). More importantly, this procedure provides a means for linking group tasks with personality.

RESEARCH AGENDA

It is now possible to specify the relationship between personality and group performance in terms of six summary hypotheses which can be confirmed or disconfirmed by empirical test (see Figure 4).

Hypothesis 1. The intellectance trait will be positively related to successful performance in intellectual/analytic and imaginative/aesthetic task. The intellectance trait reflects two general tendencies: (a) intellectual effort, the behavior most critical for intellectual/analytic tasks, and (b) originality, a prime requirement for imaginative/aesthetic tasks. This trait will be less important for tasks requiring interpersonal skills (social and manipulative/persuasive tasks), and for tasks requiring vigilance and rule observance (mechanical/technical and logical/precision tasks). In fact, Crutchfield (1955) and others reported negative correlations between intellectual competence and comformity.

Hypothesis 2. Adjustment will predict successful performance in all task types. Poorly adjusted persons are moody and unpredicatable; they tend to disrupt group interaction no matter what type of task performance may be required. All group tasks require mutually coordinated behavior: this is what defined group as contrasted with individual tasks. Poorly adjusted persons disrupt this coordination.

TASK / TRAIT	MECHANICAL/ TECHNICAL	INTELLECTUAL/ ANALYTIC	IMAGINATIVE/ AESTHETIC	SOCIAL	MANIPULATIVE/ PERSUASIVE	LOGICAL/ PRECISION
1. INT	AV	HI	HI	AV	AV	AV
2. ADJ	HI	HI	HI	HI	HI	HI
3. PRU	HI	AV	LO	AV	AV	HI
4. AMB	HI	HI	AV	AV	HI	HI
5. SOC	LO	AV	HI	HI	AV	LO
6. LIK	AV	AV	AV	HI	HI	AV

Note. AV: Average, and not predictive
       HI: Positively related to task performance
       LO: Negatively related to task performance

Figure 4. Optimal Personality Traits for Six Task Categories

34

Hypothesis 3. _Prudence will be positively related to successful performance in mechanical/technical and logical/precision tasks and negatively related to successful performance in imaginative/aesthetic tasks._ Prudent people are conscientious, self-controlled, and conforming, and they perform well on tasks requiring routine, systematic, or rule-guided performance. On the other hand, lower prudence (particularly in conjunction with high intellectance) is associated with creativity.

Hypothesis 4. _Ambition will be positively related to performance on mechanical/technical, intellectual/analytic, manipulative/persuasive, and logical/precision tasks._ Ambitious people are achievement-oriented. Consequently, ambition will predict performance on all task types except those that depend on social coordination and support, e.g., imaginative/aesthetic tasks which require coordinating the expressive output of team members to fashion products, and social tasks which require understanding or helping others.

Hypothesis 5. _Sociability will be positively related to performance on imaginative/aesthetic and social tasks but negatively related to performance on mechanical/technical and logical/precision tasks._ Sociability will promote effectiveness on social tasks where outgoing, affiliative behaviors are required, and on imaginative/aesthetic tasks where uninhibited, exhibitionistic behaviors are required. Conversely, tasks that require a minimum of social interaction (e.g., mechanical/technical and logical/precision tasks) tend to be disrupted by high levels of affiliative behavior.

Hypothesis 6. Likeability will be positively related to performance on social and manipulative/persuasive tasks. Likeability is important for tasks based on interaction and requiring social competence and interpersonal tact. Tasks that do not depend on smooth social functioning for successful performance will be less affected by this trait.

The foregoing six hypotheses are summarized in Figure 4. Predicted trait relevance for each task type is presented in the table rows; table of columns present the optimal group member profile for each task type.

SUMMARY

The model presented here provides a rational basis for analyzing the effects of personality on group performance. In brief, it was argued that different personality types will perform better in different task groups, because different behaviors are required in different task situations. These claims were formalized, and then a set of predictions were derived in a manner that can be empirically tested.

These derivations deal with pure or ideal types. They are the simplest, most fundamental propositions that can be derived from the preceding analysis. However, the fact that our typology is elementary does not invalidate its usefulness. Rather, the utility of our analysis is that it provides a parsimonious basis from which more complex observations can de deduced. In other words, it provides a standard against which the variations observed in actual situations may be compared (see Lundberg, 1940).

This model should be qualified in four ways. First, task situations may rarely correspond to the pure types presented in Figure 3. However, tasks can be classified using a profile of scores based on their resemblance to each of

36

the ideal task types. Holland (1985) has developed a model that places the six task types in Figure 3 at the vertices of a hexagon. The types that are closest to each other are the most similar, whereas those across from each other are most dissimilar. For example, a social-manipulative/persuasive task, in which a group is formed to help others and to solicit donations, is relatively consistent because these two tasks share similar behavioral requirements. In contrast, an imaginative/aesthetic-logical/precision task is much less consistent. This means, on the one hand, that most real-world tasks will be classified in terms of profiles, with primary, secondary, and tertiary descriptors used, as required. On the other hand, personality will best predict performance for consistent types of tasks.

Second, the impact of personality on task performance may vary across tasks, a complexity not considered in the present model. It was argued that personality affects performance by influencing three summary variables: skill, effort, and strategy. Personality will influence these variables differentially; for example, personality may determine strategy more than skill. Moreover, tasks differ in the degree to which these variables are important; that is, some tasks are primarily determined by skill, others by effort, and others by strategy. Consequently, personality may influence performance more on some tasks than others. In addition, within tasks (for example, consider a mechanical/technical task) personality may be more important for performance if the task is effort-based rather than skill-based.

Third, different phases of a task or different subtasks may have very different behavioral requirements. In these circumstances, a group task may contain separate social, technical, or persuasive roles. Teams will perform best by matching people to appropriate task roles; good managers or team

leaders do this intuitively. In a sense, the present analysis is
decontextualized; it is assumed that other group and environmental factors
remain constant. This is not always the case. For example, the same trait
may result in different behaviors under different group conditions. Berkowitz
(1956b) placed high and low ascendant (Ambition) persons in either central or
peripheral positions in a group. During the initial trials of the experiment,
low ascendant persons were more passive than highs. But by the third trial,
both lows and highs acted similarly. Furthermore, the lows in a central
position were more active in task behavior than the highs in a peripheral
position. Such results clearly indicate that "low ambition" individuals can
become assertive in group interaction in specific situations. Our analysis
simply suggests that those not "traited" for a particular task may be less
effective in its performance.

Fourth, in the foregoing discussion the topic of team leadership has not
been addressed. Indeed, the personality of a team leader can have a major
influence on team performance. This is the subject of further research (see
Salas, Driskell and Hogan, 1987 for further discussion).

Finally, this report has attempted to integrate a substantial body of werk
in personality, social psychology, and vocational psychology. This
theoretical development yields testable hypotheses and points to an obvious
research agenda. The theory makes general predictions about both individual
and team performance in specific situations. The inability to make such
predictions has plagued research for some time, and has hampered the
application of this research to real-world environments.

References

Adams, S. (1953). Status congruency as a variable in small group performance. Social Forces, 32, 16-22.

Altan, I., & Haythorn, W. W. (1967). The effects of social isolation and group composition on performance. Human Relations, 20, 313-340.

Apple, W., Steeter, L., & Krauss, R. (1979). Effects of pitch and speech rate in personal attributions. Journal of Personality and Social Psychology, 37, 715-727.

Aries, E. J. Gold, C., & Weigel, R. H. (1983). Dispositional and situational influences on dominance behavior in small groups. Journal of Personality and Social Psychology, 44, 779-786.

Arnoff, J., Meese, L. A., & Wilson, J. P. (1983). Personality factors in small group functioning. In H. H. Blumberg, P. Hare, V. Kent, and M. Davies (Eds.), Small Groups and Social Interaction, Vol 1. (pp. 79-88). New York: Wiley.

Bass, B. M. (1954). The leaderless group discussion. Psychological Bulletin, 51, 465-492.

Bass, B. M. (1960). Leadership, psychology, and organizational behavior. New York: Harper.

Bass, B. M., & Wurster, C. R. (1953). Effects of company rank on LGD performance of like refinery supervisors. Journal of Applied Psychology, 37, 100-104.

Berger, J., Webster, M., Ridgeway, C. & Rosenholtz, S. J. (1984). Status cues, expectations, and behavior. Paper presented at a meeting on Status, Expectations, and Related Processes. University of South Carolina, Columbia.

Berkowitz, L. (1956). Group norms among bomber crews: Patterns of perceived crew attitudes, 'actual' crew attitudes, and crew liking related to aircrew effectiveness in Far Eastern combat. Sociometry, 19, 141-153.

Biersner, R. J., and Hogan, R. (1984). Personality correlates of adjustment in isolated work groups. Journal of Research in Personality, 18, 491-496.

Block, J. (1961). The Q-sort method in personality assessment and psychiatric research. Springfield, IL: Charles C. Thomas.

Bouchard, T. J. (1969). Personality, problem-solving procedure, and performance in small groups. Journal of Applied Psychology Monograph, 53, 1-29.

Carter, L. Haythorn, W., & Howell, M. (1950). A further investigation of the criteria of leadership. Journal of Abnormal and Social Psychology, 45, 350-358.

Cartwright, D., & Zander, A. (Eds.). (1953). Group dynamics: Research and theory. Evanston, IL: Row, Peterson.

Cattell, R. B., & Stice, G. F. (1954). Four formullae for selecting leaders on the basis of personality. Human Relations, 7, 493-507.

Collins, D. L. (1985). Psychological issues relevant to astronaut selection for long-duration spaceflight: A review of the literature (Technical Paper No. 84-41). Brooks Air Force Base, TX: Air Force Human Resource Laboratory.

Collins, B. E., & Guetzkow, H. (1964). A social psychology of group processes for decision-making. New York: Wiley.

Costa, P. T., & McCrae, R. R. (1985). The NEO Personality Inventory Manual. Odessa, FL: Psychological Assessment Resources.

Chemers, M. M. (1983). Leadership theory and research: A systems-process integration. In P. Paulis (Ed.), Basic Group Processes (pp. 9-39). New York: Springer-Verlag.

Crutchfield, R. S. (1955). Conformity and character. American Psychologist, 10, 191-198.

Denson, R. W. (1981). Team training: Literature review and annotated bibliography (Research Report No. TR-80-40). Brooks AFB, TX: Air Force Human Resources Laboratory.

Dewey, J. (1922). Human nature and conduct. New York: Holt.

Driskell, J. E. (1982). Personal characteristics and performance expectations. Social Psychology Quarterly, 45, 229-237.

Durkheim, E. (1893). The division of labor in society. New York: MacMillan, 1933.

French, E. (1958). Effects of the interaction of motivation and feedback on task performance. In J. W. Atkinson (Ed.) Motives in fantasy, action, and society. Toronto: Van Nostrand. (pp. 400-408).

Ghiselli, E., & Lodall, T. M. (1958). Patterns of managerial traits and group effectiveness. Journal of Abnormal and Social Psychology, 57, 61-66.

Gibb, C. A. (1969). Leadership. In G. Lindzey and E. Aronson (Eds.)., Handbook of social psychology, Vol 4, New York: Addison-Wesley.

Gladstein, D. L. (1984). Groups in context: A model of task group effectiveness. Administrative Science Quarterly, 29, 499-517.

40

Goldberg, L. R. (1981). Language and individual differences: The search for universals in personality lexicons. In L. Wheeler (Ed.) Personality and Social Psychology Review (Vol 2, pp. 141-165). Beverly Hills: Sage

Gottfredson, G. D., Holland, J. L., & Ogawa, D. K. (1982). Dictionary of Holland occupational codes. Palo Alto: Consulting Psychologists Press.

Gough, H. G., (1975). Manual for the California Personality Inventory. Palo Alto: Consulting Psychologists Press.

Gray, L. N., Richardson, J. T., & Mayhew, B. H. (1968). Influence attempts and effective power: A re-examination of an unsubstantiated hypothesis. Sociometry, 31, 245-258.

Greer, F. L. (1955). Small group effectiveness. Institute Report No. 6, Institute for Research on Human Relations, Philadelphia.

Greer, F. L., Galanter, E. H., & Nordlie, P. G. (1954). Interpersonal knowledge and individual and group effectiveness. Journal of Abnormal and Social Psychology, 49, 411-414.

Guilford, J. P., Christensen, P. R., Bond, N. A., & Sutton, M. A. (1954). A factor analysis study of human interests. Psychological Monographs, 68, (Whole No. 375).

Gurnee, H. (1937). Maze learning in the collective situation. Journal of Psychology, 3, 437-443.

Guzzo, R. A., & Waters, J. A. (1982). The expression of affect and the performance of decision-making groups. Journal of Applied Psychology, 67, 67-74.

Hackman, J. R. (1968). Effects of task characteristics on group products. Journal of Experimental Social Psychology, 4, 162-187.

Hackman, J. R. (1983). A normative model of work team effectiveness (Technical Report No. 2). New Haven, CT: Yale School of Organization and Management.

Hackman, J. R., & Morris, C. G. (1975). Groups tasks, group interaction process, and group performance effectiveness: A review and proposed integration. In L. Berkowitz, (Ed.), Advances in experimental social psychology, Vol 8, (pp. 45-99), New York: Academic Press.

Hare, A. P., & Bales, R. F. (1963). Seating position and small group interaction. Sociometry, 26, 480-486.

Havron, M. D., & McGrath, J. E. (1961). The contribution of the leader to the effectiveness of small military groups. In L. Petrullo and B. M. Bass (Eds.), Leadership and interpersonal behavior. New York: Holt.

Haythorn, W. (1953). The influence of individual members on the characteristics of small groups. Journal of Abnormal and Social Psychology, 48, 276-284.

Haythorn, W. W. (1968). The composition of groups: A review of the literature. Acta Psychological, 28, 97-128.

Hemphill, J. K., & Westie, C. M. (1950). The measurement of group dimensions. Journal of Psychology, 29, 325-342.

Hendrick, H. W. (1979). Differences in group problem solving behavior and effectiveness as a function of abstractness. Journal of Applied Psychology, 64, 518-525.

Herold, D. M. (1978). Improving performance effectiveness of groups through a task-contingent selection of intervention strategies. Academy of Management Review, 3, 315-325.

Heslin, R. (1964). Predicting group task effectiveness from member characteristics. Psychological Bulletin, 62, 248-256.

Hill, G. W. (1982). Group versus individual performance: Are N+1 heads better than one? Psychological Bulletin, 91, 517-539.

Hoffman, L. R. (1965). Group problem solving. In L. Berkowitz, (Ed.), Advances in experimental social psychology, Vol 2., New York: Academic Press.

Hoffman, L. R., & Maier, N.R.F. (1961). Quality and acceptance of problem-solving solutions by members of homogeneous and heterogeneous groups. Journal of Abnormal and Social Psychology, 62, 401-407.

Hogan, R. (1983). A socioanalytic theory of personality. In M. Page (Ed.), Nebraska Symposium on Motivation (pp. 55-89). Lincoln, NE: University of Nebraska Press.

Hogan, R. (1985). Personality psychology: Back to basics. Third Biennial Henry A. Murray Symposium in Personality Psychology. East Lansing, MI: Michigan State University.

Hogan, R. (1986). Manual for the Hogan Personality Inventory. Minneapolis: National Computer Systems.

Hogan, R., Carpenter, B. N., Briggs, S. R., & Hansor, R. O. (1985). Personality assessment in industry: A historical and conceptual overview. In H. J. Bernardin and D. A. Bownas (Eds.), Personality assessment in industry. New York: Praeger.

42

Hogan, J., Hogan, R., & Briggs, S. R. (1984). Psychological and physical performance factors associated with attrition in explosive ordinance disposal training. (Technical Report). Tulsa, OK: University of Tulsa.

Holland, J. L. (1959). A theory of vocational choice. Journal of Counseling Psychology, 6, 35-44.

Holland, J. L. (1966). The psychology of vocational choice: A theory of personality types and model environments. Waltham, MA: Blaisdell.

Holland, J. L. (1985). Making vocational choices: A theory of vocational personalities and work environments (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Hollander, E. P. (1954). Authoritarianism and leadership choice in a military setting. Journal of Abnormal and Social Psychology, 49, 365-370.

Hollander, E. P., & Julian, J. W. (1969). Contemporary trends in the analysis of leadership processes. Psychological Bulletin, 71, 387-395.

Holtzman, W. H. (1952). Adjustment and leadership. Journal of Social Psychology, 36, 179-189.

Homans, G. C. (1974). Social behavior: Its elementary forms. New York: Harcourt Brace Jovanovich.

Kabanoff, B., & O'Brien, G. E. (1979). Cooperation structure and the relationship of leader and member ability to group performance. Journal of Applied Psychology, 64, 526-532.

Kahan, J. P., Webb, N., Shavelson, R. J., & Stolzenberg, R. M. (1985). Individual characteristics and unit performance. Santa Monica: Rand.

Kleinke, C. L., Bustos, A. A., & Staneski, R. A. (1973). Effects of self-attributed and other-attributed gaze on interpersonal evaluations between males and females. Journal of Experimental Social Psychology, 9, 154-163.

Lamb, T. A. (1981). Nonverbal and paraverbal control in dyads and triads-- sex or power differences? Social Psychology Quarterly, 44, 49-53.

Latane, B., Williams, K., & Harkins, S. (1979). Many hands make light the work: Causes and consequences of social loafing. Journal of Personality and Social Psychology, 37, 822-832.

Lundberg, G. A. (1940). Some problems of group classification and measurement. American Sociological Review, 5, 351-360.

McCormick, E. J., Finn, R. H., & Scheips, C. D. (1957). Patterns of job requirements. Journal of Applied Psychology, 41, 358-364.

McCrae, R. R., & Costa, P. T. Jr. (in press). Validation of the five factor model of personality across instruments and observers. Journal of Personality and Social Psychology.

McGrath, J. E. (1962). The influence of positive interpersonal relations on adjustment and effectiveness in rifle teams. Journal of Abnormal and Social Psychology, 65, 365-375.

McGrath, J. E. (1984). Groups: Interaction and performance. Englewood Cliffs, NJ: Prentice-Hall.

MacKinnon, D. W. (1944). The structure of personality. In J. McV. Hunt (Ed.) Personality and the behavior disorders, Vol 1. New York: Ronald Press. Mann, R. D. (1959). A review of the relationships between personality and performance in small groups. Psychological Bulletin, 56, 241-270.

Mann, R. D. (1959). A review of the relationships between personality and performance in small groups. Psychological Bulletin, 56, 241-270.

Mazur, A., Rosa, E., Faupel, M., Heller, J., Leen, R., & Thurman, B. (1980). Physiological aspects of communication via mutual gaze. American Journal of Sociology, 86, 50-74.

Megargee, E. I. (1969). Influence of sex roles on the manifestation of leadership. Journal of Applied Psychology, 53, 377-382.

Miller, G. R., & Hewgill, M. A. (1963). The effect of variations in nonfluency on audience ratings of source credibility. Quarterly Journal of Speech, 49, 36-44.

Morris, C. G. (1966). Task effects on group interaction. Journal of Personality and Social Psychology, 5, 545-554.

Morris, C. G., & Hackman, J. R. (1969). Behavioral correlates of perceived leadership. Journal of Personality and Social Psychology, 13, 350-361.

Nemeth, C., & Wachtler, J. (1974). Creating the perceptions of consistency and confidence: A necessary condition for minority influence. Sociometry, 4, 529-540.

Norman, W. T. (1963). Toward an adequate taxonomy of personality attributes. Journal of Abnormal and Social Psychology, 66, 574-583.

O'Brien, G. E., & Owens, A. G. (1969). Effects of organizational structure on correlations between member ability to group performance. Journal of Applied Psychology, 53, 525-530.

Peabody, D. (1984). Personality dimensions through trait inferences. Journal of Personality and Social Psychology, 46, 384-403.

44

Richardson, H. M., & Hanawalt, N. G. (1952). Leadership as related to the Bernreuter personality measures. Journal of Social Psychology, 36, 141-154.

Ridgeway, C. L. (1983). The dynamics of small groups. New York: St. Martin's.

Ridgeway, C. L. (1982). Status in groups: The importance of motivation. American Sociological Review, 47, 76-88.

Ridgeway, C. L., Berger, J., & Smith, L. (1985). Nonverbal cues and status: An expectation states approach. American Journal of Sociology, 90, 955-978.

Riecken, H. W. (1958). The effect of talkativeness on ability to influence group solutions of problems. Sociometry, 21, 309-321.

Roby, T. B. (1963). Process criteria of group performance. Paper presented as part of the task and criterion work group of the small groups in isolation project of the Neuropsychiatric Division, NMRI, Bethesda, MD.

Ross, E. A. (1908). Social Psychology. New York: MacMillan.

Ryan, E. B., & Giles, H. (1982). Attitudes towards language variation, social and applied contents. Bugay, Suffolk: The Chaucer Press.

Sa..s, E., Driskell, J. E. & Hogan, R. (1987). Noncognitive predictors of leadership performance. Paper to be presented at the Center for Army Leadership Research Third Annual Conference, Kansas City, MO.

Schneider, B. (1985). The people make the place. Presidential Address, Society of Industrial and Organizational Psychology. Annual Convention: American Psychological Association, Los Angeles.

Schneider, F. W., & Delaney, J. G. (1972). Effect of individual achievement motivation on group problem solving efficiency. Journal of Social Psychology, 86, 291-298.

Schutz, W. C. (1958). FIRO: A three dimensional theory of interpersonal behavior. New York: Rinehart.

Sereno, K. K., & Hawkins, G. J. (1967). the effects of variation in speakers' nonfluency upon audience ratings of attitudes toward the speech topic and speakers' credibility. Speech Monographs, 34, 58-64.

Shaw, M. E. (1964). Communicat6ion networks. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol 1, pp. 111-147). New York: Academic Press.

Shaw, M. E. (1973). Scaling group tasks: A method for dimensional analysis, JSAS Catalog of Selected Document in Psychology, 3:8 (Ms No. 294).

Shaw, M. E. (1981). Group dynamics: The psychology of small group behavior, 3rd ed. New York: McGraw-Hill.

Shaw, M. E., & Harkey, B. (1976). Some effects of congruency of member characteristics and group structure upon group behavior. Journal of Personality and Social Psychology, 34, 412-418.

Shiflett, S. (1979). Toward a general model of small group productivity. Psychological Bulletin, 86, 67-79.

Simonton, D. K. (1985). Intelligence and personal influence in groups: Four nonliner models. Psychological Review, 92, 532-547.

Smelser, W. T. (1961). Dominance as a factor in achievement and perception in cooperative problem-solving interactions. Journal of Abnormal and Social Psychology, 62, 535-542.

Smith, B. L., Brown, B. L., Strong, W. J., & Rencher, A. C. (1975). Effects of speech rate on personality perception. Language and Speech, 18, 145-152.

Smith, R. J., & Cook, P. E. (1973). Leadership in dyadic groups as a function of dominance and incentives. Sociometry, 36, 561-568.

Sorrantino, R. M. (1973). An extension of theory of achievement motivation to the study of emergent leadership. Journal of Personality and Social Psychology, 26, 356-368.

Sorenson, J. R. (1973). Group member traits, group process, and group performance. Human Relations, 26, 639-655.

Steiner, I. D. (1972). Group processes and productivity. New York: Academic Press.

Stimson, D. V., & Bass, B. M. (1964). Dyadic behavior of self-interaction-, and task-oriented subjects in a task situation. Journal of Abnormal and Social Psychology, 68, 558-562.

Stogdill, R. M. (1948). Personal factors associated with leadership: A survey of the literature. Journal of Personality, 25, 37-71.

Stogdill, R. M. (1974). Handbook of leadership: A survey of theory and research. New York: Free Press.

Terborg, J. R., Castore, C., & DeNinno, J. A. (1976). A longitudinal field investigation of the impact of group composition on group performance and cohesion. Journal of Personality and Social Psychology, 34, 782-790.

Tjosvold, D. (1984). Effects of leader warmth and directiveness on subordinate performance on a subsequent task. Journal of Applied Psychology, 69, 422-427.

46

Triplett, N. (1898). The dynamogenic factors in pace-making and competition. American Journal of Psychology, 9, 507-533.

Tupes, E. C., & Christal, R. E. (1961). Recurrent personality factors based on trait ratings. Technical Report ASD-TR-61-97. Personnel Laboratory USAF, Lackland Air Force Base, 1961.

Tziner, A., & Eden, D. (1985). Effects of crew composition on crew performance: Does the whole equal the sum of its parts? Journal of Applied Psychology, 70, 85-93.

Tziner, A., & Vardi, Y. (1982). Effects of command style and group cohesiveness on the performance of self-selected tank crews. Journal of Applied Psychology, 67, 769-775.

Vertreace, W. E., & Simmons, C. H. (1971). Attempted leadership in the leaderless group discussion as a function of motivation and ego involvement. Journal of Personality and Social Psychology, 19, 285-289.

Viernstein, M. C. (1972). The extension of Holland's occupational dictionary of occupational titles. Journal of vocational Behavior, 2, 107-121.

Watson, D. (1971). Reinforcement theory of personality and social systems: Dominance and position in a group power structure. Journal of Personality and Social Psychology, 20, 180-185.

Weick, K. E., & Penner, D. D. (1969). Discrepant membership as an occasion for effective cooperation. Sociometry, 32, 413-424.

Williges, R. C., Johnston, W. A., & Briggs, G. E. (1966). Role of verbal communication in teamwork. Journal of Applied Psychology, 50, 473-478.

Winer, H. A., & Rubin, I. M. (1969). Motivation of research and development entrepreneurs: Determinants of company success. Journal of Applied Psychology, 53, 178-184.

Whyte, W. F. (1941). Corner boys: A study of clique behavior. American Journal of Sociology, 46, 647-664.

Willard, D., & Strodtbeck, F. L. (1972). Latency of verbal response and participation in small groups. Sociometry, 35, 161-175.

Wittgenstein, L. (1953). Philosophical investigations. New York: MacMillan.

Zander, A., & Forward J. (1968). Position in group, achievement orientation, and group aspirations. Journal of Personality and Social Psychology, 8, 282-288.

DISTRIBUTION LIST

Commanding Officer
Naval Training Systems Center
Code 712
Orlando, FL 32813-7100 (25)

Defense Technical Information
  Center
Cameron Station
Alexandria, VA 22310

Dr. Stan Collyer
Office of the Chief of Naval
  Research (OCNR-2222)
800 N. Quincy Street
Arlington, VA 22217

American Psychological Association
Psyc. Info., Document Control Unit
1200 Seventeenth Street
Washington, DC 20036

Commanding Officer
Air Force Office of Scientific
  Research
Technical Library
Washington, DC 20301

Technical Library
Naval Training Systems Center
Orlando, FL 32813-7100

Dr. Jesse Orlanski
Institute for Defense Analyses
Science and Technology Division
801 North Beauregard Street
Arlington, VA 22311

ERIC Facility-Acquisitions
4350 East West HWY #1100
Bethesda, MD 20014-4410

Library
Naval Personnel Research and
  Development Center
Code P201L
San Diego, CA 92152

Library
Naval War College
Newport, RI 02940

Library of Congress
Science and Technology Division
Washington, DC 20540

Superintendent
ATTN: Director of Research
U.S. Naval Academy
Annapolis, MD 21402

Head, Department of
  Behavioral Science and Leadership
U.S. Air Force Academy
Colorado Springs, CO 80840

Director, Applied Psychology Unit
Medical Research Council
15 Chaucer Road
Cambridge, CB2, 2EF England

Air Force Human Resources Laboratory
Technical Library
Brooks Air Force Base
San Antonio, TX 78235

National Defense Headquarters
ATTN: DPSRSC
Ottawa, Ontario K1A 2WC
Canada

Army Personnel Research Establishment
Ministry of Defense
c/o Royal Aircraft Establishment
Farnborough, Hants GU14 6TD
England

Naval Postgraduate School
ATTN: Library (Code 2124)
Monterey, CA 93940

Battelle Human Affairs Research Center
4000 NE 41st Street
Seattle, Washington 98105

Chief
ARI Field Unit - Fort Benning
P.O. BOX 2086
Fort Benning, GA 31905-0686

Chief
ARI Field Unit - Fort Bliss
P.O. BOX 6057
Fort Bliss, TX 79906-0057

Chief
ARI Field Unit - Fort Hood
HQ TCATA
Fort Hood, TX 76544-5056

Department of Administrative Sciences
Naval Postgraduate School (Code 54EA)
Monterey, CA 93943-5100

Technical Director
U.S. Army Research Institute for the
     Behavioral and Social Sciences
5001 Eisenhower Avenue
Alexandria, VA 22333

Chief
ARI, Field Unit - Fort Rucker
ATTN: PERI-SR
Fort Rucker, AL 36362

Army Research Institute
Technical Information Center
ATTN: PERI-POT-I
5001 Eisenhower Ave.
Alexandria, VA 22333

LCDR Thomas Crosby, MSC, USN
Naval Air Systems Command
ATTN: Code 933G
Washington, DC 20361-3300

Office of Naval Research
Director, Technology Programs
Code 200
800 N. Quincy Street
Arlington, VA 22217

Office of Naval Research
Code 4420E
800 N. Quincy Street
Arlington, VA 22217

Naval Research laboratory (6)
Code 2627
Washington, DC 20375

Deputy Chief of Naval Operations
    (Manpower, Personnel & Training)
Head, Research, Development, and
    Studies Branch (OP-115)
1812 Arlington Annex
Washington, DC 20350

Deputy Chief of Naval Operations
    (Manpower, Personnel, & Training)
Director, Human Resource Management
    Plans & Policy Branch (OP-150)
Department of the Navy
Washington, DC 20350

Program Administrator for Manpower,
    Personnel, and Training
MAT 0722
800 N. Quincy Street
Arlington, VA 22217

Dr. Lawrence R. James
School of Psychology
Georgia Institute of Technology
Atlanta, GA 30332

Dr. J. Richard Hackman
School of Organization & Management
Box 1A
Yale University
New Haven, CT 06520

Dr. Frank J. Landy
Department of Psychology
Pennsylvania State University
450 Moore Bldg.
University Park, PA 16802

Dr. Irwin Goldstein
Department of Psychology
University of Maryland
College Park, MD 207452

Dr. H. Wallace Sinaiko
Program Director, Manpower Research
    and Advisory Services
Smithsonian Institution
801 N. Pitt Street, Suite 120
Alexandria, VA 22314

Dr. Michael Coovert
Department of Psychology
University of South Florida
Tampa, FL 33620

Dr. Janet Turnage
Department of Psychology
University of Central Florida
P. O. Box 2500
Orlando, FL 32816

Dr. Scott I. Tannenbaum
Department of Management
State University of New York
Albany
Albany, NY 12222

Dr. Albert S. Glickman
Department of Psychology
Old Dominion University
Norfolk, VA 23508

Dr. Terry L. Dickinson
Department of Psychology
Old Dominion University
Norfolk, VA 23508

Dr. Daniel R. Ilgen
Department of Psychology
Michigan State University
East Lansing, MI 48824

Dr. Robert D. Smither
Organizational Behavior Program
Box 2725
Rollins College
Winter Park, FL 37789

Dr. Catherine D. Gaddy
General Physics Corporation
10650 Hickory Ridge Road
Columbia, Maryland 21044

Dr. Roy E. Perryman
Eagle Technology
950 N. Orlando Avenue
Winter Park, FL 32189

Dr. John Brock
Hay Systems
12424 Research Parkway
Suite 250
Orlando, FL 32826

Dr. Robert P. Fishburne, Jr.
Seville Training Systems
1333 Corporate Drive
Irving, TX 75038

Dr. Ben B. Morgan, Jr.
Department of Psychology
University of Central Florida
P. O. Box 25000

Orlando, FL 32816

Dr. Robert W. Swezey
Science Applications Int. Corp.
1710 Goodridge Drive
McLean, VA 22102

Dr. Edward L. Levine
Department of Psychology
University of South Florida
Tampa, FL 33620

Dr. Lynn R. Offermann
Department of Psychology
George Washington University
2125 G Street N.W.
Washington, DC 20052

Dr. Brian Mullen
Department of Psychology
Syracuse University
Syracuse, NY 13210

Dr. C. Mazie Knerr
HUMRRO
1100 S. Washington Street
Alexandria, VA 22314

Dr. Lawrence Reed
AF Human Resources Laboratory
AFHRL/LRG
Wright Patterson AFB, OH 45433