A MULTIVARIATE INVESTIGATION OF MACHIAVELLIANISM
AND TASK STRUCTURE IN
FOUR-MAN GROUPS

Arthur P. Bochner

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Approved by Doctoral Committee

Raymond K. Tucker Advisor
Department of Speech

Fred Pigge
Graduate School Representative

Nelson R. Ober

Otto F. Bauer

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ABSTRACT

This study was designed to test the proposition that group communication and members' reactions result from an interaction between the demands of the experimental tasks and the characteristics of the individuals performing them. After an investigation of the work of Cooley, Mead, Goffman, Szasz, Shostrom, Leary, and Berne, the researcher concluded that an important dimension for communication study is the personality trait referred to as "manipulation." The Machiavellian test developed by Richard Christie, for the purpose of measuring a person's manipulative orientations toward interpersonal relations, was chosen as the criterion measure.

Specifically, this investigator sought to determine the extent to which group interaction, social organization, and group members' reactions are affected by the interaction between different combinations of Machiavellian member characteristics and the task environment. A 5 X 2, Type I, "mixed" factorial design was used to test forty-eight hypotheses central to the research question. The two treatment variables were defined as Machiavellian group composition and task structure. Thirty-five four-man groups were spread across the five cells of the experiment. Each group received both a structured and unstructured group task, both of which were counter-balanced across experimental conditions and defined in task qua task terms.

Each group was observed from behind a two-way mirror by two trained scorers who used Borgatta's Interaction Process Scores method of coding interaction. After each task, S's rated the behavior of each co-worker on a sociometric questionnaire and then responded to a member's reaction form. A separate multivariate analysis of variance was performed for the interaction data and the self-report data. In addition, a multiple discriminant analysis and scalar comparisons were computed for each significant multivariate F-ratio.

On the basis of the multivariate analyses, the following conclusions were reached:

1. Machiavellianism can be considered a group trait as well as an individual trait.
2. Task-related interaction differences between Machiavellian groups and individuals is more a matter of style than of quantity.
3. High Mach self-reports are affected by tasks; low Mach self-reports are affected by persons.

4. There are strong pre-dispositional differences between high and low Machiavellians in both interaction and rating behaviors.
5. Unstructured tasks demand more task activity than structured tasks.
6. Unstructured tasks demand greater division of labor than structured tasks.
7. Tasks significantly affect high Machs, but do not significantly affect low Machs.
8. Generalization about communication and interaction from self-report data alone is unwarranted. What is needed is a multiple-indicator approach.

In addition to these general conclusions, the investigator argues for the inclusion of a more representative array of variables and multivariate methods in small group experimental design.

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Man is not born human. It is only slowly and laboriously, in fruitful contact, cooperation, and conflict with his fellows, that he attains the distinctive qualities of human nature.

Robert E. Park

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Chapter I

THEORETICAL FOUNDATIONS

INTRODUCTION

The results of more than fifty years of personality research has convinced the social scientist that striking differences persist among persons in their orientations to the social universe. Indeed, the experimental researcher is often discouraged by the greater variance existing among subjects than between conditions; variance which frequently can be attributed to strong personality characteristics rather than to weak independent variables. A broad review of some relationships between these individual differences and social interaction led Marlowe and Gergen (1968) to conclude that few aspects of social processes can be understood without consideration for personality variables.

Despite the variations attributable to individual characteristics, few behavioral scientists would contend that these traits alone account for most of the variation in behavior. Rather, a growing number of theorists (Sells, 1963; Lewin, 1939; Brunswick, 1956) defend what has emerged as the interactional position, in which behavior embodies the interaction of the individual and the environment. From this standpoint "the total variance of any response can be accounted for only in part by individual differences in characteristics of the participating persons: It depends also on the stimulus characteristics of the

environmental situation (both physical and social) and in part on the interactions between aspects of each" (Sells, 1963, p. 3). This study will seek to contribute to the accumulating body of research which relates individual traits (personality) to social interaction. The particular emphasis will be on communication behavior in the small group setting and the environmental stimulus, the group task.

A MULTIVARIATE RATIONALE

Sells' (1963) contention that variations in behavior are dependent on at least two classes of variables represents a contemporary viewpoint which characterizes social situations as multivariate rather than univariate. Although Galton pointed out as far back as 1869 that "any human act or achievement is the complex resultant of numerous causal factors, partly hereditary, partly environmental" (cited in Burt, 1966), only within the past twenty-five years have experimentalists discovered and employed sufficient methods to handle these complexities in their natural states. Throughout this period factor analysis has been repeatedly successful in establishing the multi-dimensionality of personality and other concepts to the point where today most social scientists would agree that concepts cannot be represented by single variable relations.

Assessing multiple relations is only possible through multivariate experimentation. By comparing it to the bivariate experiment, Cattell (1966) presents as good a definition of the

multivariate experiment as can be found:

At one extreme we have an experimenter who, as in the classical tradition of the physical sciences, works with two variables. On the other hand, especially when a later statistical analysis by factor analysis, canonical correlation, or multivariate analysis of variance is contemplated, the experimenter will generally plan to observe many variables simultaneously. This defines a multivariate experiment (p. 21).

Application of multivariate design is desirable in any situation where more than single relations are being investigated because "examination of single relations is the only thing possible in a bivariate experimental design" but "multivariate experimental results, on the other hand, can be analyzed either piecemeal, e.g. in pairs, or by some multivariate analysis method" (Cattell, p. 38).

Regardless of these advantages, researchers in the small group field, this writer's principal interest, continue to neglect this approach. In their review of small group research McGrath and Altman found that "most studies of small groups deal with a highly restricted set of variables and relate them to each other two at a time (1966, p. 71)." This practice persists despite the small group researcher's insistence that his phenomena have "multivariate interdependence" (McGrath and Altman, 1966, p. 71), and despite Cattell's (1966, p. 769) claim that "the study of more than one person is necessarily multivariate from the outset." Consequently, this field suffers from a lack of accumulated knowledge, is marred by poorly con-

ceived research, is characterized by conceptual ambiguity, and is devoid of theory. Other writers concur with this assessment of the field, but disagree with the reasons for it. However, their positions are often ambiguous or contradictory. For example, McGrath and Altman on one hand propose a number of methodological problems and urge researchers to familiarize themselves with multivariate approaches (p. 70-72), while on the other hand they contend that there is an overemphasis on procedures and an underemphasis on theory (p. 87). They suggest that for maximum gain the small group researcher should "allow back into the formative stages of research the forces of intuition, allegiance to problems, and projection of the researcher's subjective insights. Then let methodological rigor enter into testing and evaluating the ideas" (p.88).

There are several assumptions implicit in McGrath and Altman's position which need to be scrutinized. The first assumption is that the overemphasis on method has served as a deterrent to growth in the small group field. Perhaps an overemphasis on unsuitable method has been damaging, but there is little evidence to indicate that a concern for method necessarily detracts from a concern for substance. Cattell supports this viewpoint when he writes:

...the most revolutionary transitions in sciences have usually occurred through methodological innovation rather than grand and bookish theories. A new direction and power is usually given by devices--as by the microscope, the telescope, and the electron tube...--by the light of which all can see

emerging new theories. These methodological inventions solve new kinds of problems and do so moreover with altogether more exact standards of what constitutes a solution. The more exact theories readily enough follow because they are made possible by the new vision (p. viii).

If this is at all true, the plea for order in scientific problem-solving, i.e., to first find the problem and then find the method, cannot be accepted as a scientific principle. In fact, it is at the formative stages of research, i.e., finding the problem, where method may be most crucial. Again it is Cattell who reports that "multivariate methods have a special, indispensable function at the first, exploratory stages, to find the underlying influences and concepts and the valid ways of measuring them" (1966, p. 64).

RESEARCH PURPOSE

Since the informal social group can best be considered a system of inter-related organisms, the dependent measures of interest should consist of the relationships between these organisms. Despite the inadequacies of studying relationships in ad hoc groups (i.e., a failure for sufficiently integrated and differentiated structures to stabilize) optimum contributions can only be made by considering the observed relationships which exist or develop in these groups, in light of the acknowledged deficiencies. The fact that the variables of most significance have not reached their "true" or most potent state is not sufficient reason to eliminate them. Rather, if inference is guided by the careful analysis of the precision and degree of

measurement (including error which will always be present), valuable contributions can be made.

In view of these considerations, this study will attempt to relate personality and environment to several dimensions of emergent relationships in small groups. These dimensions will include the throughput stages of interaction process and interaction structuring, i.e., division of labor, and the output stages or the members' resultant reactions to each other and to their environment. Being a typical multivariate problem, this study will involve both multiple independent and multiple dependent variables.

RELEVANT HUMAN COMMUNICATION THEORY

Two questions form the prototype of much personality research and function as a guideline to the current investigation: Which personality characteristics does the investigator wish to measure? How can they best be measured? A contemporary theme in human communication theory provides an answer to the first question.

Human communication theory borrows widely from other disciplines which contribute to an understanding of man's social behavior. Among the outstanding contributions has been the work of sociologists Cooley (1902, 1956), Mead (1934), and Goffman (1959, 1961, 1963, 1967); psychiatrists and psychotherapists Szasz (1961), Berne (1964), and Shostrom (1967); and clinical psychologist Leary (1955, 1957).

Reflected in the writing of Cooley, Mead, and Goffman is an orientation toward human interaction usually referred to as symbolic interactionism. Dominant in this view of human nature are the relationships between role, self, and interaction. Both Cooley and Mead are vitally concerned with the socialization process, particularly the development of the social self. Cooley believes that everyday interactions between people are the consequences of the interactions between ideas of persons which occur in their minds. Among the first to initiate a theory regarding man's need for social approval, Cooley refers to the social self as the "reflected" or "looking glass self." This looking glass process occurs in three steps. First, one imagines how he, or some part of him, such as his behavior, appears to another person. Second, he imagines how acceptable this behavior is to the other person. Third, there is a response to this evaluation with some attached self-feeling such as pride or shame. The imagined effect of our appearance on others controls how we consequently behave towards them. Thus, Cooley observes that beginning in childhood "one learns to be different things to different people" (p. 197).

As a disciple of Cooley, Mead concurs with the idea that man possesses a reflective social self. However, while Cooley attributes major significance to the mental process, Mead considers the consequent social interaction more influential (Angell, 1956). Mead's insights are numerous, but the impor-

tance of games in the genesis of the self and the process of role-taking are especially significant. During the play stage, the child is able to assume the role of another, as for example, when playing "house" the child takes the role of "mother" and scolds her doll. While play influences the child, games with their organized procedures and rules contribute most to the ultimate formation of the social self. Mead writes:

The fundamental difference between the game and play is that in the latter the child must have the attitude of all the others involved in that game. The attitudes of the other players which the participant assumes organize into a sort of unit, and it is that organization which controls the response of the individual. The illustration used was of a person playing baseball. Each one of his own acts is determined by his assumption of the action of the others who are playing the game. What he does is controlled by his being everyone on that team, at least as far as those attitudes affect his own particular response. We get then an 'other' which is an organization of the attitudes of those involved in the same process (1934, pp. 153-154).

Through games man learns to take the role of others in order to maximize his own performance. The child realizes at an early age that he is able to communicate to others in such a way as to arouse symbols which he intends to arouse, but which he does not necessarily accept for himself (Rose, 1962). The individual becomes capable of assessing, prior to taking action, how his contemplated behavior will affect the other person.

The delicate interactions of everyday adult life furnish Goffman with an elaborate set of data. Goffman's major writings (1959, 1961, 1963, 1967) examine self-presentation rather than

self-development. Because of the hazardous demands of interpersonal involvement, a person in the presence of others needs information to help him define the situation. This information provides for the individual an understanding of both his expectations of others and their expectations of him. Since most of the necessary information is not easily accessible, but must be inferred through gestures, expressions, and other cues, Goffman compares social behavior to the behavior of actors, both of which are performed to create impressions for audiences. Persons manipulate appearances in order to create favorable impressions. This impression management often results in perceptions which are better than the situation justifies. Goffman finds deception a dominant social variable because "it is always possible to manipulate the impression the observer uses as a substitute for reality because a sign for the presence of a thing, not being that thing, can be employed in the absence of it. The observer's need to rely on misrepresentation of things itself creates the possibility of misrepresentation" (1959, p. 162).

Several psychiatrists and clinical psychologists propose a game-playing model of human behavior which is compatible with the self-theory of the symbolic interactions and the naturalistic observations of Goffman. Following a detailed review of the theory of games formulated by Mead and Piaget, Szasz (1961) concludes that "men are constantly engaged in

behavior involving complicated mixtures of various logical levels of games" (p. 236). Problems arise when the individual discovers that not everyone is playing life's games according to the same rules, and in fact, many persons are not even interested in playing the same games. Given a sterile model of life as an ideal, the individual is led to believe that he must "play a role" and receive social approval for it. For many persons the only role left to play is "mentally ill." As a result, Szasz finds that many of the so-called "psychotics" or "neurotics" fraudulently adopt the sick role as an alternative to the fundamental life problem.

Further support for this game-playing framework is presented by Leary (1957) who argues that the mental patient is not sick, but has merely failed to comprehend the rules of the game. However, Leary transcends the "myth" hypothesis when he suggests that the inability to understand life's games breeds confusion and eventually the helplessness we call "mental illness." In an earlier paper, Leary (1955) reported observing surprising ease, among even the most maladaptive personalities, for getting others to respond in a uniform and reinforcing manner. Despite their illness these patients were able to "pull from others interpersonal responses which lead to a repetition of (their) own favored interpersonal security operations" (p. 161). Mental patients appear as competent at achieving working definitions of the situation as the normal interactors observed by Goffman.

A transitional analysis of game-playing presented by Berne (1964) diagnoses still another variation on this same viewpoint toward human interaction. Berne maintains that everyday life provides little occasion for the psychological comfort of intimacy and as a result the majority of transactions between people are occupied by game-playing. The precariousness of the game-player's psychological state forces him to victimize other persons through the use of insidious maneuvers. These maneuvers are climaxed by an emotional payoff, the essence of the game, which reduces anxiety and preserves the participant's psychic stability. The dishonesty occurs when "the metanorms governing interpersonal contracts are more or less deliberately violated and exploited for the benefit of one member of the dyad" (Carson, 1969, p. 190). Despite the fraud involved in this type of game (e.g. "Rapo," "Now I've Got You, You S. O. B.," "See What You Made Me Do"), most players are not distinguished by any gross psychopathology. Although people play games for various reasons, differences between healthy and sick players are often difficult to detect.

When game-playing becomes a way of life characterized by a strong need for control, the salient personality dimension is referred to as manipulation.

Shostrom (1967) points out that manipulation is more than a game. It is a lifetime system of interpersonal relations. Shostrom's work describes manipulation as a personal orientation

toward the social world marked by a determination for control.

The manipulator...exploits, uses, and/or controls himself and others as things in certain self-defeating ways...and...habitually conceals and camouflages his real feelings behind a repertoire of behavior which runs the scale from arrogant hostility to servile flattery in his continuous campaign to serve his own wishes (pp. 15-16).

Taken together, the theoretical orientations of Cooley, Mead, Goffman, Leary, Szasz, Berne, and Shostrom converge into a central dominant theme: Persons deceptively manipulate symbols to receive desired, though often unwarranted, responses from others. Throughout the past fifteen years, several social psychologists at Columbia University have been engaged in research designed to determine if the extent to which a person adopts a manipulative orientation to interpersonal relations could be reliably and validly measured. They have called this manipulative orientation Machiavellianism.

MACHIAVELLIANISM

Machiavellianism, as a personality description, refers to persons with a manipulative orientation toward interpersonal relations (Christie and Geis, 1970). In addition to possessing the interpersonal style of the manipulator, the Machiavellian person treats others as objects to be controlled rather than individuals with whom he can develop harmonious relationships. He also believes others are weak and cannot be trusted, so he aspires to get them to do what he wants them to do. In addition to emotional detachment, Machiavellians possess little concern

for conventional morality, low ideological commitment, and no gross psychopathological disturbances (Christie and Geis, 1970).

Richard Christie began studying the phenomenon of manipulation while a fellow at the Center for Advanced Studies in the Behavioral Sciences more than fifteen years ago. Stimulated by his earlier research on The Authoritarian Personality (Christie and Jahoda, 1954), Christie was initially interested in identifying the social psychological variables which were fundamental to membership in political and religious extremist groups. Noticing that most previous research had dealt with followers, Christie decided to examine leaders, those persons who wielded power in extremist groups through their ability to manipulate followers. After determining a number of traits which they believed were essential for the effective control of others, Christie and his two co-workers, political scientists Robert Agger and Frank Pinner, began an intensive investigation of power theorists with the hope of discovering common assumptions about efficient methods of control. With one exception, they found few explicitly-stated assumptions. The exception was Niccolo Machiavelli.

THE MACH SCALE: RELIABILITY & VALIDITY

Acknowledging that specific statements found in both The Prince and The Discourse are consistent with the implicit postulates of other power theorists, Christie decided to con-

struct a scale which would indicate whether Machiavelli's assumptions "hang together empirically" (Christie and Geis, 1970). Mach II, the first publicly administered scale, consisted of 71 items which were either taken directly from the plays or written to be theoretically congruent with them. The items were worded in opposite directions so that agreement with half of the statements signified acceptance of the Machiavellian viewpoint, while agreement on the others reflected a rejection of this viewpoint. A five-point Likert technique was used. The scale was administered to 1,196 students at three different universities. By dividing at the median to distinguish high scorers (those accepting the Machiavellian orientation) from low scorers (those rejecting the Machiavellian orientation) and then computing part-whole correlations, Christie found that fifty of the seventy-one items discriminated between high and low scorers at the .05 level (Christie and Geis, 1970). This furnished sufficient evidence that a fairly high degree of internal consistency exists in the work of Machiavelli.

Since the Mach scale was designed for making group comparisons as well as for selecting subjects for research, Christie detected a need for a shorter version, one which could be administered in combination with other tests. A twenty-item Likert-type scale, named Mach IV, was constructed for this purpose. In order to dispose with the possibility of a set response tendency, the items were again counterbalanced; ten

were scaled to support Mach statements and ten were scaled in the opposite direction. After administering Mach IV at the same three universities, Christie found that the mean item-whole correlations for the twenty statements was .38. This correlation compares favorably with the mean item-whole correlation of .33 computed on the third revision of Adorno's F scale (Christie and Geis, 1970). The first nine samples given the Mach test had a mean split-half reliability of .79. When the same subjects responded to the Christie, Havel, and Seidenberg (1958) revision of the California F scale, a version which also contains twenty items counterbalanced for response set, their split-half reliability was only .68.

Although counterbalancing may eliminate set agreement or disagreement tendencies, it cannot remove the effects of a social desirability response set. A study conducted by Budner (1962) and reported in Christie and Geis (1970) resulted in computed correlations between Mach IV and Edwards (1957) SD scale of $-.35$ for college males and $-.75$ for college females. To evade this strong tendency to conceal feelings of interpersonal duplicity, especially among women, Christie believed another plan was necessary. A forced-choice version of the Mach scale was created to eliminate the social desirability response tendency. On this test the subject must choose between statements for each of the twenty items. He first chooses the statement which is the most characteristic of him,

then the one which is least characteristic of him. One statement remains unmarked. For each set of statements, one is keyed as the scale of interest and is matched in assessed social desirability with another statement, unrelated to the dimension of interest. The third statement is a buffer. This buffer is either high or low in social desirability, appears in the opposite direction from the matched statements, and is easily recognized as such by the respondent (2/3 according to Christie and Geis, 1970). The subject's real choice is between two noxious items or two highly desirable ones. Thus, between the matched and keyed statements he must choose the socially desirable one, a difficult choice to make (Christie and Geis, 1970).

Christie reports that in most samples reliability of this Mach V scale reaches the .60's, which is not nearly as high as Mach IV. However, an interpretation of its meaning illuminates its utility in experimental research:

...The elimination of both response set and social desirability tends to decrease scale reliabilities. If our concern had been to construct a scale with high internal consistency, this could have been done easily. We were more interested in devising a scale which would make meaningful discrimination among individual's behavior. For this reason an attempt was made to minimize the effects of such possibly extraneous variables as response set and social desirability... The decision was not to worry about psychometric perfection, but to find out if the scales had any relevance to the respondent's behavior. (Christie and Geis, 1970, p. 27).

The validity of the Mach scales has been demonstrated in several ways. Available evidence indicates that Machiavellianism is not systematically correlated with present measures of intelligence, social class, political ideology, personality, or psychopathology (Harris, 1966). Seven separate studies which used seven different tests of intelligence, and were conducted at seven different institutions, failed to yield any significant correlations between Mach and IQ (Christie and Geis, 1970). The assumption that Machs have no gross psychopathologies was substantiated in a study of Peace Corps trainees at Teachers College, Columbia University. Christie and Geis (1970) found no significant correlations between Mach and the clinical scales of MMPI. Wrightsman and Cook (1965) however, factor-analyzed 78 measures and found one factor, which they labeled "Hostility and Anxiety," positively correlated with Machiavellianism. In fact, the correlation of .60 between Mach IV and Siegal's Hostility Scale (1956) is the highest computed correlation between a personality measure and Mach IV. On the basis of this evidence, Christie and Geis (1970) conclude that high Machs are not necessarily more hostile than low Machs, but they do apparently recognize and confess their hostile drives. This correlation may, in part, explain the high Mach's rejection of the other person's opinions as well as his cynical outlook toward life in general. A study by Harris (1966) indicates that the high Mach does not restrict

his cynicism to persons in general, but rather includes those with whom he has just interacted. Harris employed a counter-balanced design so that subjects could interact with both high and low Mach partners in a cooperative judgment task. Following the task, each subject was asked to rate the personality and performance of his teammates. On 19 of 20 scales high Machs were more neutral in rating their partners. Although both high Machs and low Machs used the socially desirable continuum of the scales, high Machs consistently rated their co-workers as less warm, less gentle, less interesting, etc., than did low Machs.

A remarkably high number of confirmed predictions substantiate the predictive validity of the Mach scales. Exline, et. al., (1961) found that when charged with cheating, high Machs looked their accuser in the eye longer while denying any dishonesty than did low Machs. In a study where subjects were placed in the role of experimenter and then asked to distract subjects taking a personality test, Geis, Christie and Nelson (1963) discovered that high Machs exceeded low Machs in attempts to manipulate the subjects. In a follow-up study Geis (1964) constructed a three-person bargaining game so that results would reflect a person's success at conning his partners. High Machs outbargained lows and their success increased as the ambiguity of the situation increased. The correlation of .71 between Mach test scores and success playing a bargaining game

verifies Geis' claim that this personality variable can greatly affect group interaction in a task-relevant situation.

EXAMINATION OF RELEVANT EXPERIMENTAL RESEARCH

To date less than forty studies which relate Machiavellianism to other social psychological variables have been reported in the literature. Of these, only a handful pertain to this investigator's principal interest, small group research. Before considering the implications of these studies, a brief review of the situational characteristics which consistently yield dispositional differences between high and low Machs is necessary.

Geis and Christie (1970) report three relevant situational properties: face-to-face interaction, latitude for improvisation, and arousing irrelevant affect. In thirteen of fourteen experiments in which these three characteristics were present, high Machs behaved as expected significantly when compared to low Machs. In contrast, Geis and Christie discovered that in eleven studies where no significant differences were reported all three variables were absent. Furthermore, in twelve cases when two of the three were present high Machs outperformed lows, but when only one of the variables was present high Machs won in only five of thirteen experiments. Winning or behaving as predicted was the criterion measure in all cases reviewed. A chi square test on this data reaches the .001 significance level, indicating a high degree of success at separating experiments

where high Machs win from those in which they do not (Geis and Christie, 1970).

Depending on the demands of the task, in the presence of these three situational parameters, Christie and Geis predict that the high Mach's salient disposition is "coolness" and "detachment:"

In pursuit of largely self-defined goals, he disregards both his own and others' affective states and therefore attacks the problem with all the ability he possesses. He reads the situation in terms of perceived possibilities and then proceeds to act on the basis of what action will lead to what results (p. 350).

Under identical conditions, the low Mach will apply a "soft touch." He is

...much more open to others and liable to becoming affectively involved with them or with his own concerns. He becomes more engrossed in the content of conversation...(and)...is more likely to get carried away in the process of interacting with others and acting upon the basis of noncognitive reactions to the situation (p. 350).

These speculations regarding Mach behavior derive almost exclusively from experiments in which either ability to win or ability to persuade were the criterion variables. In many of these studies subjects competed against each other and were aware that winners would receive pennies or dollars or M & M candies or better course grades. Several experiments required subjects to cheat, role-play, or support a position contrary to their beliefs. These conditions suggest a need to contemplate the important question of external validity (Campbell and Stanley, 1963). Do results secured under such conditions

generalize to interpersonal situations in everyday life? To justify her use of games Geis (1970) refers to Goffman's (1961) contention that social games manifest exactly the same conflict and processes among persons which occur in "real, serious interactions" (p. 128). She believes that game reality is less important than the reality of the interpersonal processes it produces. While this may in fact be true, Geis fails to account for the less serious, but more prevalent interactions which constitute most of everyday experience. For example, Berne (1964) observed that the majority of transactions between people, not just the "serious" ones, are occupied by game-playing. An increase in the generality of the Machiavellian concept will be achieved only after evidence is secured in situations where the games are less obvious and the rewards less certain. The informal social group offers a suitable environment for such work.

MACHIAVELLIANISM AND SMALL GROUP RESEARCH

High Machs seem to evoke a much greater influence on their co-workers than low Machs. For instance, when subjects were asked to rate two different characters in Beckett's Waiting For Godot, and then discuss their ratings with a partner before coming to a joint decision, Harris (1966) found that high Machs changed their decisions significantly less than lows regardless of whom they worked with. In another small group study Oskenberg (1968) ran five-man groups through Leavitt's highly

structured symbol identification task. While he did not obtain the predicted differences, Oskenberg did report that high Machs experienced less enjoyment, less liking for the group, and less desire to work with the same group in the future than lows. Rim (1966) administered six of Kogan and Wallach's (1964) risk-taking problems to fourteen five-man groups who then participated in a group discussion. He found that "subjects scoring high on the Mach scale tend to be influencers in the group discussion, leading to a shift of the whole group in the risky direction" (p.35). Rim's conclusion suggests that high Machs are able to control the process and outcome of a group discussion. High Machs achieve this domination over the group because they initiate and control the group structure. Since they are not distracted by irrelevant affect, high Machs can give complete effort to the task. Geis, Krupert, and Berger (1965) found that high Machs literally take over leaderless discussions. On a post-experimental questionnaire, highs significantly outranked lows on all task criteria including: effectiveness in presenting ideas, listening, quality of ideas, and leadership displayed. However, on a sociometric questionnaire highs were not preferred to lows. In a further study designed to discover whether high Machs would gain control when other members had more at stake, Geis (1968) told group members that one-fourth of their course grade would be determined by a cooperative laboratory project.

Twenty minutes were allocated for members to get acquainted after which the groups were asked to choose a leader. In nineteen groups with a high Mach available, the highest scorer was chosen leader more frequently than any of the lower scoring members.

Taken together, these studies indicate that high Machs behave in such a way that other group members consistently recognize them as task leaders. Because only two studies have examined the interaction process of Machiavellian groups, the methods and style by which high Machs exert their influence remains unclear. Geis (1964) recorded the interaction during the Con Game, but unfortunately she considered only behaviors directly relevant to the game. However, a correlational field study, executed by Hacker and Gaitz (1970) has furnished some clues to the interaction styles of Machiavellians. Using Bales' (1950) method of Interaction Process Analysis, they studied the interaction of a ten-member mental health team over a period of sixty planning conferences. Their results indicated "that a Machiavellian approach to human relations correlates with the tendency to contribute more to a small-group discussion and to favor certain styles of interaction, e. g. asking for information and directing or making suggestions for action and, finally, to making greater use of negative socio-emotional interaction" (Hacker and Gaitz, 1970, p. 100). Deficient in its small sample size and failure to report

observer reliability, Hacker and Gaitz nevertheless contribute the first conscious effort to discover the interaction styles of Machiavellians.

It seems relatively obvious that with the exception of task leadership previous researchers have had little interest in relating Machiavellianism to the process and structural dimensions of small group behavior. As a result, group research employing high and low Machs has neglected systematic treatment of the relationships between the composition of the groups, the group interaction, and the task environment. Christie and Geis (1970) contend that the greatest differences between high and low Mach behavior occur in loosely-structured situations characterized by ambiguity in rules, goals, and rewards; they hypothesize different behavioral tactics for both highs and lows depending on the structure of the task. However, these predicted differences are deduced only from individual observations in game-playing situations where only behaviors relevant to winning, losing, or forming coalitions were observed. Furthermore, in most experiments the groups were composed of a high, a middle, and a low Mach, or all highs and all lows. These researchers make no systematic attempt to vary the degree of heterogeneity within the groups and then observe the concomitant effect on emergent group structure and process. Also, comparisons of results employing different task conditions have largely been between studies,

rather than between different task treatments in the same study. When ambiguity of the situation was used as an independent variable, subjects changed partners at the same time the experimenter changed task conditions. Machiavellian group research has not utilized repeated task conditions on the same groups.

EXPERIMENTAL TASKS

Earlier, this investigator alluded to the fact that this study would be executed from the "interactional" perspective. From this standpoint, where the interaction between the individuals and the situations accounts for most of the variation in behavior, we have to assess both the individual and the situation in order to predict behavior in a specific situation (Magnusson, Gerzen, and Nyman, 1968, p. 297). For this reason predicted differences between high and low Mach behavior are contingent upon the demands of the experimental environment.

At the present stage in small group research, the group task appears to be the most important environmental variable. Recently, a number of social psychologists (Roby and Lanzetta, 1958; Hare, 1962; Shaw, 1963, 1966; Fiedler, 1964; Heslin, 1964; Hoffman, 1965; Weik, 1965; Golembiewski, 1962, 1965; Collins and Guetzkow, 1964; McGrath and Altman, 1966; Morris, 1966; and Hackman, 1968, 1969, 1970) have censured the common practice of disregarding systematic task analysis. Typical of the criticism is Shaw's (1966) allegation that the task

variable is among the most neglected in all of social science research, and Golembiewski's (1965) contention that the paucity of knowledge about task differences and their effects on behavior is one of the greatest weaknesses of small group research. These arguments are well-documented by small group experimentation. For example, Weik (1965) warned organizational experimenters that tasks probably contain more uncontrolled sources of variance than any other components of experiments. This was verified by Heslin (1964) who discovered that experimenters who attempt to predict group performance from member characteristics often find the experimental task emerging as a major source of random error. This random task error frequently becomes the scapegoat for unconfirmed predictions. For example, when Schutz (1955) saw that several of his experimental manipulations had failed, he quickly pointed out that "there had not been sufficient analysis of the tasks given to predict completely the task-induced behavioral differences" (p. 445). Similarly, Hoffman (1959) blamed his failure to achieve predicted differences between homogeneous and heterogeneous groups to "the lack of adequate classification of problem-solving tasks in the psychological literature" (p. 31).

Unlike those using task variance to interpret failure, experimenters who have systematically introduced tasks into their experimental designs have achieved unusual success.

Thorndike (1938) explored the group vs. individual performance question by employing four different tasks: sentence completion, vocabulary, limerick completion, and crossword puzzle. He successfully determined that in the performance of the first three tasks, when the range of possible responses increased, the superiority of groups over individuals increased. Similarly, when Duetsch (1950) compared human relations problems to mathematical problems in cooperative and competitive groups, he found a strong interaction effect between group and task characteristics, which confirmed Carter's (1952) contention that most of group behavior is determined by the group composition, the nature of the group task and goals, and group structure. Apparently, highly-structured tasks (math problems) minimize conflicting differences, whereas loosely-structured tasks (human relations problems) maximize them. Also, Carter, Haythorn, and Howell (1950) found a limit to the generality of leadership performance across tasks. A factor analysis across six tasks yielded two different task types demanding two different leadership abilities. A further study by Hoffman (1960) indicates that tasks differ in both the kinds and amounts of interaction they require from group members. Although he had practically no idea of the dimensions on which his tasks differed, Hoffman found that different types and quantities of inter-personal behavior emerged from each of the four problems, regardless of the other factors operating. Investigating

different empirical questions, Morris (1966), Mann and Mann (1959), Pepinsky, Pepinsky, and Pavlik (1960), Tuckman (1967), and Borgatta (1963), all reached a similar conclusion: tasks significantly influence behavior. Most striking of the above mentioned reports is Morris' (1966) research, where task type significantly affected the dispersion of 60 per cent of group behavior. Results such as these can no longer be ignored because as Hoffman warns "the common practice of not identifying the problem used or stating merely that 'a problem of the human relations variety was used' deprives the researcher on group process of a great deal of important and necessary information for his understanding of the results of the experiment reported" (1960, p. 286).

It seems obvious that experimenters who have recognized the task as a significant source of variation have been rewarded for their efforts. But despite these encouraging results, small group researchers in general have been unable to integrate their findings into a theory of tasks. Two factors contribute to this deficiency. First, like so many other variables in small group research (Golembiewski, 1965; McGrath and Altman, 1966) task research is plagued by highly particularistic efforts. The experimenter participating in continuity research is the exception, not the rule. Secondly, to date no conceptual framework of tasks has been able to stimulate vigorous empirical investigation.

A small program of research emerging from the University of Illinois provides an exception to these criticisms. A series of experiments were undertaken to test the utility of a framework for the analysis of certain task types proposed by Hackman (1968, 1970). Hackman (1968) found that task type determined up to 50 per cent of the variance on relevant product dimensions. Morris (1966) discovered that different task types required different levels and categories of interaction. Kent and McGrath (1969) replicated Hackman's experiment and reported that task type was a more potent determinant of performance than group characteristics. Finally, Hackman and Vidmar (1970) found substantial task type effects regardless of group size. As a composite program of research these studies offer strong support for the task-type conception. However, as a general framework for task analysis it is limited by the fact that it accounts for only one task variable, type. Hackman (1968), himself, recognizes that this framework is insufficiently explicit to be considered a theory. Summarizing the research on task type, he revealed:

What is needed now is a "theory of tasks" which maps out the relations among tasks and task characteristics, and which show how these relate to substantive variables in the small group field. For only as such a theory is developed can tasks be selected for use in group studies with real precision, and can a broader understanding of the role of situational factors in social behavior be achieved (p. 186).

Although no theory of tasks currently exists, the investigator must nevertheless attempt to make meaningful discriminations between his experimental tasks. Hackman (1968) outlines four approaches to systematic task description. The first approach is the task qua task description. In utilizing this domain the researcher attempts to identify "the pattern of stimuli impinging on the subject" (McGrath and Altman, 1966, p. 76). The task characteristics are described independently of the group characteristics. To date, Shaw's (1963) dimensional analysis of 104 group tasks is the most thorough task qua task description.

A second approach conceptualizes tasks in terms of behavior description. Roby and Lanzetta's (1958) report on modal properties of tasks as well as McCormick's (1965) development of industrial job dimensions are typical of the behavior description approach. Job classification in industrial psychology is also based on this method. However, this approach is inadequate for general task description. Hackman (1969) observes that:

Researchers concerned with job and task descriptions in organizational settings have circumvented the (admittedly difficult) problem of making task descriptions in terms of the tasks themselves simply by substituting a dependent variable class for what should have been an independent variable class. That is, if we are interested in the effects of tasks and task characteristics on behavior, it is essential that we develop some method of describing and classifying our independent variables (tasks) other than in terms of the dependent variables

to which we ultimately wish to predict. The task qua task approach offers this possibility; the behavior description approach does not (p. 111).

Industrial psychologists (Sutle, 1946; Ghisseli and Brown, 1955) advocate another approach which is equally inadequate. Describing tasks in terms of personal ability requirements also avoids defining tasks in task terms. Therefore, this method offers little to those concerned with assessing behavioral variance attributed to tasks.

A final method of task description conceptualizes task as behavior requirement. Steiner's (1966) report of task demands and Roby and Lanzetta's (1958) discussion of "critical demands" are representative of this approach. Since behavioral demands vary from task to task they are legitimate traits of tasks rather than persons. While this approach offers considerable promise for the future, no one has yet undertaken a classification of task-determined behavioral requirements. Classifying task dimensions which have potent behavioral effect remains, as Hackman (1969) notes, a high priority research need. Until this is achieved, however, the efficacy of task description as behavioral requirement remains in doubt.

In view of this primitive state of knowledge regarding experimental tasks, the task qua task description appears to be the most logical strategy. Critics of this approach have generally attacked its feasibility rather than its correctness (Hackman, 1969). Altman (1966) believes that there is too

large a gap between independent properties and observable behavior. Another critic, Ferguson (1956) represents a group of psychologists who feel that only actual behavior is appropriate for task description. However, data gathered by several ecological psychologists suggests that just the opposite may be true. Barker (1969) reveals that Barker and Wright (1955) were able to predict many aspects of children's behavior more adequately from a knowledge of the behavior characteristics of their environments than from the children's behavioral tendencies. Several studies reported in Willems and Rausch (1969) further verify this argument. Finally Sells (1963) puts the issue in proper perspective: "If important interaction effects between individual and situational factors are to be studied, the situational measures must be obtained independently of the individual's perspective of them" (Sells, 1963, p. 7).

Task qua task description possesses several advantages over other methods. First, it offers the investigator an analysis of dimensions which are independent of the behaviors which he intends to measure. Second, it can provide precise operational specification of task structure, which is an independent characteristic of the task. Third, Shaw (1963) has completed a thorough investigation in which he scaled 104 tasks on ten task qua task dimensions, and this study is available to the researcher.

STATEMENT OF RESEARCH QUESTIONS AND HYPOTHESES

Separation rather than union has been the modus operandi of previous research pertaining to task and performer characteristics. In contrast, this investigation will seek to determine the significant relationships between the two, particularly in terms of their discriminating power on a variety of dependent variates. The omission of research executed for the purpose of determining relationships is viewed as a serious deficiency. The need to unite these two particular variables (individual and task) was recently commented upon by Hackman (1970):

All of (our) interpretations (on the strong effects of task characteristics) assume, of course, that group performance and member reactions result from an interaction between the demands of the tasks and the characteristics of the individuals performing them. Task characteristics, taken alone, probably can not be very potent in determining member reaction to the group experience or characteristics of the group output. Given the magnitude of the task effects obtained in this research, further investigation of the means by which the interaction between task characteristics and performer characteristics take place would seem to be well worthwhile (p. 51).

Prior research suggests a number of questions and hypotheses in regard to Machiavellianism and task characteristics. It should be recalled that the multiple measures employed in this study will all relate to relationships. For this reason, the present investigator has chosen to use the multiple responses of interaction process, members' reactions, and sociometric choice. In its most general form the overall

research question is: to what extent do different systems of multiple measures of interaction process, members' reactions, and sociometric choice discriminate between Machiavellian member characteristics, the task environment and the interaction of the two?

To date, the usual procedure in multivariate studies has been to reduce research questions into hypotheses which predict no differences between treatment means on the multiple responses employed (Di Salvo, 1971, p33). However, in light of the accumulating evidence (particularly on the task variable), predictions of no differences in all cases are not justifiable. For this reason, where appropriate, this researcher will predict differences. The hypotheses will follow each treatment question. Hypothesis, in the present case, is considered "as a 'working conjecture' about relationships ... derived deductively from a larger theoretical system, or inductively from whatever scanty previous empirical signs existed" (Cattell, 1966, p. 41).

Assuming that the previously mentioned evidence is valid, this experiment will explore the following questions and hypotheses:

I. INTERACTION SCORES

A. Group Interaction Scores

1. Are the sample mean vectors equal for group composition treatments across different systems of interaction variates?

Hypothesis A-1: The mean vectors will differ as a function of the Machiavellian group compositions.

2. Are the sample mean vectors equal for task structure treatments across different systems of interaction variates?

Hypothesis A-2: The mean vectors will differ in the following ways:

- (a) The sample mean vectors will differ across the total system of interaction variates.
- (b) The sample mean vectors for the structured task will be greater than the mean vector for the unstructured task across the task activity subset of interaction variates.
- (c) The sample mean vector for the unstructured task will be greater than the sample mean vector for the structured task across the positive social-emotional subset of interaction variates.
- (d) The sample mean vector for the unstructured task will be greater than the sample mean vector for the structured task across the negative social-emotional subset of interaction variates.

3. Are the sample means equal for the group composition and task structure treatments across different systems of interaction variates?

Hypothesis A-3: No differences are expected.

B. Individual Interaction Scores

1. Do the sample mean vectors of Machiavellian individuals indicate a pre-dispositional difference across different systems of interaction variates?

Hypothesis B-1: The sample mean vectors will indicate the following differences:

- (a) The sample mean vectors will differ across the system of all interaction variates.
- (b) The sample mean vectors will be greater for high Machs than for low Machs across the task activity subset of interaction variates.
- (c) The sample mean vectors will be greater for low Machs than for high Machs across the positive social-emotional subset of interaction variates.
- (d) The sample mean vector will be greater for high Machs than for low Machs across the negative social-emotional subset of interaction variates.

2. Do the sample mean vectors differ for task structure across different systems of interaction variates?

Hypothesis B-2: The sample mean vectors will differ in an identical way with Hypothesis A-2.

3. Do the sample mean vectors differ for the Machiavellian individuals and task structure across different systems of interaction variates?

Hypothesis B-3: No differences are expected.

4. Are the sample mean vectors for individuals belonging to homogeneous Machiavellian groups equal across different systems of interaction variates?

Hypothesis B-4: The sample mean vectors for homogeneous groups will differ in the following ways:

- (a) The sample mean vectors of individuals belonging to homogeneous groups will differ across the system of all interaction variates.
- (b) The sample mean vectors for the homogeneous high Mach members will be greater than the sample mean vectors for the homogeneous low Mach members across the task activity subset of interaction variates.
- (c) The sample mean vectors for the homogeneous low Mach members will be greater than the sample mean vectors for the homogeneous high Mach members across the positive social-emotional subset of interaction variates.
- (d) The sample mean vectors for the homogeneous high Mach members will be greater than the sample mean vectors for the homogeneous low Mach members across the negative social-emotional subset of interaction variates.

5. Are sample mean vectors equal for task structure across different systems of interaction variates?

Hypothesis B-5: The sample mean vectors will differ for task structure in an identical way with Hypothesis A-2 and B-2.

6. Are sample mean vectors equal for individuals belonging to homogeneous Mach groups and task structure across different systems of interaction variates?

Hypothesis B-6: No differences are expected.

7. Do the sample mean vectors of high Machiavellian individuals belonging to groups composed of a proportionately different Machiavellian membership indicate different patterns of interaction across different systems of interaction variates? (i.e. Is a high Mach's interaction differentially affected by the group of persons he is interacting with?)

Hypothesis B-7: No differences are expected.

8. Are the sample mean vectors equal for task structure across different systems of interaction variates?

Hypothesis B-8: The sample mean vectors will differ in an identical way with Hypotheses A-2, B-2, and B-5.

9. Are the sample mean vectors of high Machiavellian individuals belonging to groups comprised of a proportionately different Machiavellian membership and task structure equal across different systems of interaction variates?

Hypothesis B-9: No differences are expected.

10. Do the sample mean vectors of low Machiavellian individuals belonging to groups composed of proportionately different Machiavellian membership indicate different patterns of interaction across different systems of interaction variates? (i.e. Is a low Mach's interaction differentially affected by the group of persons he is interacting with?)

Hypothesis B-10: Differences are expected but the magnitude and direction of these differences are unknown.

11. Are the sample mean vectors equal for task structure across different systems of interaction variates?

Hypothesis B-11: The sample mean vector will differ in an identical way with Hypotheses A-2, B-2, B-5, and B-8.

12. Are the sample mean vectors of low Machiavellian individuals belonging to groups composed of proportionately different Machiavellian membership and task structure equal across different systems of interaction variates?

Hypothesis B-12: No differences are expected.

C. Group Structure

1. Are the sample mean vectors equal for group composition treatments across different systems of interaction structure variates? (i.e. Is interaction structure related to Machiavellian member composition?)

Hypothesis C-1: Differences are expected, but the magnitude and direction of these differences are unknown.

2. Are the sample mean vectors equal for task structure treatments across different systems of interaction structure variates?

Hypothesis C-2: The sample mean vector for the structured task treatment will be greater than the mean vector for the unstructured task across all systems of interaction structure variates.

3. Are the sample mean vectors equal for group composition and task structure treatments across different systems of interaction structure variates?

Hypothesis C-3: No differences are expected.

4. Are the sample mean vectors equal for the homogeneously composed groups across different systems of interaction structure variates?

Hypothesis C-4: The sample mean vector for the homogeneous high groups will be greater than the sample mean vector for the homogeneous low groups across all systems of interaction structure variates.

5. Are the sample mean vectors equal for task structure treatments across different systems of interaction structure variates?

Hypothesis C-5: The sample mean vectors will differ in an identical way with Hypothesis C-2.

6. Are the sample mean vectors equal for the homogeneously composed groups and task structure treatments across different systems of interaction structure variates?

Hypothesis C-6: No differences are expected.

II. GROUP MEMBERS' REACTIONS

1. Do the sample mean vectors of Machiavellian individuals indicate a pre-dispositional difference across a system of group members' reactions:

Hypothesis 1: The sample mean vector for low Machiavellian persons will be greater than the sample mean vector for high Machiavellian persons across a system of group members' reactions.

2. Are the sample mean vectors equal for the task structure treatments across a system of group members' reactions?

Hypothesis 2: Differences are expected, but the direction and magnitude of differences are unknown.

3. Are the sample mean vectors equal for Machiavellian individuals and task structure across a system of group members' reactions?

Hypothesis 3: No differences are expected.

4. Are the sample mean vectors equal for individuals belonging to differently composed homogeneous groups across a system of group members' reactions?

Hypothesis 4: The sample mean vector for homogeneously composed low Mach groups will be greater than the sample mean vector for homogeneously composed high Mach groups across a system of group members' reactions.

5. Are the sample mean vectors equal for the task structure treatments across a system of group members' reactions?

Hypothesis 5: Differences are expected, but the direction and magnitude of differences is unknown.

6. Are the sample mean vectors equal for the homogeneously composed Mach groups and the task structure treatments across a system of group members' reactions?

Hypothesis 6: No differences are expected.

7. Do the sample mean vectors of high Machiavellian individuals belonging to groups composed of a proportionately different Machiavellian membership indicate that high Machiavellian responses across a system of group members' reactions are a function of the group composition? (i.e. Are high Mach's responses differentially affected by the persons he interacts with?)

Hypothesis 7: No differences are expected.

8. Are the sample mean vectors equal for the task structure treatments across a system of group members' reactions?

Hypothesis 8: Differences are expected, but the direction and magnitude of differences is unknown.

9. Are the sample mean vectors equal for high Machiavellian individuals belonging to groups composed of a proportionately different Machiavellian membership and task structure treatments across a system of group members' reactions?

Hypothesis 9: No differences are expected.

10. Do the sample mean vectors of low Machiavellian individuals belonging to groups composed of a proportionately different Machiavellian membership indicate that low Machiavellian responses across a system of group members' reactions are a function of the group composition? (i.e. Are low Mach's responses differentially affected by the persons he interacts with?)

Hypothesis 10: Differences are expected, but the direction and magnitude of differences are unknown.

11. Are the sample mean vectors equal for the task structure treatments across a system of group members' reactions?

Hypothesis 11: Differences are expected, but the direction and magnitude of differences are unknown.

12. Are the sample mean vectors equal for low Machiavellian individuals belonging to groups composed of a proportionately different Machiavellian membership and task structure treatments across a system of group members' reactions?

Hypothesis 12: No differences are expected.

III. SOCIOMETRIC CHOICE

1. Is the sample mean vector equal for Machiavellian individuals across a system of choice variates?

Hypothesis 1: The mean vectors of the low Machs' selective preference for high Machs will be greater than any other mean vector.

2. Are the sample mean vectors equal for task structure across a system of choice variates?

Hypothesis 2: Differences are expected, but the direction and magnitude of differences are unknown.

3. Are the sample mean vectors equal for Machiavellian individuals and task structure across a system of choice variates?

Hypothesis 3: No differences are expected.

4. Do the sample mean vectors of high Machs rating other high Machs across a system of choice variates indicate a dependence on their group composition membership? (i.e. Is a high Mach's rating of another high Mach differentially affected by the others he interacts with?)

Hypothesis 4: No differences are expected.

5. Are the sample mean vectors equal for task structure across a system of choice variates?

Hypothesis 5: Differences are expected, but the direction and magnitude of differences are unknown.

6. Are the sample mean vectors equal for high Machs rating other high Machs from different group compositions and task structure across a system of choice variates?

Hypothesis 6: No differences are expected.

7. Do the sample mean vectors of high Machs rating low Machs across a system of choice variates indicate a dependence on their group composition membership? (i.e. Is a high Mach's rating of a low Mach differentially affected by the others he interacts with?)

Hypothesis 7: No differences are expected.

8. Are the sample mean vectors equal for task structure across a system of choice variates?

Hypothesis 8: Differences are expected, but the direction and magnitude of differences are unknown.

9. Are the sample mean vectors equal for high Machs rating low Machs from different group compositions and task structure across a system of choice variates?

Hypothesis 9: No differences are expected.

10. Do the sample mean vectors for low Machs rating high Machs across a system of choice variates indicate a dependence on their group composition membership? (i.e. Is a low Mach's rating of a high Mach differentially affected by the others he interacts with?)

Hypothesis 10: Differences are expected, but the direction and magnitude of differences are unknown.

11. Are the sample mean vectors equal for task structure across a system of choice variates?

Hypothesis 11: Differences are expected, but the direction and magnitude of differences are unknown.

12. Are the sample mean vectors equal for low Machs rating high Machs from different group compositions and task structure across a system of choice variates?

Hypothesis 12: No differences are expected.

13. Do the sample mean vectors of low Machs rating other low Machs across a system of choice variates indicate a dependence on their group composition membership? (i.e. Is a low Mach's rating of another low Mach differentially affected by the others he interacts with?)

Hypothesis 13: Differences are expected, but the direction and magnitude of differences are unknown.

14. Are the sample mean vectors equal for task structure across a system of choice variates?

Hypothesis 14: Differences are expected, but the direction and magnitude of differences are unknown.

15. Are the sample mean vectors equal for low Machs rating other low Machs from different group compositions and task structure across a system of choice variates?

Hypothesis 15: No differences are expected.

Chapter II.

METHOD

The purpose of this chapter is to describe the research design, procedures, and the statistical treatments used in this experiment. Included in this description will be the operational specification of both the dependent and independent variables, the selection of subjects, and the actual experimental procedures used during the execution of the experiment.

EXPERIMENTAL DESIGN

A 5 X 2, Type I, mixed factorial design suggested by Lindquist (1953) and Edwards (1968) was used to test the hypotheses generated in Chapter I. In this design, each of the B treatments in combination with one A treatment is given to the same subjects, but each A treatment is given to a different group of subjects. Treatment A is defined as group composition; treatment B is defined as task structure. In treatment A, the total group composition acts as a stimulus to the individual group member. Five different group compositions, representing all possibilities for four-person groups based on a dichotomized criterion variable were used, but each S was exposed to only one. A schematic representation of the experimental design, along with a legend for the group composition levels, appears in Figure 1.

TREATMENT VARIABLES

Group composition. Scores on Christie's Mach V test

Figure 1
Schematic Representation of
the Design of the Experiment

		B Treatment	
		Unstructured Task	Structured Task
A Treatment	Group 1		
	Group 2		
	Group 3		
	Group 4		
	Group 5		

Legend

Group 1	4 high Machs
Group 2	3 high Machs, 1 low Mach
Group 3	2 high Machs, 2 low Machs
Group 4	1 high Mach, 3 low Machs
Group 5	4 low Machs

constituted the operational specification for the tendency toward interpersonal manipulation. The Mach V version was chosen over the Mach IV because of its demonstrated success in measuring "covert" Machiavellianism. Previous research has indicated that a person's assessment of another's Machiavellianism is more closely related to that person's covert Machiavellian traits (Mach V) than to overt (that which he is willing to admit) traits (Mach IV) (Hacker and Gaitz, 1970, p. 96). Since sociometric choice was earlier determined as a variate of interest, Mach V was selected. Frequently, in the past, experimenters have administered both versions of the scale and used consistency above and below the median to classify their subjects. A pilot experiment demonstrated that the academic quarter system did not provide sufficient time to employ such a procedure in a group composition experiment.

It was decided to place S's into experimental groups on the basis of their Mach V scores. A computer program (Tucker and Bochner, 1970) written in Fortran IV was utilized in order to achieve faster scoring. A pilot study (N = 245) demonstrated that the program was congruent with Christie and Geis' (1970) scoring suggestions. For the purposes of this experiment, low Machiavellianism was defined as those scores falling below the twenty-fifth percentile, and high Machiavellianism was defined as those scores falling above the seventy-fifth percentile. Thus if an individual's score fell below the

twenty-fifth percentile (94 or below) he was said to possess an orientation toward interpersonal relations marked by openness and a tendency toward becoming affectively involved with others, and if an individual's score fell above the seventy-fifth percentile (106 or above) he was said to possess an orientation toward interpersonal relations marked by a disregard for affective states and a tendency toward control of others. Scores on this version of the test can range from 20 (low Mach) to 140 (high Mach). Means and standard deviations for the total population are reported in Table 1.

TABLE I

Population Means and Standard Deviations for the Mach V Test

<u>N.</u>	<u>Mean</u>	<u>S. D.</u>
355	101.45	9.02

A frequency distribution of the obtained Mach V scores below the twenty-fifth percentile and a frequency distribution of the obtained scores above the seventy-fifth percentile are reported in Table II.

Once their Machiavellian membership was determined, S's were randomly placed into one of the experimental group conditions. High Machs were ineligible for membership in the homogeneous low Mach groups and low Machs were ineligible for membership in the homogeneous high Mach groups.

TABLE II
Mach V Population Sample Scores For
Bottom Quartile (Low Machs)

<u>Score Interval</u>	<u>Frequency</u>
77-82	3
83-88	24
89-94	58
	<hr/>
Total	85

Mach V Population Sample Scores For
Top Quartile (High Machs)

<u>Score Interval</u>	<u>Frequency</u>
105-110	64
111-116	34
117-122	16
123-128	2
129-134	1
	<hr/>
Total	117

Task Structure. The degree of task structure was identified as the second treatment variable. The two tasks adopted for this study were defined in task qua task terms similar to those described by Shaw (1963) in his dimensional analysis of group tasks. Working under a Naval research grant, Shaw requested 40 judges to rate 104 tasks on ten descriptive (task qua task) dimensions. The judges used a sort-resort method, similar to Thurstone and Chave's (1929) attitude scaling procedure. Estimates of scale values as well as estimates of reliability were computed for each of the ten dimensions across all 104 tasks. A factor analysis performed on the most reliable data yielded five independently meaningful task dimensions. Factor II is of special interest to the present investigator. Shaw labeled this factor solution multiplicity because, in essence, it determines to what degree there is more than one solution to the problem. Following rotation, variables loading high on this factor were: (1) decision verifiability, $-.7264$; goal path multiplicity, $.9266$; and solution multiplicity, $.9905$. Tasks which have high scale values on this factor have many possible solutions which are acceptable, many alternatives for achieving these solutions, and no solution which can be easily verified (Shaw, 1963). This factor served as an operational specification for task structure. The researcher assumed that highly unstructured tasks contain vague instructions for goal achievement, many

possible solutions, and little opportunity for verifying the correctness of the solution. Structured tasks, on the other hand, contain explicit instructions, few possible solutions, and relatively easy verification. Fiedler (1964) added goal clarity to these three dimensions for his operational definition of task structure in the contingency theory of leadership. In the present study, goal clarity is eliminated for two reasons. First, it is by far the most inconsistently rated of Shaw's ten dimensions. Only one-third of the tasks were reliably placed on this dimension. Second, it does not load highly on Factor II and presumably is independent of the other three dimensions. An outline of the two tasks selected for this research along with their scale and reliability estimates (Shaw, 1963) appears below:

Task 1 ... Unstructured

<u>Scale values</u>	<u>Q values</u>
Goal path multiplicity 7.23	1.64
Solution multiplicity 7.26	1.28
Decision verifiability 0.91	1.80

Adapted from Festinger and Hutte (1954) this task describes an interpersonal problem between two friends who are both in love with the same girl. One of the fellows is incurably ill, but only the other fellow knows this.

Task 2 ... Structured

<u>Scale values</u>	<u>Q values</u>
Goal path multiplicity 1.86	2.70
Solution multiplicity88	1.70
Decision verifiability 7.32	0.86

Adapted from Gaier and Bass (1955) this task requires the group to rank order six United States cities according to their population in a recent census.

The results of a pilot experiment indicated that a wide dispersion of average total interaction frequencies existed

between the two tasks. Apparently, the unstructured task required a greater number of communicative acts than did the structured one. For this reason, Task 2 was expanded by the inclusion of six additional cities.

A number of experienced small group researchers were informed of this change and reported no reason to believe this would result in significantly changed scale values. A copy of the two tasks along with their accompanying scale values appears in Appendix D.

DEPENDENT VARIABLES

I. Measurement of Interaction Process

Two coders, unaware of the nature of the study, were trained in the use of Interaction Process Scores (IPS; Borgatta, 1962; Borgatta and Crowther, 1965) which is, essentially, a modification and expansion of Bales' Interaction Process Analysis (1950). The training period began during the fall quarter, 1970, with the coding of written protocols. After achieving satisfactory reliability ($r = .80$) on the written protocols, the coders were invited to observe and record live case study discussions in the undergraduate group communication course. During all live discussions, the coders were instructed to consider each statement as a unit of interaction. Statement was defined as "the word, sentence, or longer passage of an individual that follows such a participation by one member and continues until it is terminated by an appreciable pause or by

the participation of another member" (Stephan and Mishler, 1952, p. 600).

Following the in-class observation drills, the coders participated in a pilot experiment involving twenty-four separate one-hour groups. Unfortunately, computed agreement estimates on the pilot experiment were unsatisfactory (8 of the 18 categories fell below .65). Continued training was therefore required. This additional training period included stop-start coding of both audio and video tape recordings. After a total training period of fifty hours, the minimum acceptable agreement level which had been set at .70 for each category prior to the pilot study was reached. To eliminate the possibility of an angle view effect on reliability the seating position of the coders was interchanged (counter-balanced) during each experimental session.

IPS includes eighteen categories, but only twelve were utilized in this study. A description of the twelve categories used appears in Borgatta and Crowther (1965). The pilot experiment indicated that social acknowledgements (IPS categories 1 and 2) usually were disposed of before the actual discussions began. In addition, the time limitations placed on this study (S's were available for only seventy-five minutes) and the nature of the tasks, precluded sufficient activity in several of the negative social-emotional categories for meaningful inference. For these reasons, IPS categories 1, 2, 9, 15, 17

and 18 were eliminated from use in the main experiment. The coders were instructed to use them when appropriate, but they were eliminated from the analysis. Twelve categories remained, exactly the same number included in Bales' (1951) original system.

Three of Borgatta's most stable factors were selected as appropriate for multivariate subsystem analysis. For a validation and replication of these three factors, see Borgatta (1962). These factors were labeled Activity Rate, Socio-Emotional Support, and Antagonistic Behavior. Factor loadings, category numbers, and brief descriptions for each factor are listed in Table III.

TABLE III
Subsystem Choices Selected From Borgatta's (1962) Factor Analysis

<u>Category No.</u>		<u>Subsystem I</u>	
		<u>Description</u>	<u>Loading</u>
IPS	8	Gives evaluation	.89
IPS	12	Draws attention	.78
IPS	4	Acknowledges	.42
IPS	11	Gives information	.41
IPS	14	Disagrees	.37
IPS	6	Procedural suggestion	.36
IPS	5	Shows agreement	.30
		<u>Subsystem II</u>	
IPS	3	Laughs	.83
IPS	10	Redirected aggression	.60
IPS	16	Tension increase	.51
		<u>Subsystem III</u>	
IPS	14	Disagrees	.35
IPS	6	Procedural suggestion	.26

For the purpose of inference, Factor I was specified as task-related activity, Factor II was specified as positive socio-emotional behavior, and Factor III was specified as negative socio-emotional behavior.

II. Interaction Structure

The present study sought to determine, among other things, the Machiavellian pre-dispositional and group composition influences on those dimensions of group structure related to task and social-emotional behaviors. Arnoff and Messé (1971) recently pointed out that group structure, or "the organization through which the group carries out its functions is not simply reflected in the raw frequencies of...distribution of such acts across group members" (p. 319).

Group structure scores were computed for both the tasks according to the formula presented by Arnoff and Messé (1971). The proportion of each individual's acts to his group's total score for each category was tabulated for each of the twelve categories, as well as the total acts. Then, the expected mean proportion (i.e. .25, the resultant value if all four members contributed equally to the total score) was subtracted from each of these values. The obtained deviation scores were then summed across members, disregarding sign. For purposes of analysis, the more closely the absolute deviation score approached zero, the more closely the distribution of acts in that category were considered to be equalitarian or undifferentiated. The higher the group score, the more differentiated or

hierarchical its structure in that category.

Arnoff and Messe have made a valuable contribution to future group structure analysis, but their univariate data analysis was rejected for use in the present study. Rather than examine each category separately "to measure more precisely the extent to which personality characteristics differentially influenced their distribution within a group," the present investigator decided to analyze the categories as systems, so that the correlations between the structuring of different acts would not be disregarded. Again Borgatta's factor analysis provided the guidelines for selection of the relevant systems. However, categories 10 and 16 were eliminated from the analysis because in the former case the frequencies were too low for meaningful analysis, and in the latter case (as Borgatta suggests) the distribution is practically always equalitarian. Twelve variates were included in the final analysis.

III. Member Reaction Questionnaires

A questionnaire labeled "member's reactions" was administered to each subject after each task. It consisted of eighteen items dealing with a diversity of possible reactions to the group experience. Thirteen of the items were derived from Hackman's (1970) research on group size and task type. The remaining five items were taken from Dunnette, Campbell, and Jaasted's research on industrial job satisfaction (1963).

These deal specifically with the individual's performance, liking of other members, and involvement with the group. Each item was accompanied by a seven-point Likert-type scale anchored on the respective ends by "not at all true" and "very true" or reasonable variations. The items are presented in Appendix E.

In order to determine what this questionnaire was actually measuring, the data from 256 observations was subjected to a factor analysis (orthogonal rotation). The results of this factor analysis are reported in Table IV.

TABLE IV
Rotated Factor Matrix Loadings For Eighteen Likert Scales (N=256)

<u>Variable No.</u>	<u>Factor I</u>	<u>Factor II</u>	<u>Factor III</u>
1	.093	-.150	.450
2	-.020	-.622*	.178
3	.134	-.555*	.161
4	.065	-.524*	.170
5	.106	-.685*	.040
6	.040	-.489*	-.152
7	.068	-.242	.492*
8	.067	.174	-.105
9	.043	.257	-.053
10	.020	-.176	.583*
11	.125	-.108	.637*
12	.084	-.383	.190
13	.727*	.134	.131
14	.336	-.240	.505*
15	.266	-.078	.731*
16	.430	-.269	.338
17	.904*	.053	.159
18	.569*	-.157	.114

*Denotes variables chosen for system and subsystem analysis.

The results suggested that three dimensions of members' reactions were being discriminated. The first factor was labeled Task Involvement. The three scales loading high on this factor were: I was interested in this problem; How much did you enjoy working on this problem?; and How would you feel if I told you that your group did not do a good job on this task? Factor II was labeled Perception of Group Climate. This factor included the following variables: There was too much competition among the group members; There were considerable differences in ability and competence among the group members; There was much disagreement among the members of the group on this task; Some people in the group talked too much; I talked too much. Factor III, Perception of Acceptance by the Group, was comprised of: Considering the entire problem-solving session, my opinion was given adequate consideration by the other group members; I felt inhibited from expressing my feelings during the group discussion; I had considerable influence in determining my group's final written solution to the task; How satisfied were you with your own performance on this task?

Four variables failed to load highly on any of the three factors. These variables were assumed to be irrelevant and were deleted from the statistical analysis. Variable number one was also deleted because its' loading shifted substantially from a previous factor analysis and it did not logically corre-

spond to the other variables comprising Factor III.

IV. Sociometric Scales

Six sociometric scales, developed by Schutz and reported by Hoffman (1960), were used to measure perceived role activity. These scales, which were labeled "Your Reaction To Your Other Group Members' Problem Solving Activities," required the participants to rate each other group member on each of six role activities across a seven-point scale. The roles included were: guidance or supervision of the problem discussion, promotion of personal relations, participation in the discussion, influence over the problem solution, contribution of ideas, and attempts to be liked by the other members. These scales are reported in Appendix E.

PROCEDURES

Subjects. Subjects in this experiment were undergraduate male students enrolled in the Speech 102 course at Bowling Green State University during the Spring Quarter, 1971. The decision to use males was based on the report (Christie and Geis, 1970) that a wide dispersion existed between male and female scores on the test (proportionately few females score high). A further consideration was Jandt's (1969) conclusion that the sex variable can significantly affect group interaction.

The Mach V test was administered to 355 male students. On the basis of their scores, 202 subjects were assigned to the study. Of these, 128 actually participated in the experiment.

Since each subject participated in both tasks, there were 256 total observations. All of the subjects were required by a course regulation to participate in a research project outside of class time.

Administration of the Mach Test. During the second week of the Spring Quarter, all Speech 102 instructors administered the Mach Test to the male students attending the television lecture. All of the instructors were required to follow a standard set of instructions which had been pretested in a pilot study. Essentially, these instructions were designed to motivate the students to complete the test as honestly as they could. As such they followed the suggestions of Locke (1968) and were similar to those used successfully by Di Salvo (1970). The directions accompanying the students' test forms were identical to those used by Christie in his research. A copy of the Mach V test is reported in Appendix A.

Scheduling of Subjects. During the first week of the Spring Quarter, all Speech 102 students were asked to record their class schedules on a form provided by their instructors. These schedules were then used by the researcher to assign research appointments to the subjects. Each subject received two separate assignment slips informing him of his scheduled time, date, and room. At least ten other research projects were being conducted at the same time, so the subject did not know the specific nature of his assignment until he actually reported.

The experiment was executed over a three-week period beginning Monday, April 26 and ending Thursday, May 13, 1971. Each night, four groups were scheduled into consecutive one-hour time slots, from 6:00 PM to 10:00 PM, except for the final night when only three groups were assigned.

Group Composition. After assigning all 102 subjects a number (odd numbers for low Machs and even numbers for high Machs), a table of random numbers was used to produce the thirty-five four-man groups. Of these thirty-five original groups, three were not used because of subject mortality (i.e. fewer than four subjects attended that particular hour).

Throughout the initial creation of the groups, a University telephone directory and class rosters were used to insure that S's were not grouped with roommates or speech classmates. After the thirty-five groups had been composed, the sixty-four remaining subjects were randomly assigned to different groups as alternates.

EXECUTION OF THE EXPERIMENT

Nine different male research assistants, each working a different night, were employed to conduct the experiment. Because of the complexity and length of the procedures, the assistants were requested to follow a three-page set of standardized instructions (see Appendix B for a copy of the Instructions for Experimenters). Each assistant met with the experimenter and reviewed the instructions for

approximately forty-five minutes prior to the start of the experiment. Following this meeting they received the subject assignment list and the first task for the 6:00 group. In all cases, the order of presentation of the tasks was counter-balanced to eliminate any confounding primacy or recency effect.

At five minutes past the hour, the research assistant entered the subject waiting-room. He proceeded to take attendance and assign code numbers to the four persons who comprised the experimental group. High Machs were assigned even numbers (2, 4, 6, 8), and low Machs were assigned odd numbers (1, 3, 5, 7). The subjects and research assistant were unaware of the meaning of these numbers.

After the code numbers had been assigned, the assistant led the four subjects into the experimental room. The alternates were requested to remain in the other room for further instructions. Soon after, these alternates were administered a short questionnaire, which related to another person's research, and dismissed.

When the four S's arrived in the experimental room, they were instructed to sit in the seats which corresponded to their code numbers. An IBM card with an accompanying code number had earlier been placed at the foot of each chair. The seating arrangement was counterbalanced within each group composition condition as well as within time periods and days. Figure 2 shows the approximate construction of the room.

Once the S's were seated in the proper chairs, the assistant read the following message to them:

Before we begin our study in group discussion there are a few things we feel we must honestly tell you. As you probably know, the mirrors in this room are transparent. Behind the mirrors are two persons who will be observing your discussion. The chief purpose of this study is to see how persons solve problems. The observers behind the mirror will be taking notes on how your group solves its problems. Although both audio and video equipment is available in the room, neither will be used. No transcripts of any kind will be made. (Pause) You may now turn over the general instruction sheet and read it.

This message was constructed in accordance with Bales' (1950) tradition of informing subjects that they are being observed:

The background knowledge that observations are being taken probably has some effect on the subjects' behavior, but most of them seem to accept the mirrors as a part of the conventional boundaries of their situation and go on about their business very much as usual. It appears that the knowledge of observation is not a particularly disrupting factor possibly because we are all used to being observed in social situations, at least in an informal sense. It is disturbing, however, to suspect that one may be under observation, without actually knowing. It is our general practice, therefore, to make the situation clear in a matter-of-fact way (p. 1).

The pre-discussion instructions were designed to reduce any remaining subject anxiety. (See Appendix C.) The subjects were informed that they were competing with students at other universities who were working on similar problems to determine if it is true that students at private universities do better

than those at state universities. To maximize involvement, the S's were also told that their peers have done well on similar problems and that the group whose two solutions were judged "best" would receive a 20-dollar cash reward.

When the subjects finished reading the instructions, the assistant distributed the first task. He was instructed to tell the group to read the directions and the task, and then begin their discussion. When they were finished, they were to write their solution on the Group Solution Form, which had been placed on the floor in the center of the group, and knock on the door. At that time the assistant would return.

Each task required approximately twenty minutes of discussion time. The observers began coding the interaction as soon as the assistant left the room. They discontinued their observation as soon as the group solution had been written.

Following the knock on the door, the assistant re-entered the room, collected the Group Solution forms, and distributed envelopes containing the self-report measures to each subject. At no time were the S's requested to use their names; the questionnaire contained only their code numbers. The first three pages of the questionnaires contained the sociometric scales. The S's were informed that on each of the first three pages they were to rate the behavior of the group member who corresponded to the code number written in red at the top of each page. These code numbers were counterbalanced to eliminate

the possible effect of the same person being rated first or last by all other group members. Eighteen items comprising the member's reaction form appeared on the final two pages. While the S's completed the questionnaire, the assistant took an unobtrusive position near the door.

When all of the subjects had completed their forms, they were instructed to put them back into the coded envelopes and return them to the assistant. Then the assistant distributed the second task along with the same instructions to the S's concerning their procedures, and left the room.

When they finished the second task, an S knocked on the door and the assistant returned. After the tasks and solutions were collected, the assistant again administered the dependent variable envelopes, requested the S's to follow the same procedures in responding to the items, and took an unobtrusive seating position.

Following the completion of these, the assistant collected the envelopes and distributed one final form, a task evaluation questionnaire designed to test the operational specification of task structure. (See Appendix F.) When all forms, tasks, and instructions had been finished and collected, the assistant read a final statement to the S's:

You have now completed your participation in this study. We want to thank each of you very much for your cooperation. About forty more groups, each similar to yours, will be participating in this study, so we would appreciate it if you would not tell anyone what you

did here tonight. In about three weeks your drill instructor will deliver to you detailed information about the purpose and results of this study. Thank you.

The S's were then dismissed. Each experimental session lasted between sixty and seventy-five minutes. Only one group was conducted at a time. Each group followed the same instructions.

Chapter III

RESULTS

Statistical Analysis

This study was designed to determine the extent to which group and individual interaction, group structure, group members' reactions and sociometric choices are affected by Machiavellian member characteristics and task structure. The multiple independent and multiple dependent variables necessitated a multivariate statistical analysis. The decision to apply multivariate statistics was based on the need "to determine how and to what extent the independent variables explain or predict the responses of the subjects represented in the dependent variables" (Bock and Haggard, 1968, p. 100). Traditionally, researchers have attempted to reach this end by assessing each response separately through the uni-response method of ANOVA. However, this procedure ignores and fails to account for the existing correlations between responses (Smith, Gnanadesikan, and Hughes, 1962). Cramer and Bock (1966) recently observed several other important errors associated with the application of univariate procedures to multivariate problems:

...Such a procedure inevitably forces the investigator to pick out and interpret the largest t or F statistic, correlation coefficient, or whatever, often from rather large numbers of nonindependent statistics and of course, increases the probability of errors of the first kind to levels far above their nominal values. Since the educational literature is undoubtedly already biased toward studies in which chance was favor-

able to the outcome (i.e. results of significance tests influence the acceptance of papers for publication), uncritical selection of and emphasis on a few variables which show significance in multivariate studies are bound to increase the reporting of findings which will not replicate. For the most part, this problem may be avoided by the use of multivariate statistical methods when the data are multivariate. The investigator then has the protection of an exact test of the treatment effect which is comprehensive of all variables simultaneously (p. 605).

The multivariate analysis of variance and discriminant function analyses were performed on an IBM 360 computer at the BGSU Computational Services Center. Finn's Multivariate-Univariate and Multivariate Analysis of Variance and Covariance: A Fortran IV program was used. Initial checks were made on the data by comparing results to computer runs on some of the same data employing the BMD X69 program as well as Cramer's (MANOVA).

Since one set of observations came from the subjects and another set was generated by observers, it was necessary to perform at least two separate multivariate analyses. In addition, the nature of the experimental hypotheses necessitated shifts in the statistical design which correspondingly increased the number of separate analyses. A total of fifteen separate analyses were performed. A description of these tests follow:

I. Likert Scales (Group Members' Reactions)

A. A 2 X 2 Multivariate Analysis of Variance (hereafter referred to as MANOVA) was performed on all lows against all highs regardless of their group composition condition. This analysis was used to test hypotheses regarding predispositional differences.

B. A 2 X 2 MANOVA was performed on lows who participated in homogeneous groups against highs who participated in homogeneous groups. This analysis was used to test the homogeneous group association hypotheses.

C. A 4 X 2 MANOVA was performed which contrasted the highs in each experimental group composition condition. In other words, the highs from homogeneous groups were compared with the highs in the 3-1, 2-2, and 1-3 groups. This analysis was used to determine whether highs were differently affected by their co-workers.

D. A 4 X 2 MANOVA was performed which contrasted the lows in each experimental group composition condition. In other words, the lows from homogeneous groups were compared with the lows in 1-3, 2-2, and 3-1 groups. This analysis was used to determine whether lows were differentially affected by their co-workers.

II. Sociometric Scales (Choice)

A. A 4 X 2 Manova was performed which compared the four choice conditions across the six scales. These were highs rating highs, highs rating lows, lows rating highs, and lows rating lows. This analysis was used to test the hypotheses concerning dispositional rating differences.

B. Four separate 3 X 2 MANOVAS were performed to test hypotheses concerning cell differences in rating behavior. The first 3 X 2 compared the three conditions (4-0, 3-1, 2-2, 1-3) in which highs rated lows. The second 3 X 2 compared the three conditions (3-1, 2-2, 1-3) in which highs rated lows. The third 3 X 2 compared the three conditions (1-3, 2-2, 3-1) in which lows rated highs. The final 3 X 2 compared the three conditions (0-4, 1-3, 2-2) in which lows rated lows.

III. Group Structure Scores

A. A 5 X 2 MANOVA was performed on the group structure scores. This analysis was used to test the group structure hypotheses.

IV. Group Interaction (IPS Total Group Percentages)

A. A 5 X 2 MANOVA was performed on the IPS total group percentage scores. The method by which these scores were calculated is given below. This analysis was used to test the hypotheses regarding patterns of group interaction.

V. Individual Interaction Patterns (IPS Percentages)

A. Four separate MANOVAS, two 2 X 2 and two 4 X 2, were performed on these scores. The organization of the data as

well as the purposes for these analyses exactly correspond to those for the Likert Scales.

In order to execute a meaningful analysis of variance on the interaction data the raw frequencies were converted to percentages. These frequencies were determined by calculating the mean score per subject, between the two observers, on each category. Whether such data actually fits the linear assumptions in the analysis of variance is open to debate (see for example Bereiter, 1966, and Anderson, 1961). Clearly, the issue has yet to be resolved. The decision to use variance analysis was ultimately based on this writer's agreement with Games and Klare (1967):

Assigning numbers to test performances is one of the procedures involved in trying to relate them to, or predict, other performances (usually expressed in numbers). Suppose an experiment is run in which one group receives a treatment hypothesized to increase aggressiveness, and another group serves as a control. The hypothesis tested is always concerned with the empirical test scores, not with hypothetical inner dimensions. We learn by such experimentation the extent to which the entire process is accurate and useful. If it works--great! The complaint that the numbers do not form a ratio or interval scale is irrelevant... we take issue with the notion that the usefulness of statistical indices such as the mean and standard deviation is limited to situations in which the investigator can prove the internal characteristics of the numbers obtained by his measuring operations (pp. 477-478).

DECISION MODEL

Multivariate analysis of variance has at least four statistics for testing the null hypothesis. The four most frequently used are: (1) Roy's largest root statistic, (2) Wilk's

likelihood ratio statistic, (3) Hotelling's generalized T^2 statistic, (4) Pillai's criterion (Pillai and Jayachandran, 1967).

In the present study, Wilk's likelihood ratio is reported for each test of the equality of mean vectors. The probability level for rejection of the null or acceptance of the experimental hypothesis was set at .05. The Wilk's test is reported for both overall and subsystem analyses. When the overall system ratios exceeded the alpha level, the subsystem analyses were used to determine what systems were contributing the most to the overall system effect. When only two levels were involved (as in all cases of the main effects test on the task variable), estimated combined means and least square estimates were reported. These were used to assess the general directional trend in the data.

When more than two levels were involved, other procedures were used. First, estimated combined means and least square estimates were reported for each level. Then the discriminant function coefficients for each criterion were reported. The highest coefficients were chosen as the "maximal separators" and were used in the scalar parametric tests which followed. In order to find the confidence intervals for the scalar comparisons, Roy's criterion was calculated. The calculations of the simultaneous confidence intervals followed the procedures outlined by Ray and Bose (1953), Morrison (1967), and Di Salvo

(1971). The results of these procedures along with the standard errors of the least square estimates ($\delta\psi$) are reported for each hypothesis test.¹

Multivariate tests have frequently been criticized on the grounds that they are only suitable to test overall differences and are difficult to interpret because they fail to detect individual differences (Rao, 1961). This limitation was magnified in the present study when several sets of scalar comparisons failed to yield even a single significant difference, despite an overall significant Wilk's ratio. Since the same results were achieved when these calculations were replicated by other researchers, it would appear that scalar comparisons are limited in their usefulness. When these comparisons failed, the researcher was forced to adopt a less powerful procedure. This procedure involved a search for the highest interpretable least square estimates between levels, on the best discriminating variables. In light of the current limitations, this procedure appears to yield reasonably legitimate estimations, although they are not statistically significant.

PRELIMINARY STATISTICAL PROCEDURES

Prior to testing the hypotheses, two preliminary statistical measures were calculated. First, observer-to-observer agree-

¹The data decks used for all analyses, along with the printouts and computational procedures for each table reported in this chapter can be obtained by writing to the author. There will be a minimal charge for duplicating the computational procedures, as well as for postage.

ment was estimated through the use of Pearson product moment correlations.

TABLE V
Observer-To-Observer Agreement Using
Interaction Process Scores System

<u>IPS No.</u>	<u>Correlation Coefficient</u>
3	.96
4	.87
5	.91
6	.90
7	.85
8	.92
10	.93
11	.93
12	.87
13	.96
14	.93
16	.99
Total	.98

The correlations reported in Table V indicate that all of the I. P. S. data exceeded the acceptable agreement levels which had been set at .70.

The second preliminary statistical procedure was a multivariate and three separate univariate analyses of variance to test the operational specification of the task variable. Specifically, these tests were executed to determine the validity of the scale values reported by Shaw (see Chapter II).

TABLE VI
Means, Multivariate and Univariate Analysis
of Variance on Task Evaluation Questionnaire

	Means		
	<u>Decision Verifiability</u>	<u>Goal Path Multiplicity</u>	<u>Solution Multiplicity</u>
Task 1 (Unstructured)	4.250	5.940	5.716
Task 2 (Structured)	6.379	4.448	3.155

Multivariate Analysis of Variance			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
Task	3,228	40,7983	<.0001

Univariate Analysis of Variance				
<u>Variable</u>	<u>Mean Square</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
Decision Verifiability	262.97	1,230	44.77	<.001
Goal Path Multiplicity	129.00	1,230	28.66	<.001
Solution Multiplicity	380.21	1,230	65.12	<.001

Results from Table VI suggest that significant differences exist between the tasks taken as both a correlated system and as three independent measures. Also, the differences between the means are in the same direction as the differences between the scale values reported by Shaw. On the basis of this evidence, it was concluded that the experimental specification of task structure was successful.

TESTS OF HYPOTHESES

INTERACTION SCORES

Group Interaction Scores. The first question concerning group interaction scores asked whether the sample mean vectors were equal for group composition treatments across different systems of interaction variates. Hypothesis A-1 predicted that the mean vector would differ, but the direction of this difference was not predicted. The 5 X 2 MANOVA reported in Table VII supports the hypothesis. Both the overall system and System I main effect test for group composition were significant. From these results it is apparent that System I (task activity) made the major contribution to the overall system. To determine the sources of these differences, least square estimates, discriminant function analysis, and scalar comparisons were executed for each dependent variable and level. These are reported in Tables VIII and IX. The discriminant coefficients showed that variate 2 (acknowledges), variate 6 (gives evaluation), and variate 9 (draws attention) maximally separated the groups. Although no scalar comparisons were significant, the least square estimates indicated several interpretable trends. For "showing agreement" the highest interpretable differences were between groups 1 and 4, 2 and 4, and 3 and 4. These contrasts indicated that there was a higher proportion of agreement in group 4 (three low Machs and one high Mach) than in any of the others (all highs, three highs-

TABLE VII
5 X 2 Multivariate Analysis of Variance
Test of Equality of Mean Vectors
(Group Composition x Task)

I. P. S.--Total Group Percentages (P = 12)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Composition)	48,167.6792	1.50	<.0316
B (Task)	12,43	13.39	<.0001
AB (Composition x Task)	48,167.6792	less than 1	n.s.

System I (P = 7)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	28,174.4887	1.94	<.0054
B	7,48	16.97	<.0001
AB	28,174.4887	1.09	n.s.

System II (P = 3)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	12,137.8705	1.28	n.s.
B	3,52	less than 1	n.s.
AB	12,137.8705	less than 1	n.s.

System III (P = 2)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	8,106	less than 1	n.s.
B	2,53	2.47	n.s.
AB	8,106	less than 1	n.s.

TABLE VIII

Cell Means and Discriminant Function
Coefficients For System I Significant (A)
Main Effect Reported in Table VII

Level	Y ₂	Y ₃	Y ₄	Y ₆	Y ₈	Y ₉	Y ₁₁
1	.047	.105	.020	.171	.127	.033	.038
2	.050	.142	.021	.177	.109	.043	.058
3	.043	.127	.016	.215	.094	.038	.024
4	.081	.150	.019	.218	.102	.056	.033
5	.054	.155	.021	.197	.098	.055	.037

Discriminant Function

.6742 .2011 .0694 .4845 -.4305 .4092 -.0486

Denotes variables which maximally separate
levels in the Test of the Hypothesis

TABLE IX

Contrasts (ψ) Between Cell Means On the
Maximally Discriminating Dependent Variables
For System I Significant (A) Main Effect
Reported in TABLE VII

Levels of Contrast	Y ₂	Y ₆	Y ₉
1-2	-.003	-.006	-.010
1-3	.004	-.044*	-.005
1-4	-.034*	-.047*	-.023*
1-5	-.007	-.026	-.022*
2-3	.007	-.038*	.005
2-4	-.031*	-.041*	-.013
2-5	-.004	-.020	-.012
3-4	-.038*	-.003	-.012
3-5	-.011	.018	-.017
4-5	.027	.021	.001

*Indicates the highest interpretable contrasts.

one low, two highs-two lows). On category 6, "gives evaluation," the highest interpretable differences were between 1 and 3, 1 and 4, and 2 and 3, 2 and 4. These differences indicated that as the proportion of low Machs in the group increased, the amount of opinion-giving increased. This was true as long as there was at least one high Mach in the group, because the homogeneous low group did not appear to differ from the others. Contrasts on the final category showed that "drawing attention" was considerably more prevalent in groups 4 and 5, those with the highest low Mach membership, than in group 1, the homogeneous high Mach group.

The second question in regard to group interaction scores asked whether the mean vectors were equal for task structure treatments across the different systems of interaction variates.

TABLE X

Estimated Combined Means, Least Square Estimates ($\hat{\psi}$),
and Standard Errors of the Least Square Estimates ($\hat{\sigma}_{\hat{\psi}}$),
For System I Significant (B) Main Effect Reported in

TABLE VII

Dependent Variable	(P = 7)		$\hat{\psi}$	$\hat{\sigma}_{\hat{\psi}}$
	$\bar{X}$ Task 1	$\bar{X}$ Task 2		
2	.076	.034	.042	.006
3	.154	.118	.036	.012
4	.016	.023	-.007	.004
6	.211	.180	.030	.011
8	.082	.130	-.048	.010
9	.059	.031	.028	.004
11	.045	.030	.015	.009

Hypothesis A-2 predicted several differences, as well as the direction of many of these differences. In regard to these hypotheses, the MANOVAS reported in Table VII and least square estimates reported in Table X indicate the following:

- (1) Acceptance of Hypothesis (a) that the mean vectors would differ across the overall system.
- (2) Rejection of Hypotheses (c) and (d). There are no differences in the recorded proportion of social-emotional behavior, either positive or negative.
- (3) Rejection of the directional prediction in Hypothesis (b). Although the mean vectors differed, only in category 11, "gives information," was the vector mean greater for the structured task than for the unstructured task. Since this category was not a major discriminator, it was concluded that the unstructured task required a greater proportion of task activity than the structured task.

The final question concerning the Group Interaction Scores was: Are the sample mean vectors equal for the group composition and task structure treatments across different systems of interaction variates. The null hypothesis of no difference was accepted on the basis of results reported in Table VII.

Individual Interaction Scores. The questions and hypotheses regarding individual predispositional differences were tested by a 2 X 2 MANOVA which is presented in Table XI. The first question was answered affirmatively. The results did suggest that a predispositional interaction difference exists between high and low Mach individuals.

Based on the results of the MANOVA and a report of the least square estimates in Table XII, the following assessment of Hypothesis B-1 was made:

TABLE XI
2 X 2 Multivariate Analysis of Variance
Test of Equality of Mean Vectors
(Individual Machiavellianism x Task)

Overall System I. P. S. (P = 13)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Mach)	13,240	2.70	<.0015
B (Task)	13,240	11.01	<.0001
AB (Mach x Task)	13,240	less than 1	n.s.
System I (P = 7)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	7,246	1.43	n.s.
B	7,246	15.36	<.0001
AB	7,246	less than 1	n.s.
System II (P = 3)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	3,250	4.57	<.0039
B	3,250	less than 1	n.s.
AB	3,250	less than 1	n.s.
System III (P = 2)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	2,251	less than 1	n.s.
B	2,251	3.23	<.0414
AB	2,251	less than 1	n.s.

TABLE XII

Estimated Combined Means, Least Square Estimates ($\hat{\psi}$),
 and Standard Errors of the Least Square Estimates ($\sigma\hat{\psi}$)
 For Significant (A) System II Main Effect and (B) System
 I and III Main Effects Reported in TABLE XI

(P = 3)							
<u>Dependent</u>	<u>Variable</u>	<u>X</u>	<u>Highs</u>	<u>X</u>	<u>Lows</u>	<u>($\hat{\psi}$)</u>	<u>($\sigma\hat{\psi}$)</u>
1			.170		.130	.040	.016
7			.008		.003	.005	.002
12			.031		.024	.007	.009

(P = 7)							
<u>Dependent</u>	<u>Variable</u>	<u>X</u>	<u>Task 1</u>	<u>X</u>	<u>Task 2</u>	<u>($\hat{\psi}$)</u>	<u>($\sigma\hat{\psi}$)</u>
2			.068		.033	.035	.006
3			.158		.125	.033	.010
4			.015		.020	-.005	.003
6			.214		.173	.041	.011
8			.080		.124	-.044	.008
9			.053		.033	.020	.005
11			.047		.033	.014	.006

(P = 2)							
<u>Dependent</u>	<u>Variable</u>	<u>X</u>	<u>Task 1</u>	<u>X</u>	<u>Task 2</u>	<u>($\hat{\psi}$)</u>	<u>($\sigma\hat{\psi}$)</u>
4			.015		.020	-.005	.003
11			.047		.033	.014	.006

(1) The acceptance of Hypothesis (a); the mean vectors differ across the overall system. The major contribution to this system came from System II..

(2) The rejection of Hypothesis (b) and (d); the mean vectors were not different for either task activity or negative social-emotional activity.

(3) The rejection of the directional prediction in Hypothesis (c). Although the mean vectors differed, they did so in the opposite direction from the prediction. There were greater proportions of positive social-emotional behavior among high Machs than there were among lows.

Question 2 was also answered affirmatively. There was a difference in the mean vectors for task structure across different systems of interaction variates. Hypothesis B-2 was assessed as follows:

(1) The acceptance of Hypothesis (a); the mean vectors differed across the overall system. Major contributions to this system came from System I and System III.

(2) The rejection of the directional prediction in Hypothesis (b). As in the example of the group hypothesis, only category 11, a low discriminator, differed in the predicted direction. Instead, task activity was greater for the unstructured task than for the structured task.

(3) The rejection of Hypothesis (c). No task differences existed for the positive social-emotional categories.

(4) The acceptance of Hypothesis (d); the mean vectors across the negative social-emotional categories was greater for the unstructured task than for the structured task.

Question 3 concerned whether there would be an interaction between Machiavellianism and task structure across different systems of interaction variates. The null hypothesis (B-3) was accepted.

Hypotheses concerned with questions 4, 5 and 6 were tested by a 2 X 2 MANOVA. The sample size was reduced because only

individuals from homogeneous groups were compared. The results of the MANOVA are reported in Table XIII. Each of the questions was answered affirmatively. The mean vectors were different for the Machiavellian individuals, for the task structure, and for the interaction between Machiavellianism and task structure. Morrison (1967) contends that row and column main effects become unimportant when interactions are found, so the decision was made to disregard the hypotheses dealing with Questions 4 and 5. Cell means and a discriminant function analysis were executed on the System II interaction, since it appeared to be the major contributor to the overall AB effect. Then scalar comparisons were calculated for each cell comparison on the maximum discriminators. The results of these tests are reported in Tables XIV and XV. Category 10, "redirected aggression," and category 16, "tension increase," were chosen as the best discriminators. The means of cell 12 (the homogeneous high Machs working with the structured task) were different from the means of cell 11 (the homogeneous high Machs working with the unstructured task), cell 21 (the homogeneous low Machs working on the unstructured task), and cell 22 (the homogeneous low Machs working with the structured task), for both interaction criteria. In each case, the means of cell 12 were greater than the means of the other three cells.

TABLE XIII

2 X 2 Multivariate Analysis of Variance

Test of Equality of Mean Vectors

(Individual Machs From Homogeneous Groups x Task)

Overall System I. P. S. (P = 13)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Mach)	13,80	4.66	<.0001
B (Task)	13,80	4.86	<.0001
AB (Mach x Task)	13,80	2.10	<.0232
System I (P = 7)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	7,86	3.60	<.0020
B	7,86	6.68	<.0001
AB	7,86	less than 1	n.s.
System II (P = 3)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	3,90	8.30	<.0001
B	3,90	1.92	n.s.
AB	3,90	6.97	<.0003
System III (P = 2)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	2,91	less than 1	n.s.
B	2,91	1.97	n.s.
AB	2,91	less than 1	n.s.

TABLE XIV
Cell Means and Discriminant Function Coefficients
For System II Significant (AB) Interaction
Reported in TABLE XIII

<u>Cells</u>	Y_1	Y_7	Y_{12}
11	.2096	.003	.008
12	.1946	.012	.043
21	.1242	.004	.013
22	.1042	.002	.000
<u>Discriminant Function</u>			
	.0254	.4554*	.9120*

*Denotes variables which maximally separate levels in the Test of the Hypothesis

TABLE XV
Contrasts (ψ) Between Cell Means on the Maximally
Discriminating Dependent Variables For System II
Significant AB Interaction Reported in TABLE XIII

<u>Cells of Contrast</u>	Y_7	Y_{12}
11 and 12	-.009*	-.035*
21 and 22	.002	.013
11 and 21	-.001	-.005
12 and 22	.010*	.043*
11 and 22	.001	.008
12 and 21	.008*	.030*
(Standard Error Roy Bose Constant 2.857	(.0014)	(.0029)

*Denotes significant difference using Roy's Criterion at .05 level of confidence.

Question 7 was concerned with whether the sample mean vectors of high Machs who participated in differently composed groups (4-0, 3-1, 2-2, 1-3) would be equal across different systems of interaction variates. Table XVI reports the results of a 4 X 2 MANOVA used to test hypotheses B-7, B-8, and B-9. Hypothesis B-7, that no differences would occur was rejected. Differences occurred in both the overall system and System I. Since System I was the major contributor to the significant main effect, discriminant analysis and scalar comparisons were executed on the task activity categories. The results of these tests are reported in Table XVII and Table XVIII. Variate 8 (category 11--"gives information") and variate 11 (category 14--"disagrees") were chosen as the maximal separators. Scalar comparisons yielded no significant differences, but the least square estimates revealed several interpretable trends. On category 11 the greatest contrasts were between 1 and 4 (all high vs. 1 high -- 3 lows) and 2 and 4 (3 highs vs. 1 high -- 3 lows). The means of levels 1 and 2 were greater than the mean of level 4. On category 14 the greatest contrasts were between 2 and 3 and 2 and 4. The mean of level 2 was greater than the means of both 3 and 4.

TABLE XVI

4 X 2 Multivariate Analysis of Variance

Test of Equality of Mean Vectors

(High Machs--out of cells x Task)

Overall System I. P. S. (P = 13)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Mach)	39,320.5588	1.93	<.0012
B (Task)	13,108	6.13	<.0001
AB (Mach & Task)	39,320.5588	1.00	n.s.
System 1 (P = 7)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	21,327.8965	2.38	<.0008
B	7,114	8.25	<.0001
AB	21,327.8965	1.22	n.s.
System II (P = 3)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	9,287.3315	1.61	n.s.
B	3,118	less than 1	n.s.
AB	9,287.3315	1.54	n.s.
System III (P = 2)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	6,238	1.57	n.s.
B	2,119	1.25	n.s.
AB	6,238	less than 1	n.s.

TABLE XVII

Cell Means and Discriminant Function Coefficients For
System I Significant (A) Main Effect Reported in TABLE
XVI

<u>Level</u>	Y_2	Y_3	Y_4	Y_6	Y_8	Y_9	Y_{11}
1	.040	.109	.016	.169	.122	.036	.043
2	.049	.145	.021	.181	.111	.040	.057
3	.037	.127	.011	.218	.090	.041	.030
4	.085	.158	.019	.226	.069	.051	.025
<u>Discriminant Function</u>							
	-.6133	-.3837	.1058	-.6059*	.5307*	-.0975	.3680*

*Denotes variables which maximally separate levels in the Test
of the Hypothesis

TABLE XVIII

Contrasts ($\hat{\psi}$) Between Cell Means on the Maximally
Discriminating Dependent Variables For System I
Significant (A) Main Effect Reported in TABLE XVI

<u>Levels of Contrast</u> ($\hat{\psi}$)	Y_4	Y_6
1-2	.011	-.014
1-3	.032	.013
1-4	.053*	.018
2-3	.021	.027*
2-4	.042*	.032*
3-4	.021	.005

*Indicates the highest interpretable contrasts

Question 8 asked whether the sample mean vectors were equal for task structure across different systems of interaction variates. As reported in Table XVI, the variation between the mean vectors was significant. In order to assess the hypotheses, a post hoc analysis of the means and least square estimates for the System I significant main effect was undertaken. The results are reported in Table XIX.

TABLE XIX

Estimated Combined Means, Least Square Estimates ($\hat{\psi}$),
and Standard Errors of the Least Square Estimates ($\hat{\sigma}\hat{\psi}$)
For System I Significant (B) Main Effect Reported in

TABLE XVI

(P = 7)					
<u>Dependent</u>	<u>Variable</u>	<u>$\bar{X}$ Task 1</u>	<u>$\bar{X}$ Task 2</u>	<u>$\hat{\psi}$</u>	<u>$\hat{\sigma}\hat{\psi}$</u>
2		.075	.031	.044	.010
3		.146	.123	.023	.013
4		.015	.018	-.003	.005
6		.220	.177	.042	.018
8		.070	.126	-.054	.013
9		.050	.034	.016	.007
11		.047	.031	.016	.010

In regard to the hypotheses the following conclusions were drawn:

(1) The acceptance of Hypothesis (a); the sample mean vectors for task structure differed across the overall system of variates.

(2) The rejection of Hypotheses (c) and (d). No differences were found on either positive or negative social-emotional variates.

(3) The rejection of the directional prediction in Hypothesis (b). Once again, the mean vectors differed, but only in the case of one category, 11, was the direction of difference congruent with the prediction.

Table XVI also indicates that there was no interaction between the four levels of high Machiavellian composition and task structure. Therefore, the null hypothesis (B-9), was accepted.

A similar 4 X 2 MANOVA was computed for the groups in which low Machs participated. The purpose of this analysis was to determine whether the low Mach's interaction patterns were differentially affected by the group members with whom he was interacting. The results are reported in Table XX. Differences were predicted, but the direction of these differences was not. As Table XX indicates, both System I and System II variations were significant. Post hoc discriminant analysis and scalar comparisons were therefore computed. Tables XXI and XXII show the results of these tests for System I.

For the task activity system, variate 2 (category 4--"acknowledges,"), variate 3 (category 5--"shows agreement"), and variate 11 ("disagrees") were chosen as the maximal discriminators. Scalar comparisons again were non-significant. However, least square estimates indicated the following trends:

(1) For "acknowledges," the mean vector for level 2 (lows participating in the 3 low-1 high condition) was higher than the mean vectors for level 3 (2-2 groups) and level 4 (1 low-3 high groups).

TABLE XX

4 X 2 Multivariate Analysis of Variance

Test of Equality of Mean Vectors

(Low Machs--out of cells x Task)

Overall System I. P. S. (P = 13)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Mach)	39,320.5588	1.27	n.s.
B (Task)	13,108	7.20	<.0001
AB (Mach x Task)	39,320.5588	less than 1	n.s.

System I (P = 7)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	21,327.8965	1.74	<.0239
B	7,114	10.39	<.0001
AB	21,327.8965	1.07	n.s.

System II (P = 3)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	9,287.3315	2.50	<.0091
B	3,118	less than 1	n.s.
AB	9,287.3315	1.89	<.0536

System III (P = 2)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	6,238	1.34	n.s.
B	2,119	2.59	n.s.
AB	6,238	less than 1	n.s.

TABLE XXI

Cell Means and Discriminant Function Coefficients For
System I Significant (A) Main Effect Reported in TABLE XX

<u>Level</u>	Y_2	Y_3	Y_4	Y_6	Y_8	Y_9	Y_{11}
1	.055	.162	.022	.917	.095	.052	.037
2	.064	.163	.016	.220	.107	.052	.040
3	.038	.115	.019	.183	.094	.037	.020
4	.041	.164	.005	.169	.092	.027	.048

Discriminant Function

-.6640* -.6741* -.0452 -.4599 -.2833 -.3669 -.6943*

*Denotes variables which maximally separate levels in the Test of the Hypothesis

TABLE XXII

Contrasts ($\hat{\psi}$) Between Cell Means on the Maximally
Discriminating Dependent Variables For System I
Significant (A) Main Effect Reported in TABLE XX

<u>Levels of Contrast</u> ($\hat{\psi}$)	Y_2	Y_3	Y_{11}
1-2	-.009	-.001	-.003
1-3	.007	.047*	.017*
1-4	.014	-.002	.011
2-3	.026*	.048*	.020*
2-4	.023*	-.001	-.008
3-4	-.003	-.049*	-.028*

*Indicates the highest interpretable contrasts

(2) For "shows agreement," the mean vector for level 3 (2-2 groups) was lower than each of the others.

(3) For "disagrees," the mean vector for level 3 (2-2 groups) was again lower than each of the others.

The results for the discriminant analysis and contrasts for System II are reported in Tables XXIII and XXIV. Variate 12 (Category 16--"tension increase") was the maximal separator of the low Machs. Again, scalar comparisons were non-significant. However, several high contrasts did suggest that level 3 low Machs (2-2 groups) differed from each of the other three levels in "tension increase." In each contrast, the mean vector for 3 was greater.

TABLE XXIII

Cell Means and Discriminant Function Coefficients For
System II Significant (A) Main Effect Reported in TABLE XX

<u>Level</u>	<u>Y₁</u>	<u>Y₇</u>	<u>Y₁₂</u>
1	.114	.003	.007
2	.122	.001	.015
3	.155	.005	.070
4	.164	.003	.029
<u>Discriminant Function</u>			
	.4181	.3515	.8929*

*Denotes variables which maximally separate levels in the Test of the Hypothesis

TABLE XXIV

Contrasts (ψ) Between Cell Means on the Maximally
Discriminating Dependent Variables For System II
Significant (A) Main Effect Reported in TABLE XX

<u>Levels of Contrast</u>	Y_{11}
1-2	-.008
1-3	-.063*
1-4	-.022
2-3	-.055
2-4	-.014
3-4	.042*

*Indicates the highest interpretable contrasts

The results in Table XX again show that the mean vectors for task structure were significantly different. Thus, question 11 was answered affirmatively. Table XXV reports the least square estimates and estimated cell means for the two levels of task structure.

TABLE XXV

Estimated Combined Means, Least Square Estimates ($\hat{\psi}$),
and Standard Errors of the Least Square Estimates ($\hat{\sigma}\hat{\psi}$)
For System I (B) Main Effect Reported in TABLE XX

		(p = 7)			
<u>Dependent</u>	<u>Variable</u>	<u>$\bar{X}$ Task 1</u>	<u>$\bar{X}$ Task 2</u>	<u>$\hat{\psi}$</u>	<u>$\hat{\sigma}\hat{\psi}$</u>
2		.068	.032	.036	.011
3		.172	.130	.042	.019
4		.011	.020	-.009	.006
6		.214	.171	.043	.017
8		.076	.117	-.041	.013
9		.050	.034	.016	.009
11		.039	.034	.005	.009

The results and direction of differences correspond to the same analysis for the tasks discussed by high Mach individuals. For this reason, Hypothesis (a) was accepted; Hypothesis (c) and (d) were rejected; and the directional hypothesis (b) was rejected. No interaction effect was found. For this reason, the null hypothesis (B-12) was accepted.

GROUP STRUCTURE SCORES

A 5 X 2 MANOVA was computed on the deviation scores, for the purpose of answering questions 1, 2, and 3, and testing the hypotheses associated with these questions. The results of this test appear in Table XXVI. The sample mean vectors for the group composition conditions were shown to be equal, thus Hypothesis C-1 was rejected.

TABLE XXVI

5 X 2 Multivariate Analysis of Variance

Test of Equality of Mean Vectors

(Group Composition x Task)

I. P. S. (Group Structure Scores) (P = 11)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Composition)	44,170.2875	1.38	n.s.
B (Task)	11,44	3.43	<.0017
AB (Composition x Task)	44,170.2875	less than 1	n.s.
System I I. P. S. (P = 8)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	32,174.9226	1.22	n.s.
B	8,47	4.31	<.0007
AB	32,174.9226	1.01	n.s.
System II I. P. S. (P = 3)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	12,137.8705	1.34	n.s.
B	3,52	less than 1	n.s.
AB	12,137.8705	1.37	n.s.

The sample mean vectors for task structure were significantly different. Therefore, question 2 was answered affirmatively and Hypothesis C-2 was accepted. This difference necessitated further analysis. To determine the direction of the structure differences, estimated combined means and least square estimates were recorded. These results are reported in Table XXVII.

These results indicate that for most of the task-related criteria, a more equalitarian structure occurred in the discussion of the structured task than in the discussion of the unstructured task. Only one sizable difference in the opposite direction appeared. This showed up on category 8, "gives evaluation."

Hypothesis C-3, which assumed that no interaction effect would be found was also accepted. The mean vectors of group composition and task structure across the different systems of interaction structure variates were equal.

TABLE XXVII

Estimated Combined Means, Least Square Estimates ($\hat{\psi}$),
and Standard Errors of the Least Square Estimates For
System I Significant (B) Main Effect Reported in TABLE XXVI

<u>Dependent Variable</u>	(P = 8)			
	<u>$\bar{X}$ Task 1</u>	<u>$\bar{X}$ Task 2</u>	<u>$\hat{\psi}$</u>	<u>$\hat{\sigma}_{\hat{\psi}}$</u>
2	.803	.654	.149	.080
3	.429	.440	-.010	.045
4	1.195	.900	.295	.090
6	.392	.536	-.144	.049
7	.580	.504	.076	.061
8	.734	.726	.008	.074
9	.618	.559	.059	.064
11	.324	.350	-.025	.031

GROUP MEMBERS' REACTIONS (Likert Scales)

Hypotheses relating to predispositional differences in members' reactions were tested by a 2 X 2 MANOVA which compared high Machs with low Machs regardless of groups they participated in. On the basis of the results reported in Table XXVIII Hypothesis 1 which predicted differences between the highs and lows was accepted, Hypothesis 2 which predicted differences between tasks was not accepted, and the null hypothesis 3 was accepted. In addition to a significant overall system effect for Machiavellianism, each of the three system reanalysis effects for Machiavellianism were also significant.

TABLE XXVIII

2 X 2 Multivariate Analysis of Variance

Test of Equality of Mean Vectors

(Individual Machiavellianism x Task)

Overall System (P = 13)			
Likert Scales			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Mach)	13,240	3.03	<.0004
B (Task)	13,240	1.02	n.s.
AB (Mach x Task)	13,240	1.06	n.s.
System I (P = 3)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	3,250	5.42	<.0013
B	3,250	2.03	n.s.
AB	3,250	1.44	n.s.
System II (P = 5)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	5,248	3.80	<.0025
B	5,248	1.07	n.s.
AB	5,248	less than 1	n.s.
System III (P = 5)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	5,248	3.07	<.0105
B	5,248	1.31	n.s.
AB	5,248	1.37	n.s.

An inspection of the cell means and least square estimate results followed. See Table XXIX.

TABLE XXIX

Estimated Combined Means, Least Square Estimates ($\hat{\psi}$), and Standard Errors of the Least Square Estimates For Significant (A) Main Effect Reported in TABLE XVII

Dependent Variable	$\bar{X}$ Highs	$\bar{X}$ Lows	$\hat{\psi}$	$\hat{\sigma}_{\hat{\psi}}$
1	5.844	6.221	-.367	.174
2	4.906	5.594	-.688	.225
3	5.297	5.906	-.605	.187
4	5.688	6.016	-.328	.195
5	5.734	5.641	.093	.201
6	5.672	5.766	-.094	.178
7	6.219	6.313	-.094	.172
8	4.805	4.852	-.047	.221
9	4.125	5.016	-.891	.245
10	5.016	5.734	-.712	.191
11	4.625	5.070	-.445	.199
12	4.117	4.859	-.742	.224
13	3.664	4.398	-.734	.249

These computations showed that low Machs were more involved with the tasks, perceived a more cooperative group climate, and perceived greater acceptance of their contributions than did the high Machs. They consistently responded by using the more favorable end of the scale.

Hypotheses 4, 5, and 6 related to the differences in the homogeneous groups. A 2 X 2 MANOVA, comparing only individuals who participated in homogeneous high Mach groups and homogeneous low Mach groups tested these hypotheses. Table XXX presents the results.

TABLE XXX
 2 X 2 Multivariate Analysis of Variance
 Test of Equality of Mean Vectors
 (S's from Homogeneous Groups x Task)

Overall System (P = 13)			
Likert Scales			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Mach)	13,80	2.68	<.0036
B (Task)	13,80	less than 1	n.s.
AB (Mach x Task)	13,80	1.63	n.s.
System I (P = 3)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	3,90	6.37	<.0006
B	3,90	less than 1	n.s.
AB	3,90	2.19	n.s.
System II (P = 5)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	5,88	2.35	<.0470
B	5,88	1.21	n.s.
AB	5,88	1.83	n.s.
System III (P = 5)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	5,88	2.01	n.s.
B	5,88	1.45	n.s.
AB	5,88	2.02	n.s.

The significant main effect for Machiavellianism supported Hypothesis 4. The mean vectors for individuals participating in differently composed homogeneous groups were not equal. System I, "task involvement," and System II, "perception of group climate," produced the major contributions to this overall main effect. Estimated means and least square estimates reported in Table XXXI once again revealed the low Machs' greater involvement with the task and more favorable perception of the group climate.

TABLE XXXI

Estimated Combined Means, Least Square Estimates ($\hat{\psi}$),
and Standard Errors of the Least Square Estimates ($\hat{\sigma}_{\hat{\psi}}$)
For Significant (A) Main Effect Reported in TABLE XXX

<u>Dependent Variable</u>	(P = 13)		<u>$\hat{\psi}$</u>	<u>$\hat{\sigma}_{\hat{\psi}}$</u>
	<u>$\bar{X}$ Highs</u>	<u>$\bar{X}$ Lows</u>		
1	5.812	6.208	-.396	.279
2	4.896	5.812	-.916	.378
3	5.167	6.042	-.875	.284
4	5.687	6.042	-.354	.307
5	5.667	6.000	-.333	.303
6	5.646	5.833	-.187	.300
7	6.000	6.458	-.458	.306
8	4.687	4.792	-.104	.377
9	4.146	5.500	-1.354	.367
10	5.021	5.896	-.875	.296
11	4.562	5.042	-.479	.339
12	4.187	5.083	-.896	.345
13	3.771	5.125	-1.354	.376

However, the results of the MANOVA failed to support Hypothesis 5. No differences were found in the mean vectors

of the two tasks across the members' reaction variates. The failure to find a significant interaction effect resulted in the acceptance of Hypothesis 6, which was a null hypothesis.

A 4 X 2 MANOVA performed on the four different group compositions involving high Machs is reported in Table XXXII. Both main effects and the interaction for the overall system failed to reach statistical significance. These results supported Hypothesis 7, which predicted that high Mach responses would not be differentially affected by co-workers. Since no interaction effect between high Machs and task structure was disclosed by these results, Hypothesis 9 was also accepted.

The significant System III main effect for task partially supported Hypothesis 8. Although the overall system vectors were equal, task variation did occur on the "perception of acceptance by the group" factor. The means and least square estimates for the two tasks across the System III variates are reported in Table XXXIII.

From these results, it is apparent that the unstructured task produced greater perception of acceptance than the structured task.

TABLE XXXII
 4 X 2 Multivariate Analysis of Variance For
 Test of Equality of Mean Vectors
 (High Machs--out of cells x Task)

Overall System (P = 13)			
Likert Scales			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Mach)	39,320.5588	less than 1	n.s.
B (Task)	13,108	1.41	n.s.
AB (Mach x Task)	39,320.5588	less than 1	n.s.
System III* (P = 5)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	15,320.6262	1.19	n.s.
B	5,116	.238	<.0430
AB	15,320.6262	less than 1	n.s.
*System F-Ratios for I and II were not significant and therefore are not reported.			

TABLE XXXIII

Estimated Combined Means, Least Square Estimates ($\hat{\psi}$),
and Standard Errors of the Least Square Estimates ($\hat{\sigma}_{\hat{\psi}}$)
For Significant (B) Main Effect Reported in TABLE XXXII

<u>Dependent Variable</u>	(P = 5)		<u>$\hat{\psi}$</u>	<u>$\hat{\sigma}_{\hat{\psi}}$</u>
	<u>$\bar{X}$ Task 1</u>	<u>$\bar{X}$ Task 2</u>		
6	5.769	5.589	.180	.279
7	6.183	6.323	-.140	.295
8	5.088	4.720	.368	.362
10	5.292	4.695	.597	.344
11	4.984	4.375	.609	.316

Group compositions in which low Machs participated were also subjected to a 4 X 2 MANOVA. Results are shown in Table XXXIV. These results indicate a significant low Mach main effect, but no task or interaction effect. Thus, Hypothesis 10, which predicted a task main effect, was rejected, and Hypothesis 12, which predicted no interaction differences was accepted.

In order to determine the differences in the four levels of low Machiavellianism, which produced this overall effect, discriminant analysis followed by scalar comparisons were executed on the data. These are illustrated in Tables XXXV and XXXVI.

Two scales maximally separated the groups in System I, the major contributor to the significant overall effect. Scalar comparisons on these two items indicated the following:

TABLE XXXIV
 4 X 2 Multivariate Analysis of Variance For
 Test of Equality of Mean Vectors
 (Low Machs--out of cells x Task)

Overall System (P = 13)			
Likert Scales			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Mach)	39,320.5588	1.63	<.0126
B (Task)	13,108	less than 1	n.s.
AB (Mach x Task)	39,320.5588	less than 1	n.s.

System I* (P = 3)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A	9,287.3315	4.53	<.0001
B	3,118	less than 1	n.s.
AB	9,287.3315	less than 1	n.s.

*System F-Ratios for II and III were not significant and therefore are not reported.

TABLE XXXV

Cell Means and Discriminant Function
Coefficients For Significant System I (A)
Main Effect Reported in TABLE XXXIV

<u>Level</u>	Y_9	Y_{12}	Y_{13}
1	5.500	5.083	5.125
2	4.667	4.714	3.976
3	4.167	4.083	2.833
4	5.897	5.857	5.857
<u>Discriminant Function</u>			
	.4082*	-.0546	.8450*

*Denotes variables which maximally separate levels in the Test of the Hypothesis.

TABLE XXXVI

Scalar Parametric Functions On Maximally
Discriminating Dependent Variables For
Significant System I (A) Main Effect Reported
In TABLE XXXIV

<u>Levels of Contrast</u> ($\hat{\psi}$)	Y_9	Standard Error	Y_{13}	Standard Error
1-2	.833	.454	1.149	.484
1-3	1.333	.454	2.292*	.484
1-4	-.357	.516	.732	.550
2-3	.500	.454	1.143	.484
2-4	-1.190	.524	-1.881	.558
3-4	-1.690	.571	-3.024*	.608

*Denotes significant difference using Roy's Criterion at .05 confidence level.

- (1) No significant differences between the levels on item 9: "I was interested in the problem."
- (2) Significant differences between levels 1 and 3 and 4 and 3 on item 13: "How would you feel if I told you your group did not do a good job on this task?" The mean vector for level 3 (2 highs--2 lows) was less than the mean vector of the other two levels.
- (3) A reinspection of the contrasts for item 9 indicated that the largest differences were also between 1 and 3 and 4 and 3.

SOCIOMETRIC CHOICE

Fifteen hypotheses relating to sociometric rating behavior were earlier generated. To test these, another set of MANOVAS was performed. The first test was a 4 X 2 MANOVA which was used to evaluate Hypotheses 1, 2, and 3. The results are recorded in Table XXXVII.

TABLE XXXVII

4 X 2 Multivariate Analysis of Variance

Test of Equality of Mean Vectors

(Sociometric Choice x Task)

Sociometric Scales (P = 6)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Choice)	18,2133.1194	4.52	<.0001
B (Task)	6,754	less than 1	n.s.
AB (Choice x Task)	18,2133.1194	less than 1	n.s.

The four choice levels tested were highs rating highs, highs rating lows, lows rating highs, and lows rating lows. These results offer partial support for Hypothesis 1. Although a strong main effect was found, evaluation of the hypotheses was

forestalled until the levels which contributed to the effect could be determined. The discriminant coefficients indicated that four of the six scales were maximal separators (see Table XXXVIII).²

Scalar comparisons for these scales led to the following conclusions (Table XXXIX):

- (1) For Scale 1 (guidance of the problem discussion) the mean of lows rating highs was significantly higher than the mean of highs rating highs and highs rating lows.
- (2) For Scale 2 (promotion of personal relations) the mean of lows rating lows was significantly higher than the mean of highs rating highs.
- (3) For Scale 4 (influence over the problem solution) the differences were not statistically significant, but the greatest mean difference was between the highs rating lows, and the lows rating highs. The lows' rating of highs was greater.
- (4) For Scale 6 (attempts to be liked by the other group members) the mean of lows rating lows was significantly higher than the mean of highs rating highs.

The F-Ratio for task structure effects failed to support Hypothesis 2. However, the equality of the mean vectors for the interaction effect led to the acceptance of Hypothesis 3.

²The fact that two-thirds of the scales were maximal separators is indicative of the possible importance of high partial correlation. Partial correlation between these scales ranged from .35 to .75.

TABLE XXXVIII

Cell Means and Discriminant Function Coefficients
For Significant (A) Main Effect Reported in Table XXXVII

<u>Level</u>	<u>Y₁</u>	<u>Y₂</u>	<u>Y₃</u>	<u>Y₄</u>	<u>Y₅</u>	<u>Y₆</u>
1	5.425	5.040	5.123	4.690	4.806	4.000
2	5.396	5.053	4.946	4.542	4.763	4.198
3	6.030	5.545	5.561	5.182	5.212	4.545
4	5.810	5.560	5.258	5.103	5.048	4.829
<u>Discriminant Function</u>						
	.4623*	.3624*	-.3151	.3876*	-.3258	.5163*

*Denotes variables which maximally separate levels in the Test of the Hypothesis

TABLE XXXIX

Scalar Parametric Functions On Maximally
Discriminating Dependent Variables For
Significant (A) Main Effect Reported in TABLE XXXVII

<u>Levels of Contrast</u> ($\hat{\psi}$)	<u>Y₁</u>	<u>Y₂</u>	<u>Y₄</u>	<u>Y₆</u>
1-2	.029	-.008	.142	-.198
1-3	-.605*	-.505	-.492	-.545
1-4	-.385	-.520*	-.413	-.829*
2-3	-.634*	-.492	-.640	-.347
2-4	-.414	-.507	-.561	-.631
3-4	.220	-.015	.079	-.284
<u>Standard Error of the Contrast</u>				
1-4	.098	.099	.128	.138
all others	.119	.121	.155	.166

*Denotes significant difference using Roy's Criterion at .05 confidence level.

Two sets of 3 X 2 MANOVAS were used to assess Hypotheses 4 through 15. The first set was conducted on cells where highs evaluated other group members. Results from Table XL indicate that there were no between-cell differences in the high Machs' ratings of other high Machs. As Table XLI indicates, the same was true in the cells where highs rated lows. It was concluded that the high Mach's rating behavior is not differentially affected by the other persons he interacts with. This confirmed Hypotheses 4 and 7. The failure to obtain an interaction effect from either of these two also supported Hypotheses 6 and 9. Because no main effect for task was found either, Hypotheses 5 and 8 were rejected.

The remaining hypotheses were tested by the second pair of 3 X 2 MANOVAS. Table XLII illustrates that when lows rating highs were compared by cell, no main effects or interaction were found. Thus, both Hypotheses 10 and 11 failed to receive support. The null interaction hypothesis (12) was confirmed.

Lows apparently were not differentially affected by other members of the group when they rated highs. However, when lows rated lows, they were differentially affected. Results reported in Table XLIII showed that a strong main effect occurred when lows' ratings of other lows were compared by cell. This supported Hypothesis 13. Further analysis reported in Table XLIV and Table XLV led to the following conclusions:

(1) Scale 4 (influence over the problem solution) and Scale 6 (attempts to be liked by the other group members) maximally separated the groups.

TABLE XL

3 X 2 Multivariate Analysis of Variance

Test of Equality of Mean Vectors

(Highs' Choice of Highs--out of cells x Task)

Sociometric Scales (P = 6)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Choice)	12,482	less than 1	n.s.
B (Task)	6,241	1.86	n.s.
AB (Choice x Task)	12,482	less than 1	n.s.

TABLE XLI

3 X 2 Multivariate Analysis of Variance

Test of Equality of Mean Vectors

(Highs' Choice of Lows--out of cells x Task)

Sociometric Scales (P = 6)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Choice)	12,242	less than 1	n.s.
B (Task)	6,121	less than 1	n.s.
AB (Choice x Task)	12,242	less than 1	n.s.

TABLE XLII

3 X 2 Multivariate Analysis of Variance

Test of Equality of Mean Vectors

(Lows' Choice of Highs--out of cells x Task)

Sociometric Scales (P = 6)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Choice)	12,242	1.47	n.s.
B (Task)	6,121	less than 1	n.s.
AB (Choice x Task)	12,242	less than 1	n.s.

TABLE XLIII

3 X 2 Multivariate Analysis of Variance

Test of Equality of Mean Vectors

(Lows' Choice of Lows--out of cells x Task)

Sociometric Scales (P = 6)			
<u>Source of Variation</u>	<u>DF</u>	<u>F-Ratio</u>	<u>P</u>
A (Choice)	12,482	2.72	<.0015
B (Task)	6,241	less than 1	n.s.
AB (Choice x Task)	12,482	less than 1	n.s.

TABLE XLIV

Cell Means and Discriminant Function Coefficients for
Significant (A) Main Effect Reported in TABLE XLIII

<u>Level</u>	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6
1	5.875	5.667	5.368	5.250	5.062	5.181
2	5.845	5.476	5.136	5.024	5.167	4.542
3	5.292	5.208	5.042	4.500	4.542	4.042

Discriminant Function

.0843 -.2307 .0022 .3048* -.4578 1.0760*

*Denotes variables which maximally separate levels in the Test
of the Hypothesis

TABLE XVL

Contrasts ($\hat{\psi}$) Between Cell Means On the Maximally Discriminating
Dependent Variables For Significant (A) Main Effect Reported in

TABLE XLIII

<u>Levels of Contrast</u> ($\hat{\psi}$)	Y_4	Y_6
1-2	.226	.729*
1-3	.750*	1.139*
2-3	.524	.410

*Indicates the highest interpretable contrasts

(2) No scalar comparisons were significant. However, the highest interpretable contrasts existed between level 1 (all low Machs) and level 3 (2 low Machs and 2 high Machs). On both of the items, the mean vector for level 1 was higher. Low Machs in the homogeneous low Mach groups perceived that their low Mach co-workers made more attempts to be liked and had greater influence over the problem solution than low Machs in half-and-half heterogeneous groups.

Results from this Manova did not support Hypothesis 14; no main effect for task was found. Since no interaction effect resulted, Hypothesis 15 was accepted.

DISCUSSION

This experiment was designed to discover the extent to which different multiple measurement systems of interaction process, members' reactions, and sociometric choice discriminate between Machiavellian member characteristics, task structure, and the interaction of the two. The theoretical framework descended from a model proposed by Christie and Geis and supported by the contemporary "interactionist" position in social-psychological research. In light of this rationale, the final chapter seeks to determine what general conclusions can be drawn from the research.

It should be recalled that the investigator's task of interpreting inter-level differences was complicated by the imprecise (for the purpose of interpretation) method of post hoc analysis employed. Despite substantial main effect F-ratios, pair-wise scalar comparisons frequently failed to yield significant differences between the levels. Unfortunately, this disclaimer did not eliminate the necessity for assessing the between-level differences. The most general trends in the data were discovered by observing the greatest interpretable contrasts. Although this method lacked the power of a statistical test, it was nevertheless, necessary.

BASIC FINDINGS OF THE RESEARCH

Machiavellianism. Machiavellianism made a difference.

Results from this study demonstrated that Machiavellian traits can affect group interaction, satisfaction, and choice.

One of the most surprising findings was that non-homogeneous groups frequently differed as much from each other as from the homogeneous groups. This brings into question the propriety of adopting the experimental design paradigms which have previously been successful in group composition studies. Usually, experimenters have either compared homogeneous groups of one type with homogeneous groups of another (or other) type (s), (e.g. Schutz, 1955), or they have compared homogeneous groups with heterogeneous groups (e.g. Hoffman, 1961). The present study adopted a third alternative, systematic variation of heterogeneity. Differences were not expected; inclusion of three levels was based only on the need for design representativeness. However, the results indicate that imbalance in composition on one trait can affect the interaction profile of the entire group. It appears that systematic imbalance in personality may have as much meaning as pure homogeneity-heterogeneity, for on two of the highest discriminating variables, "acknowledges" and "gives evaluation" as the imbalance shifted from the highs to the lows, interaction in those categories increased.

Except for group structuring, the Machiavellian effect pervaded all main effect tests. Four general conclusions

seem appropriate:

- (1) Machiavellianism can be considered a group trait as well as an individual trait.
- (2) Task-related interaction differences between Machiavellian groups and individuals is more a matter of style than of quantity.
- (3) High Mach self-reports are affected by tasks; low Mach self-reports are affected by persons.
- (4) There are strong pre-dispositional differences between high and low Machiavellians in both interaction and rating behavior.

In general, the overall results demonstrated that group composition based upon Machiavellian profiles had a decided effect on group interaction, particularly task-related communicative acts. Tests of the task acts indicated that as low Mach membership in the group increased, task activity increased. These results seem incongruent with Hacker and Gaitz' (1970) observation that high Machs prefer task leadership styles of interaction. The incongruity can be reconciled in two ways. First, the assumption that group behavior is a straightforward arithmetic sum of its individual members' behaviors is rejected. In the present study the pre-dispositional (individual scores) data confirmed Hacker and Gaitz' conclusion. The group data did not. Second, the terms task-related and socio-emotional-related are somewhat misleading. They are not single-variable factors. Rather, as factor-analysis has demonstrated, a number of variables comprise the factor labeled task, and a number of variables comprise the

factor labeled socio-emotional. The important question in the present case is whether the groups differed in the style by which they discussed the task, and/or the style by which they maintained interpersonal relations. By looking at the variables which maximally separated the groups, it became apparent that the styles of the groups differed considerably. Since there was no indication that high Machs controlled the structure of the groups, it was more likely that group styles of interaction were a result of the dominant orientation existent in the group.

To better understand the results, the following proposition is advanced: Machiavellianism can be considered a group trait as well as an individual trait, and as such has a pervasive effect on interaction and reaction.¹ Essentially, this means that in the present case, groups quickly developed an atmosphere congruent with their dominant Machiavellian trait and this climate regulated interaction. The climate in low Machiavellian-dominated groups is presumed to have been cooperative and open rather than competitive and hostile, i.e. low Machiavellian, whereas the climate in groups dominated by high Machiavellian traits is presumed to have been competitive and impersonal, i.e. high Machiavellian. Styles of activity under a low Mach climate would therefore be different than

¹Readers may find this explanation similar to the coalition proposition of several other writers. The coalition proposition was not advanced here because direction and flow of interaction was not analyzed. Though such coalitions may have been formed, their existence could not be empirically supported by these results.

styles of activity under a high Mach climate. Thus, it is not surprising to find task activity greater in low Mach-dominated groups than in high Mach dominated groups. The difference can be demonstrated to be more of kind than of amount.

Inspection of the individual score results supports the present position. Acknowledgement, agreement, and disagreement separated the low Mach-dominated groups from the high ones. Although these three variables are obviously socio-emotional modes of behavior, rotated loadings on Borgatta's factor analysis illustrated that they are a part of the task factor. It is apparent then, that low Machs deal with the task through socio-emotional modes of behavior. Correspondingly, behaviors on the variables which maximally separated the high Mach individuals, information-passing and disagreement, were displayed less by high Mach members of low Mach-dominated groups, particularly the 3 low-1 high condition, than high Mach members of high Mach-dominated groups.

The distinctiveness of the evenly balanced heterogeneous groups (2-2) provides further evidence for the group climate proposition. Apparently, these groups possessed an ambivalent or undefined climate, neither clearly high- nor clearly low-Machiavellian. This conclusion is based on the results of the individual low Mach data. Tension increase separated these low Machs from low Machs in other groups. In addition to this

increased tension, they showed less interest in the task and were less concerned with the adequacy of their performance than low Machs in other conditions. Also, they rated their low Mach partners as less influential and less socio-emotionally oriented than low Machs from other groups. Evidently, they experienced greater discomfort in this condition than in any other, and it affected their behavior, and evaluation of others. It seems that they perceived that the climate was neither high- nor low-Mach-dominated and this ambiguity bothered them.

The high Machs were probably less affected by the undefined climate than the lows, because they respond to tasks rather than persons. For example, high Machs perceived that they had contributed more and had been more influential in the discussion of the unstructured task than in the discussion of the structured task. Since there was more latitude for improvisation and more ambiguity in the unstructured discussion, these results were consistent with the prediction of the Mach model.

The data also confirmed the Mach model predictions of pre-dispositional differences. High Machs experienced and released greater amounts of tension. They also made more references to the external situation. The label "group maintaining acts" may be misleading here. Taken from what is already known about high Mach behavior, it seems unlikely that

their display of tension or derogation of outside sources was motivated by a need for solidarity or cohesion.

The self-report results clearly illustrated the high Mach's more negative outlook toward people and life in general. These results precisely support Harris' (1966) finding. On all six sociometric scales high Machs had a less positive view of both high and low individuals with whom they had just interacted. Although both highs and lows favored the socially desirable end of the scale, the lows always used the more favorable continuum. Also, the results strongly suggest that the highs do not restrict these feelings to other persons, rather, they are equally pessimistic about themselves. On the member's reaction questionnaire, they responded as less interested in the tasks, as finding less competence in the group, and as feeling less influential and accepted in the group, than did the low Machs.

It is interesting to ponder the implications of these results. Coupled with Harris' findings, there is now substantial evidence that systematic differences occur when high and low Mach evaluators are compared. The possibility exists that this could be an uncontrolled source of variation in any study employing a rating instrument.

The data from the sociometric scales provided the answer to another interesting question: Do low Machs and/or high Machs perceive systematic differences in their co-workers,

i.e. are they sensitive to the interpersonal orientations of others? An answer was reached by examining the mean rating of each combination possibility across each scale (see Table XXXVIII). Scales 1, 3, 4, and 5 concerned influence, participation, leadership, and ideas. In each case, highs and lows both preferred highs, i.e. rated them higher than lows. Scales 2 and 6 dealt with promotion of personal relations and attempts to be liked. Here, highs and lows alike preferred lows. The significant differences in rating behavior were already attributed to the disposition of lows to rate higher, regardless of the scale or person. This additional finding indicates that the highs' greater facility with leadership activities and the lows' greater facility with maintenance activity is perceptible. Coffey (reported in Kemp, 1964) has described differences between psych-group and socio-group affiliation. Persons prefer to be with different people when they engage in work activities (socio-group) than when they engage in leisure activities (psych-group). Coffey advanced Jennings' thought by proposing that the process in socio-groups are different from the processes in psych-groups. This data suggests that persons can distinguish between those individuals who possess psyche-traits and those who possess socio-traits.

Data from the present study indicate that analysis of individual scores is not sufficient basis for inference about

group structure. Christie's hypothesis that highs control the structure and process of the group was based on results from individual analyses. For example, one of the primary sources of evidence for this hypothesis was Geis' (1965) finding that highs are rated higher in leadership by both highs and lows. On the basis of these results, she concluded that highs "take over" the group. The present study also found that highs are rated higher on task activities. But it was felt that an additional indicator was needed before the structure hypothesis could be accepted. The proposition was advanced that if highs control the structure of the group, then it is reasonable to assume that the distribution of interaction should be a function of the proportion of highs in the group. The results did not support the hypothesis.

The failure to confirm the structure hypothesis probably resulted from one or a combination of factors. First, the method of scoring group structure may have provided an inadequate index of structure. Structure in informal face-to-face groups could be a more subtle factor than distribution of acts. A method by which the effect of a communicative act could be assessed would be more valid. Recent criticisms and scale developments by McCrosky and Wright (1971), and Leathers (1971) were addressed to this issue.

Second, there may not have been enough time for a sufficiently stabilized structure to materialize. Neonate group

studies have often been criticized on this account. The present results support this criticism.

Finally, the task effects may have cancelled out the Machiavellian effects. Kent and McGrath (1969) found that tasks are the major sources of variance in small group performance. Since the results show that tasks consistently differed in both amounts, kinds, and structures of interaction, they may have interfered with or "washed out" the group Mach factor.

Task. Task structure affected group communication. The results of this study indicate that task structure influences both how the group interacts and how the group structures itself for that interaction. All main effect tests of task were significant on the interaction and structure data except the test of low Machs taken out of cells. Except for the test of high Machs taken out of cells, none of the main effect tests of task were significant for the self-report or sociometric data. From these results, four conclusions are advanced:

- (1) Unstructured tasks demand more task activity than structured tasks.
- (2) Unstructured tasks demand greater division of labor than structured tasks.
- (3) Tasks significantly affect high Machs, but do not significantly affect low Machs.
- (4) Generalization about communication and interaction from self-report data alone is unwarranted. What is needed is a multiple-indicator approach.

Shaw's (1963) solution multiplicity factor served as the operational specification for task structure. Results from the task evaluation questionnaire indicated S's perceived differences in the tasks on each of the three variables comprising this factor: solution multiplicity, decision verifiability, and goal clarity. This strong support for the specification of task structure leads the investigator to believe that tasks with similar scale values can be considered homogeneous in task structure with those employed in the present study. Therefore, the phrase "unstructured task" or "structured task" refers to any task homogeneous to the one actually used.

The unstructured task required a greater proportion of task activity and a more highly differentiated structure than the structured task. This difference was in the opposite direction from what was predicted. What are the implications of this finding?

It appears that the problem-solving procedure for an unstructured task is considerably different than that for a structured task. The goals on an unstructured task are not well-defined; the procedures are unclear; many possible solutions are plausible. These factors require the group to allocate more time to task activities. The problem must be defined; the procedures must be established; alternate paths to the goal must be discussed. Therefore, a higher proportion of interaction will be delegated to those task activities.

Structured tasks, on the other hand, require less task activity. The goal is clear; only a few (or one) solution (s) are possible; the rules or procedures are known and presumably accepted. Therefore, some of the task orientation steps may be skipped. The group probably can move quickly into the solution stages. Agreement and disagreement (attitudes toward proposed solutions) modes of interaction will probably be more prominent.

The structure data supports this line of reasoning. Interaction was more highly differentiated on the unstructured task than on the structured task. In the process of defining goals, establishing procedures, and suggesting solutions, interaction becomes more random. Since the situation is ambiguous and the rules are unclear, members divert to their own favored forms of interaction. An additional indicator of this greater randomness of interaction was the increased amount of time allocated to the unstructured task.

Although much more research on the question is necessary, at least tentatively, data from this study indicates that different tasks require different problem-solving procedures. It would seem that there is no one best method of problem-solving, regardless of the situation. Industrial psychologists have been telling organizations for some time that different tasks require different abilities. A concomitant of this proposition is that different tasks (problems) require different problem-solving procedures.

As was predicted, the tasks significantly affected high Machs, but did not affect low Machs. When high Mach data was compared out of the cells, significant differences resulted in both interaction and reaction systems. The task effects of the members' reaction data for high Machs was the only instance of such results. No similar findings were reported for the low Machs. As in prior research, these results imply that low Machs are person-oriented while high Machs are task- (or object) oriented.

The statistical tests of task structure repeatedly resulted in differences for the interaction data, but failed to yield differences for the questionnaire data. This finding suggests that, as expected, the three different measures used were assessing different behaviors. This is not a startling conclusion, since these instruments were not designed to measure the same behavior. However, within these results lies an important implication for those investigators who base their inferences about the process and dynamics of interaction solely on self-report data.

A case in point is Hare's (1952) well-known study of interaction and consensus in variously sized groups. To evaluate the interaction differences in these groups, Hare employed a questionnaire which was "designed to reveal some characteristics of the nature of interaction during discussion." The items on his questionnaire were similar to the ones

employed in the present study. All of Hare's inferences about interaction were dependent upon this instrument alone.

If the present investigator had relied on only one measure, the conclusions of this study would have been considerably different. For example, the self-report data, taken alone, suggests that task structure does not make a difference. This data, of course, would obscure the fact that large statistical differences occur in task-related interaction.

Results from the present study argue strongly for the multiple-indicator approach to the assessment of interaction and attitudes. At the present stage of development, single measures, most of which are surprisingly crude, seem to have little utility. By increasing the representativeness of measurement, the validity of our inferences should be increased. As Cook and Selltiz (1964), the leading advocates of the multiple-indicator approach write: "This orientation leads to an emphasis on the need for a number of different measurement approaches to provide a basis for estimating the common underlying disposition, and to the expectation that data from these approaches will not be perfectly correlated" (p. 37).

Interaction Between Machiavellianism and Task Structure.
For the most part, no strong relationship between Machiavellianism and task structure was verified by this study. Only one interaction was found. High Mach members from homogeneous

groups made significantly more references to the external situation and displayed significantly more tension when discussing the structured task than in any of the other three conditions (highs discussing the unstructured task, lows discussing the unstructured task, and lows discussing the structured task). This result illustrates the high Mach's greater difficulty with more structured situations. However, this cannot be considered a very general conclusion, since it was not confirmed by any of the other data. Why did the interaction fail?

Several variables may have contributed to the failure of the interactions. First, the tasks may not have varied substantially on the situational parameters most relevant to Machiavellianism. For example, the unstructured task may not have provided enough latitude for improvisation by the high Machs or aroused enough irrelevant affect from the low Machs. The rewards for successful completion of the tasks may not have been high enough to interest the high Machs in using their full repertoire of manipulative skills. Also, the fact that the main effect differences were not consistently due to any one level or cell implies that the main effects were so strong that they washed out any interaction effect. Finally, the tasks themselves may not have accounted for enough of the variance in the environment. It is possible that the S's responded only to one situation, rather than two.

THE EFFICACY OF THE MULTIVARIATE APPROACH

The relationship between Machiavellianism and task structure was examined through multivariate procedures, which included a multivariate design and multivariate statistics. Empirically, several methodological strengths and limitations of these procedures were discovered.

Multivariate analysis treats response measures as systems. If the following premise is accepted: that the whole is more than, or less than, the sum of its parts--multivariate analysis must correspondingly be considered the optimum analytical tool. For systems are wholes by the virtue of the relation of their parts. Systems are not static, but single entity analysis can only treat them as such. By taking into account the partial correlation between response measures, multivariate analysis maintains the dynamic state of the response systems. In the present study, these tests clearly demonstrated the importance of the interaction between the parts (partial correlation) of the response systems. Sizable shifts in partial correlation affected the significance tests. For example, acknowledgement, agreement, and disagreement discriminated between low Mach S's, but two different variables, information passing and disagreement separated high Mach S's. Partial correlations for these response variables were considerably different among the independent variables.

Multivariate analysis can reduce large, almost insurmount-

able, quantities of data, to generally interpretable underlying dispositions. In this investigation, if the researcher had replaced the fifteen MANOVAS with ANOVAS, more than eight hundred and fifty would have been required. Since over half would have yielded significant F-ratios, laborious post hoc procedures would have been necessary. Interpretation of these tests would have been extremely difficult.

Multivariate techniques are more suited to detecting overall differences than to providing a logical basis for interpretation of individual differences. Scalar comparisons frequently failed to detect significant individual differences following a significant overall difference. Levin (1971) recently substantiated this difficulty in communication with participants of a pre-session on multivariate analysis. Researchers interested only in the interpretation of individual differences will need to give substantial thought to this.

SUGGESTIONS FOR THE FUTURE DIRECTION OF SMALL GROUP RESEARCH

Certainly, this study, with strategic variations, should be replicated. The field would profit from knowledge concerning the output (group product) concomitants of Machiavellianism and task structure. An attempt should be made to specify other operational dimensions of the task variable. Additional environmental factors such as seating position and assigned leadership along with the inclusion of new systems of dependent variables would further understanding of the relevant systems.

But, specific research strategies aside, the greatest contributions will probably descend from a new direction and outlook toward small group research, the multivariate viewpoint.

This writer believes that Larson (1971) was correct when he told small group researchers in speech-communication that "...when conceptual and theoretical bases are laid, many of our statistical and analytical decisions seem essentially unrelated to our conceptual and theoretical concerns" (p. 106). But this investigator also believes he was incorrect when he suggested that the remedy for this sorry state was the clarification of single classes of variables. Given the almost limitless number of relevant input and output variables, and the probability of reasonably high partial correlations between them, it seems unlikely that studying one class of inputs with one class of outputs will ever lead to the identification of "the best predictors." Rather, this writer argues for the inclusion of a more representative array of variables into small group experimental design. Ultimately, those variables which show no correlation or make minute contributions to the systems can be discarded, and the underlying dispositions can be discovered.

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APPENDIX A

To 102 Instructors:

PLEASE READ THE FOLLOWING TO ALL 102 STUDENTS BEFORE
DISTRIBUTING THE QUESTIONNAIRES:

During the past three years, Ohio State University Test Center along with the Psychological Test Association has developed a set of attitude instruments specifically for the college student population. It is hoped that these new instruments will be more relevant to today's college student population. Students here at Bowling Green State University have been selected to take the instruments along with college students from New York, Florida, Texas, Oklahoma, Iowa, Wisconsin, Colorado, California, and Oregon in an attempt to establish a set of national norms for the newly developed instruments. The attitude instrument will be given here at BGSU during the Fall, Winter, and Spring Quarters of 1970-71. You have been selected along with other BGSU students to take one of the attitude instruments and help the Psychological Test Center establish national norms. Your cooperation will be greatly appreciated.

While the instrument is being distributed please follow these procedures in an attempt to insure standardization from school to school:

1. Please no talking from this point on.
2. Please remove everything from the top of your desk except a pen or a pencil.

3. When you receive the attitude instrument, please put your name, your small group section number, and your small group instructor's name at the top of the first page.

Distribute the instruments. Give test marked "Males only" to the males in the group, test marked "Females only" to females in the group. Before they begin repeat No. 3. of the above. They then may begin reading the instructions. Before collecting the instruments remind them to check to see if their name, instructor's name and small group section number are filled in at the top of the first page.

MACH V TEST

Attitude Inventory

You will find 20 groups of statements listed below. Each group is composed of three statements. Each statement refers to a way of thinking about people or things in general. They reflect opinions and not matters of fact -- there are no "right" or "wrong" answers and different people have been found to agree with different statements.

Please read each of the three statements in each group. Then decide first which of the statements is most true or comes the closest to describing your own beliefs. Place a plus (+) in the space provided to the right of the statement.

Just decide which of the remaining two statements is most false or is the farthest from your own beliefs. Place a minus (-) in the space provided to the right of the statement.

Here is an example:

A.	It is easy to persuade people but hard to keep them persuaded.	_____
B.	Theories that run counter to common sense are a waste of time.	_____ <u>+</u> _____
C.	It is only common sense to go along with what other people are doing and not be too different.	_____ <u>-</u> _____

In this case, statement B would be the one you believe in most strongly and A and C would be ones that are not as characteristic of your opinion. Statement C would be the one you believe in least strongly and is least characteristic of your beliefs.

You will find some of the choices easy to make; others will be quite difficult. Do not fail to make a choice no matter how hard it may be. You will mark two statements in each group of three -- the one that comes the closest to your own beliefs with a + and the one farthest from your beliefs with a -. The remaining statement should be left unmarked.

Do not omit any groups of statements.

1. A. It takes more imagination to be a successful criminal than a successful business man. _____
 B. The phrase, "the road to hell is paved with good intentions" contains a lot of truth. _____
 C. Most men forget more easily the death of their father than the loss of their property. _____
2. A. Men are more concerned with the car they drive than with the clothes their wives wear. _____
 B. It is very important that imagination and creativity in children be cultivated. _____
 C. People suffering from incurable diseases should have the choice of being put painlessly to death. _____
3. A. Never tell anyone the real reason you did something unless it is useful to do so. _____
 B. The well-being of the individual is the goal that should be worked for before anything else. _____
 C. Once a truly intelligent person makes up his mind about the answer to a problem he rarely continues to think about it. _____
4. A. People are getting so lazy and self-indulgent that it is bad for our country. _____
 B. The best way to handle people is to tell them what they want to hear. _____
 C. It would be a good thing if people were kinder to others less fortunate than themselves. _____
5. A. Most people are basically good and kind. _____
 B. The best criteria for a wife or husband is compatibility--other characteristics are nice but not essential. _____
 C. Only after a man has gotten what he wants from life should he concern himself with the injustices in the world. _____

6. A. Most people who get ahead in the world lead clean, moral lives. _____
B. Any man worth his salt shouldn't be blamed for putting his career above his family. _____
C. People would be better off if they were concerned less with how to do things and more with what to do. _____
7. A. A good teacher is one who points out unanswered questions rather than gives explicit answers. _____
B. When you ask someone to do something for you, it is best to give the real reasons for wanting it rather than giving reasons which might carry more weight. _____
C. A person's job is the best single guide as to the sort of person he is. _____
8. A. The construction of such monumental works as the Egyptian pyramids was worth the enslavement of the workers who built them. _____
B. Once a way of handling problems has been worked out it is best to stick to it. _____
C. One should take action only when sure that it is morally right. _____
9. A. The world would be a much better place to live in if people would let the future take care of itself and concern themselves only with enjoying the present. _____
B. It is wise to flatter important people. _____
C. Once a decision has been made, it is best to keep changing it as new circumstances arise. _____
10. A. It is a good policy to act as if you are doing the things you do because you have no other choice. _____
B. The biggest difference between most criminals and other people is that criminals are stupid enough to get caught. _____
C. Even the most hardened and vicious criminal has a spark of decency somewhere within him. _____
11. A. All in all, it is better to be humble and honest than to be important and dishonest. _____
B. A man who is able and willing to work hard has a good chance of succeeding in whatever he wants to do. _____
C. If a thing does not help us in our daily lives, it isn't very important. _____

12. A. A person shouldn't be punished for breaking a law which he thinks is unreasonable. _____
B. Too many criminals are not punished for their crime. _____
C. There is no excuse for lying to someone else. _____
13. A. Generally speaking, men won't work hard unless they're forced to do so. _____
B. Every person is entitled to a second chance, even after he commits a serious mistake. _____
C. People who can't make up their minds aren't worth bothering about. _____
14. A. A man's first responsibility is to his wife, not his mother. _____
B. Most men are brave. _____
C. It's best to pick friends that are intellectually stimulating rather than ones it is comfortable to be around. _____
15. A. There are very few people in the world worth concerning oneself about. _____
B. It is hard to get ahead without cutting corners here and there. _____
C. A capable person motivated for his own gain is more useful to society than a well-meaning but ineffective one. _____
16. A. It is best to give others the impression that you can change your mind easily. _____
B. It is a good working policy to keep on good terms with everyone. _____
C. Honesty is the best policy in all cases. _____
17. A. It is possible to be good in all respects. _____
B. To help oneself is good; to help others even better. _____
C. War and threats of war are unchangeable facts of human life. _____
18. A. Barnum was probably right when he said that there's at least one sucker born every minute. _____
B. Life is pretty dull unless one deliberately stirs up some excitement. _____
C. Most people would be better off if they controlled their emotions. _____

19. A. Sensitivity to the feelings of others is worth
more than poise in social situations. _____
- B. The ideal society is one where everybody
knows his place and accepts it. _____
- C. It is safest to assume that all people have
a vicious streak and it will come out when
they are given a chance. _____
20. A. People who talk about abstract problems
usually don't know what they are talking
about. _____
- B. Anyone who completely trusts anyone else
is asking for trouble. _____
- C. It is essential for the functioning of a
democracy that everyone votes. _____

APPENDIX B

INSTRUCTIONS FOR EXPERIMENTER

1. Pick up Subject Assignment list and first task (marked Task 1) on my desk in Room 214 South Hall. Notice that to the left of each subject's name is a code number. Notice also that after the first four names there appears a dotted line followed by an additional list of names. These subjects are to be used only if others (among the first four) are absent. In other words they are substitutes.
2. Take Subject Assignment list plus first task to either Room 211 South Hall (if the time is 7:00 p.m., 8:00 p.m., or 9:00 p.m.) or Room 209 South Hall (if the time is 6:00 p.m.).
3. At five minutes past the hour greet the subjects. Thank them for coming and tell them that the experiment will be beginning in a few minutes, but that first you must take attendance. Call roll by placing checks in the column marked attendance on the subject assignment list. If the first four subjects on the list are present, assign them their code numbers. Tell them that they will be referred to during the entire hour by code number rather than by name. If any of the first four are absent, assign one of the substitutes in his place.
Important: a substitute marked odd can only be used to replace a subject with a 1, 3, 5, or 7 beside his name. Likewise, a substitute marked even can only be used to replace a subject with a 2, 4, 6, or 8. Any substitute used should be assigned the code number of the person he is replacing. If no substitutes are present to replace an absent person do not continue, but rather excuse yourself and see me immediately.
4. Once four subjects have been assigned code numbers you are ready to take them to Room 213. Tell those to whom you have assigned numbers that you now will be taking them to Room 213. Tell the four that when they arrive in Room 213 they must sit in the chairs which are marked in correspondence with their assigned code number. That is, they must sit in the chair which has an I.B.M. card with their code number in front of it. Tell any extras to remain in the room until you return. You are then ready to go to Room 213.
5. Be sure S's are seated in the proper chairs. Once they are seated in the proper place, read them the following message:

"Before we begin our study in group discussion there are a few things we feel we must honestly tell you. As you probably know, the mirrors in this room are transparent. Behind the mirrors are two persons who will be observing your discussion. The chief purpose of this study is to see how persons solve problems. The observers behind the mirror will be taking notes on how your group solves its problems. Although both audio and video equipment is available in this room, neither will be used. No transcripts of any kind will be made. (Pause) You may now turn over the general instruction sheet and read it."

6. When all subjects have finished reading the instructions distribute the first task to each member, and place the answer card or form on the floor in the center of the group. Tell them to read over the first task and then to begin their discussion. Tell them that when they are finished they should write their solution on the card or answer form and then knock on the door when they are finished.
7. Leave the room. Be sure that the door is closed behind you when you leave.
8. Return to Room 214. Return assignment list. Pick up dependent variable folders (four of them) marked Task 1. Also pick up Task 2.
9. When you hear a knock on the door return to Room 213. Collect Task 1 and the answer card or form. Pass out dependent variable folders making sure to give the folders to the persons corresponding to their code numbers. Before they begin be sure to call their attention to the first three pages. Tell them that on these three pages they are to rate the behavior of the person in the group corresponding to the number written in red on the top of the page. (They are to rate each of the other three members.) There should be a total of five pages in each dependent variable.
10. Once they begin you can take the chair next to the door and turn it away from the group to sit in. Wait there until they finish.
11. When all subjects have finished tell them to put the questionnaires in the folders. Collect them.

12. Next, distribute Task 2 to each member. Put the answer card or form on the floor in the middle of the group. Tell them to follow the same procedure (i.e. to write the solution on the form or card when they are finished and then to knock on the door).
13. Leave the room closing the door behind you.
14. Return to Room 214. Return solution form or card and subjects' dependent variable folders for Task 1 to my desk. Pick up subjects' dependent variable folders for Task 2. Also pick up task evaluation sheets (dittoed).
15. When you hear a knock on the door return to Room 213. Collect Task 2 and the answer card or form. Pass out dependent variable folders marked Task 2 again making sure to give the folders to the persons corresponding to the code numbers. Again call their attention to the first three pages where they are to rate the behavior of the other persons in the group. Once they have begun again take an unobtrusive position in the chair near the door.
16. When they have finished instruct them to put the questionnaires back into the envelopes. Collect the envelopes. After the envelopes have been collected distribute the task evaluation forms. While they are working on them again take an unobtrusive position.
17. When they have finished the task evaluation forms collect them. Also collect any other papers or forms which are lying around.
18. Thank them for participating with the following message:

"You have now completed your participation in this study. We want to thank each of you very much for your cooperation. About forty more groups, each similar to yours, will be participating in this study, so we would appreciate it if you would not tell anyone what you did here tonight. In about three weeks your drill instructor will deliver to you detailed information about the purpose and results of this study."

Thank you
19. Dismiss them.

APPENDIX C

PRE-DISCUSSION

INSTRUCTIONS

The research project that you will be participating in is part of a national research project designed to investigate the relationship between the quality of a university and the problem-solving ability of its students. We are hoping to demonstrate that college students at Bowling Green State University can arrive at quality decisions on a variety of problems equal to or better than students attending other state or private universities. Specifically, we hope to determine whether there is any truth to the belief that private universities and Big Ten schools produce students who are more qualified to solve problems with quality decisions than those at state universities. You will be discussing two of the problems selected for the research project. We will be comparing your two solutions with the solutions suggested by similar students at other universities. Other schools participating in this study include Ohio State, Cornell, Stanford, Michigan State, Harvard, and Oberlin College.

In previous research, your particular student group has done especially well in arriving at high quality and correct decisions regarding the kinds of problems you will be discussing tonight.

The group from this particular research project arriving at solutions which are judged to be of the highest quality by

an outside panel of judges will be awarded twenty dollars (20.00) to divide among group members.

Before you read the problems it is necessary that you read the following:

1. This group should discuss each problem together with the view of trying to resolve the problem by arriving at a solution that involves everyone concerned.
2. The group will have about twenty (20) minutes to discuss each problem.
3. Once your group has completed the discussion, please have one of the group members write down your solution in the form of a single report on the designated card or answer sheet.
4. Once the group has written down the solution, have someone knock on the door to indicate that you have finished the problem, and return to his seat.

APPENDIX D

TWO GROUP TASKS (Counterbalanced order for each group)

RANKING PROBLEM

<u>City</u>	<u>Rank</u>	<u>City</u>	<u>Rank</u>
Tacoma, Washington	_____	Houston, Texas	_____
Albany, New York	_____	Fall River, Massachusetts	_____
Norfolk, Virginia	_____	Erie, Pennsylvania	_____
Columbus, Ohio	_____	Birmingham, Alabama	_____
Canton, Ohio	_____	Hartford, Connecticut	_____
Jackson, Mississippi	_____	Washington, D. C.	_____

Instructions: Your task will be to rank the cities listed above according to their population as indicated in the 1970 census. That is, assign a rank of 1 to the city which has the largest population, a rank of 2, to the city which has the next largest population, etc. You will be given 20 minutes to discuss the problem and arrive at a group ranking.

INTERPERSONAL PROBLEM

"Henry, the son of a physician, has a friend, Jim, who is under the care of Henry's father. Henry knows that Jim is incurably ill. Both are in love with a girl, Ellen. Jim doesn't know what kind of disease he has; neither does Ellen know that he is incurably ill. One night Henry calls on Ellen just after he has decided to give up his studies and accept a job in California. He intends to ask her that night to marry him and go with him to California. Henry knows that for many years Ellen has wanted to go to live there. Before he gets a chance to tell her, Ellen announces her engagement to Jim.

What should Henry say and do?"

Instructions: Your task is to give advise regarding the interpersonal problem you have been given. After reading the problem, you will be given an opportunity to discuss possible solutions. Try to find a solution that is acceptable to all, but if you cannot agree, a minority decision - report will be accepted. When you have reached a decision which is acceptable to all, or have agreed that you cannot reach a unanimous

decision, the discussion will be terminated. At that time, please write your decision on the card provided. If a minority report is submitted, please indicate who supported each proposition. You will be given 20 minutes to discuss this problem.

APPENDIX E
Dependent Variable Booklet
Distributed After Each Task

SOCIOMETRIC SCALES

Each subject received three copies of the first two pages
 YOUR REACTION TO YOUR OTHER GROUP MEMBERS' PROBLEM-SOLVING
 ACTIVITIES

Code number of the group member you are rating _____

DIRECTIONS: Answer the following questions in terms of the way each person in your group behaved. Place an X on the most appropriate line.

Guides or Supervises Problem Discussion

Helped very
much to keep
group on
discussion of
problem

Neither helped
nor diverted
group

Diverted
group very
much from
problem
discussion

Personal Relations

Helped very
much to pro-
mote good
personal
feelings
among group
members

Neither helped
nor disrupted

Caused poor
personal
feelings
among group
members

Participation

Hardly participated
in discussion at
all

Participated
in discussion
a moderate
amount

Participated
in dis-
cussion very
frequently

Problem Solving

Had very
little influence
over group's
problem
solution

Had moderate
amount of
influence

Had very
great in-
fluence over
group's pro-
blem solution

Ideas

Had very good
ideas and in-
sight about
problem

Had moderately
good ideas and
insight

Had no ideas
or very poor
ideas about
problem

Liking By Group Members

Didn't care
whether other
group members
liked me or not

Tried some-
what to be
liked by other
group members

Tried very
hard to be
liked by
other group
members

MEMBER'S REACTION QUESTIONNAIRE

1. I felt tense and uncomfortable in the group on this task.

not at all true _____ very true

2. There was too much competition among the group members.

not at all true _____ very true

3. There were considerable differences of ability and competence among the members of this group.

not at all true _____ very true

4. There was much disagreement among the members of the group on this task.

not at all true _____ very true

5. Some people in the group talked too much.

not at all true _____ very true

6. I talked too much.

not at all true _____ very true

7. Considering the entire problem-solving session, my opinion was given adequate consideration by the other group members.

not at all true _____ very true

8. There was a definite leader in the group.

not at all true _____ very true

9. My group needed a strong leader to keep it on the track.

not at all true _____ very true

10. I felt inhibited from expressing my feelings during the group discussion.

not at all true _____ very true

11. I had considerable influence in determining my group's final written solution to the task.

not at all true _____ very true

12. Rather than one unified group, it seemed that the group worked in subgroups or as individuals on this problem.

not at all true _____ very true

13. I was interested in this problem.

not at all true _____ very true

14. How satisfied were you with the group's performance on this task?

not satisfied at all _____ very satisfied

15. How satisfied were you with your own performance on this task?

not satisfied at all _____ very satisfied

16. How much did you enjoy working with this group of people?

Not at all _____ very much

17. How much did you enjoy working on this particular problem?

Not at all _____ very much

18. How would you feel if I told you that your group did not do a good job on this task?

very disappointed _____ would not bother me in the least

APPENDIX F

TASK EVALUATION QUESTIONNAIRE

Thank you for participating in this project. Before you leave there is one final thing we would like you to do. In addition to trying to find out how well people solve problems we are also interested in finding out their reactions to the problems they solve. Therefore we would like you to evaluate the two tasks you discussed tonight on three dimensions which we believe are important. The dimensions are as follows:

1. Decision Verifiability: The degree to which the correctness of the decision your group reached can be demonstrated (verified) either by appeal to authority (e.g. an outside source, encyclopedia, or book) by logical procedures (e.g. mathematical demonstration) or by feedback (actually examining the results of the decision).
2. Goal Path Multiplicity: The degree to which the task could be solved by a variety of procedures (number of different paths to the goal, number of different alternatives for solving the problem, the number of different ways that the task could have been completed).
3. Solution Multiplicity: The degree to which there was more than one correct solution to the problem. Some tasks e.g. arithmetic problems, have only one solution that is acceptable; other tasks have two or more.

USE OF THE SCALE

In ranking the tasks please use the scale in the following manner:

If you believe that the task was high on a given dimension, i.e. the decision could easily be verified, there were many alternative goal paths, and there were many possible solutions, you would circle 8.

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Low			Neutral				High

If you believe that the task was low on a given dimension, that is the correctness of the decision could not be verified, there was only a limited number of paths to achieving the goal, and there was only one right decision, you would circle 1.

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Low			Neutral				High

If you believe the task was neutral on a given dimension, that is neither high nor low, you would circle either 4 or 5.

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Low			Neutral				High

CITY RANKING PROBLEM 1970 Census

Decision Verifiability

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Low			Neutral				High

Goal Path Multiplicity

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Low			Neutral				High

Solution Multiplicity

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Low			Neutral				High

INTERPERSONAL RELATIONS PROBLEM Henry-Ellen-Jim Triangle

Decision Verifiability

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Low			Neutral				High

Goal Path Multiplicity

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Low			Neutral				High

Solution Multiplicity

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Low			Neutral				High