THE IMPACT OF BIG FIVE PERSONALITY CHARACTERISTICS ON GROUP COHESION AND CREATIVE TASK PERFORMANCE

by

Laurie Birch Buchanan

Dissertation submitted to the Faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Psychology

APPROVED:

_____
Roseanne J. Foti, Ph.D., Chair

_____
Joseph A. Sgro, Ph.D.

_____
Kusum Singh, Ph.D.

_____
Neil M.A. Hauenstein, Ph.D.

_____
Sigrid B. Gustafson, Ph.D.

February, 1998

Blacksburg, Virginia

KEY WORDS: TEAM PERFORMANCE, PERSONALITY, CREATIVE TASKS, GROUP COHESION, PATTERNS

THE IMPACT OF BIG FIVE PERSONALITY CHARACTERISTICS ON GROUP COHESION AND CREATIVE TASK PERFORMANCE

by

Laurie Birch Buchanan

Roseanne J. Foti, Chairperson

Psychology

(ABSTRACT)

One of the most prominent trends in organizations today is the use of teams to accomplish the work once assigned to individuals. Team composition variables, including the personality characteristics of team members, need to be carefully considered so that the transition of work from individuals to teams results in performance improvements. The types of tasks relegated to teams also affect performance, and it is equally important that group tasks are clearly defined. As such, the current study explores the impact of Big Five personality patterns on both group cohesiveness and group performance on creative, brainstorming tasks. At the group level, it was predicted that teams with personality patterns consisting of moderate levels of Extraversion, high levels of Openness to Experience, and high levels of Conscientiousness (Optimal pattern) would perform significantly better on an innovative task than teams with personality patterns that varied from this pattern. It was also hypothesized that group cohesiveness would mediate this relationship. Of the 65 three-person groups, it was found that those possessing the Optimal pattern

outperformed groups with three different patterns in terms of the quantity of creative ideas generated and average level of creativity. However, groups with the Optimal pattern generated more superior ideas than only one of the other pattern conditions, and contrary to predictions, did not generate a significantly higher percentage of superior ideas than any of the other pattern conditions. It was also found that group cohesion did not mediate the relationship between group-level personality and creative task performance. The implications of these findings and directions for future research are discussed.

ACKNOWLEDGMENTS

I would like to thank my advisor and committee chair, Roseanne Foti, for all of her encouragement and support throughout the duration of this research. Her willingness to adapt to the challenges of advising my research long-distance, via numerous e-mails and long-distance phone calls, was essential to the completion of my dissertation.

I would also like to acknowledge the other members of my committee, Dr. Joseph Sgro, Dr. Kusum Singh, Dr. Sigrid Gustafson, and Dr. Neil Hauenstein, who contributed to this research with their invaluable ideas and suggestions. In particular, I would like to thank Joe Sgro, who not only served as an insightful member of my committee, but also became both a mentor and a friend during the course of this research as well as my years in graduate school. His encouragement and confidence in my abilities as a psychologist will not be forgotten.

I also extend my sincere gratitude and appreciation to my research assistants, Christopher Wolcott and Rhonda Quesenbury, who devoted countless hours to the collection of data for this research. Their enthusiastic efforts and willingness to take on significant responsibility ensured the timely completion of the data collection process. Equally important, their sense of humor and interest in the project helped to make this endevour more enjoyable.

TABLE OF CONTENTS

ABSTRACT	ii
ACKNOWLEDGEMENTS	iv
chapter	page
INTRODUCTION	1
TEAM PERSONALITY RESEARCH: A LITERATURE REVIEW	11
Task Typologies and Creative Tasks	13
Creative Task Research	16
Big Five Personality Characteristics	20
Five Factor Research: Individual Level	24
Five Factor Research: Group Level	27
Personality Patterns in Groups	31
Group Personality Patterns for Creative Tasks	34
Group Personality and Cohesion	36
Summary and Hypotheses	41
Exploratory Hypothesis	43
METHOD	48
Exploratory Study	48
Pilot Study	50
Focal Study	56
Subjects	56
Task	57
Independent Measures	58

TABLE OF CONTENTS (cont.)

Dependent Measures..... 58
Procedure..... 61
Analysis..... 64
RESULTS..... 66
Descriptive Statistics..... 66
Group Pattern Effects..... 67
Group Cohesion Effects..... 69
DISCUSSION..... 71
Creative Tasks and Group Performance..... 76
Cognitive Ability and Group Performance..... 77
Group Cohesion and Performance..... 79
Limitations and Future Research..... 81
REFERENCES..... 85
APPENDICES..... 117
TABLES..... 139

INTRODUCTION

In order to stay competitive in the current fast-paced, global environment, organizations are continually looking for ways to implement effective business strategies. Companies are focusing on better methods for efficiently utilizing their employees; one of the most critical assets in an age plagued by downsizing and structural reorganization (Tjosvold, 1991). The transformation from a traditional, vertically integrated organization to the networked, dynamic organization of the future requires new management tools. The utilization of teams or groups to accomplish the work once assigned to individuals has become one of the most prominent trends in organizations today (Guzzo, 1995).

Described by some as a "corporate renaissance" (Kanter, 1983) or the "second industrial revolution" (Fisher, 1993), teams are predicted to become a basic organizational building block of successful companies (Orsburn, Moran, Musselwhite, Zenger, & Perin, 1990). Beliefs about the multiple benefits of groups for organizations occupy a central place in the widespread trend of organizational restructuring (Sinclair, 1992). These beliefs have developed from the rapid infusion of new customer demands, new technologies, and worker expectations that do not fit with the restrictive job boxes of traditional organizational thinking (Fisher, 1993). In addition, global competitiveness has forced American businesses to rethink their strategic philosophies and goals. Team-based management practices have become a way to restore America's productivity, and at the same time, create a work environment that is aligned with the

nature of workers (Guzzo & Salas, 1995).

Thus, as companies have realized hierarchical structures are not always the most effective and efficient way to respond to the changing work environment, they have looked for better methods to utilize their human resources (Shonk, 1992). Work groups ranging from quality circles and task forces to high-performance teams have formed in increasing numbers across a wide variety of organizations (Hackman, 1990). Cross-functional teams have become commonplace as companies strive for continuous improvement and struggle to remain globally competitive (Fisher, 1993). In many cases, organizations also have discovered that teams provide an effective way both to coordinate across organizational boundaries and to gain employee commitment (Shonk, 1992). A recent survey of Fortune 1000 companies found that 68% of respondents reported using self-managing work groups (Lawler, Mohrman, & Ledford, 1995), compared with 27% in 1987 (Lawler, Mohrman, & Ledford, 1992). With this trend towards team-based organizations on the rise, further empirical research is needed to ameliorate the selection and development of team members, as it is the people, not the technology and other programs, that will ultimately improve the competitiveness of companies in the changing work environment (Fisher, 1993).

Overview of Group Research

A review of the group literature reveals that the way in which a group or team is operationalized across studies varies widely. Such variability has made the integration of group research difficult, impeding the ability to draw implications about

the role of teams in organizations (Cummings, 1986). Due to the many characteristics of groups and the lack of consensus as to which characteristics are distinguishing, researchers often only emphasize the aspects of groups that fit the needs of their research. In addition, defining groups so as to encompass their variety has been challenging, despite their pervasiveness in the literature (Tjosvold, 1991). The current study attempts to operationalize groups by encompassing the central group characteristics common to a majority of the previous definitions.

Most definitions of groups or teams emphasize the interaction, interdependence, and common goals of individuals (McGrath, 1984). Lewin (1951) stated that interdependence was a central concept of groups, and Porter, Lawler, and Hackman (1987) also emphasized that groups can be distinguished by their degree of member interaction. Other researchers have characterized groups as persons who share a common fate due to shared events (Fiedler, 1967), two or more people who coordinate their activities to accomplish common goals (Shonk, 1992), and the coordination of individuals to jointly diagnose, problem solve, and collaborate to complete a task (Van de Ven et al., 1976). Tjosvold (1991) combines all of the aspects of groups mentioned above, and thus, his definition will serve as the operational definition of team or group in the current study. Team and group will be used interchangeably, and defined as, "two or more persons who interact and influence each other directly, who are mutually dependent and have interlocking roles and common norms, and who see themselves as a unity in pursuit of common goals that satisfy their individual aspirations and needs"

(Tjosvold, 1991, p.22).

Historically, group research has been prolific within the management (Bettenhausen, 1991; Sinclair, 1992), industrial engineering (Davis & Wacker, 1987), and social psychology literature (McGrath, 1984; Steiner, 1972). The emphasis on groups within these domains has been due primarily to practical interests, since teams have been identified with improved performance (Banker, Field, Schroeder, & Sinha, 1996). Given the current work environment, however, "understanding how to compose effective task groups is more important today than ever" (Driskell, Hogan, & Salas, 1987, p.93). Consequently, the effects of teams on organizational performance led to an increase in research within the domain of industrial/organizational psychology as well (Campion, Medsker, & Higgs, 1993; Guzzo & Shea, 1992; Levine & Moreland, 1990).

While industrial/organizational psychology has a history of conducting research concerning intragroup relations at the individual level (e.g., personality), there has been little cummulation of this research at the group level (Hendrick, 1987). As a result of the resurgence of interest in teams, however, the responsibilities of individuals in organizations are undergoing a transformation and functioning at the level of the group has increased in importance. First, the individual identities of employees are challenged by new group memberships. Such membership affects employees' sense of who they are, subsequently altering their behavior with other employees who are group members (Bettenhausen, 1991).

Further, the team concept challenges outmoded ways of thinking about organizations as hierarchical systems, contradicting the American cultural emphasis on individualism (Tjosvold, 1991). Teamwork requires a group a diverse individuals to work together, sharing both information and ideas, in order to achieve a common goal. As this style of work clashes with more traditional American value of individualism, teams require a new alignment of employees' responsibilities. Thus, one of the challenges faced by work group members has become the ability to maintain individuality while at the same time becoming an effective team player (Sinclair, 1992). Similarly, one of the challenges faced by industrial/organizational psychologists is the ability to make predictions about performance and satisfaction at the group level as well as the individual level.

A review of field studies and survey research on established groups (e.g., Banker et al., 1996; Campion et al., 1993; Pearce & Ravlin, 1987) reveals that many organizations have found the transition from individually-based work systems to well-designed teams has yielded numerous positive results, including lower turnover (Trist, Susman, & Brown, 1977), absenteeism (Walton, 1977), and stress-related illnesses (Bucklow, 1966). Employees themselves have often indicated they desire the greater autonomy and control associated with work teams (Cummings & Huse, 1989), as well as the "togetherness" of team membership (Lieberman, Yalom, & Miles, 1973). Evidence of the effectiveness of work teams comes from organizations such as Proctor and Gamble, where team implementation resulted in multiple organizational

improvements. "Not only are the tangible, measurable, bottom line indicators such as cost, quality, customer service, and reliability better, but also the harder-to-measure attributes such as quickness, decisiveness, and toughness" (Eberle, as cited in Fisher, 1993, p.17).

The transformation to a team system in organizations, however, does not always result in such profitable outcomes. The available evidence does not indicate that groups are invariably effective (Weldon, Jehn, & Pradhan, 1991). Teams do not necessarily fulfill individual and organizational needs, and some companies have found the infatuation with teams has resulted in declines in performance from many of their members (Sinclair, 1992). In some cases, tasks cannot be redesigned effectively at the group level and may be more meaningful when completed by individuals (Hackman & Oldham, 1980). Additionally, interactions among group members may interfere with performance on a variety of tasks. Individual efforts may decrease due to social loafing and "free-riding", for example (Karau & Williams, 1993). Group members may cope with stress and tension in different ways, resulting in conformity and isolation of team members who offer contradictory information and ideas (Janis, 1972). Highly visible examples of team failures include breakdowns in the performance of surgical teams (Tjosvold, 1995) or civilian airline accidents resulting from mistakes in cockpit crew performance (Ilgen, Major, Hollenbeck, & Sego, 1995). Such examples highlight the need to identify the composition of effective teams.

Group Composition

In order to sustain company prosperity and security, organizations need to adopt a team-based system with an understanding of how the composition of work groups alters performance and cohesiveness of these groups (Fisher, 1993). Despite evidence that teams are viewed by many companies as an integral tool for continuous performance improvements (Cutcher-Gershenfeld & Associates, 1994), the team concept is often established without consideration of how team member composition will impact the team's performance (Chatman & Barsade, 1995; Nolan, Lee, & Allen, 1997). Frequently, work groups are implemented with the assumption that such reorganization will result in improvements in productivity (e.g., quality and speed of service) and enhancement of employees' satisfaction through team cohesiveness (Adams, Eby, & Russell, 1996). As discussed above, these assumptions are not always met with reliable results, and therefore group composition variables need to be examined more fully through research. Consequently, the current study explores the composition of groups as it is a critical component of group effectiveness.

In previous studies, composition has referred to such variables as group size (Stoneman & Dickinson, 1989), job experience (Shaw, 1971), group member expertise (Libby, Trotman, & Zimmer, 1987), and heterogeneity of skills and abilities (Goodman, Ravlin, & Argote, 1986; Wall et al., 1986). Goodman, Ravlin, and Argote (1986), for example, demonstrated that heterogeneity of members task-related abilities improved team performance. Futrell and Sundstrom (1996) showed that group cognitive ability was positively correlated with the quality and quantity of performance

on an assembly task. In a study of team members work-related values, Rubenstein, Barth, and Douds (1971) found differences in their values did not hinder their ability to communicate within the group. Finally, Tziner and Eden (1985) discovered that military tank crews composed of members with uniformly high ability performed at levels that far exceeded the performance of either individuals or other crews with members of more diverse abilities. These findings suggest that individual differences among team members affect numerous criteria of group effectiveness.

Overall, research concerning group composition has had a positive impact on a variety of group processes such as decision making (Ilgen, Major, Hollenbeck, & Sego, 1995), goal setting (Mitchell & Silver, 1990; Pritchard et al., 1988) and training interventions (Woodman & Sherwood, 1980). For example, Magjuka and Baldwin (1991) showed that larger team size was positively associated with team effectiveness for some tasks. Further, groups composed of individuals who were already familiar with one another performed better than groups of strangers (Goodman & Leyden, 1991). Group composition studies have also enhanced our understanding of the impact of demographic characteristics such as race and sex (Olson & Johnson, 1996), age (Jackson et al., 1991), and tenure (Allen, West, & Nolan, 1996) on team effectiveness. For example, Olson and Johnson (1996) discovered that race diversity within a team negatively influenced the satisfaction of individual members, whereas sex diversity had little impact on satisfaction.

This suggests that the characteristics of team members, from technical

competencies to interpersonal skills, will influence the overall effectiveness of the team (Larson & LaFasto, 1989). As exemplified above, this research has focused predominantly on competencies, technical skills, and a variety of demographic characteristics while generally ignoring the influence of team members' personalities. Although individual competencies are obviously important for team performance, equally important are "the personal characteristics required to achieve excellence while working well with others" (Larson & LaFasto, 1989, p.62). High performance teams are likely to be those designed with an emphasis on selecting effective team members; that is, those individuals who are the most capable of achieving organizational objectives by working with others in a team-oriented context (Larson & LaFasto, 1989). Research has shown that employees are not only more satisfied in settings that are congruent with their dispositions (Diener, Larsen, & Emmons, 1984), but also are more effective in these situations (Chatman & Barsade, 1995). Ultimately, research concerning group composition and performance will significantly improve the team selection process.

The current research assumes certain individuals perform more effectively in group situations than other individuals. "Even when the work appears right for teams, the people may not be" (Richardson, 1996, p.11). Some employees will likely welcome the opportunity to work in a more interactive context, and their satisfaction with a team environment would be reflected in their performance as well. Other employees may prefer the independence and low level of interaction associated with

individual-level jobs. The creation of a new work environment requiring extensive interactions with other co-workers may result in performance decrements for these workers (Hackman & Oldham, 1975). In order to avoid placing individuals in environments in which they are likely to perform poorly, better methods for the selection of work team members are needed.

In addition to individual-level factors such as skills, knowledge, and status, Steiner (1972) suggests personality characteristics represent input factors that potentially define a team's productivity potential. McClintock and Liebrand (1988) note that different personalities reflect one's tendency to pursue collective or individualistic situations. Thus, enhancing our understanding of the relationship between group member personality traits and group performance potentially offers one way for employers to maximize the productivity of their work groups (Campion, Medsker, & Higgs, 1993). The purpose of the current study, therefore, is to determine what personality patterns are associated with high levels of team performance and cohesiveness.

TEAM PERSONALITY RESEARCH: A LITERATURE REVIEW

Even with a greater demand for effective team-member selection strategies, there has been relatively little synthesis of the literature involving personality variables and team effectiveness (Morgan & Lassiter, 1992). Despite this lack of integration, researchers have recognized the potential influence of personality characteristics on the productivity groups (Hackman, 1978; Seltzer & Kilmann, 1977). Golembiewski (1962) suggested personality traits are equally important as other group properties for explaining the behavior of groups. Baydoun, Emparado, and Neuman (1996) noted that, "in light of the team-oriented workforce it would be advantageous to explore the relationship between team member personality and subsequent team performance" (p.3). The predominance of organizational teams today has made it more essential to understand how the interactions of group members with different personality traits impacts overall group performance (Saavedra, Earley, & Van Dyne, 1993). Employees who prefer to interact in group settings are more likely to be effective team members than those employees who enjoy working alone (Cummings, 1981; Hackman & Oldham, 1980).

The existing literature on the effects of individual personality characteristics on group effectiveness began with an emphasis by organizations on psychopathology and negative traits to avoid (Driskell, Hogan, & Salas, 1987). For example, NASA selected astronaut crew candidates by detecting psychopathology and other undesirable characteristics (Collins, 1985). In addition, Greer (1955) showed paranoid tendencies

in members of Army groups were negatively related to the effectiveness of these groups. This type of screening is beneficial for eliminating unqualified individuals, but is not likely to improve the selection of team members. Even though personality may have both facilitative and detrimental effects on group performance, "we know considerably more about undesirable people than we do about talent, competence, and effectiveness" (Driskell, Hogan, & Salas, 1987, p.93).

Additional literature concerning team member traits and team performance has focused on one or two specific personality traits. Strube, Keller, Oxenberg, and Lapidot (1989) showed that problem solving ability was hindered in groups with the highest Type A behavior patterns. Teams composed of members who were field-independent completed tasks faster than teams of field-dependent individuals (DeBiasio, 1986). Sorenson (1973) found groups of high social differentiators, referring to those with the tendency to make distinctions in the social environment, had higher performance quality than those groups consisting of low social differentiators. Finally, groups of individuals with a concrete cognitive style were much slower at solving a group puzzle task than those groups with a more abstract cognitive style (Hendrick, 1979).

Group and personality research has included other specific characteristics as well, including dogmatism, need strength, and need for achievement. Navy teams with low levels of dogmatism out-performed high dogmatism groups on combat and abstract tasks (Altman & Haythorn, 1967), and individuals with high self-actualization need

strength were better candidates for jobs in a team environment than those with lower self-actualization need strength (Sims and Szilagyi, 1976). Schneider and Delaney (1972) found groups of individuals with high need for achievement were more efficient than groups with low need for achievement members. Further, several studies have demonstrated a relationship between dominance and group performance (Altman & Haythorn, 1967; Bouchard, 1969) and dominance and the level of team participation (Watson, 1971). Overall, these studies demonstrate that personality factors are viable predictors of group effectiveness.

Other literature includes field studies such as Foushee (1984), who explored the impact of personal compatibility of airliner flight crews on their group effectiveness. Foushee (1984) found team member skills and competencies were not enough to ensure high levels of performance. The personalities of team members, in terms of their preferences for group interaction, were relevant to crew effectiveness. In addition, a study of professional basketball teams by Jones (1974) showed that performance was predicable from the personal relations among team members and their ability to work together as a team. Finally, O'Reilly and Robert's (1977) survey of communication skills in Naval Aviation units suggested that groups with high levels of communication skills had higher levels of performance than those groups with fewer communication skills. The authors concluded that group "communication openness" was a significant antecedent to group effectiveness.

Task Typologies and Creative Tasks

Although previous team studies have often failed to adequately consider the impact of the context or the task on performance (Bettenhausen, 1991), several researchers have developed task typologies, including Shaw (1964), McGrath (1984), Hackman (1968), and Steiner (1972). The dimensions these researchers have used to distinguish tasks have differed, resulting in categories that are not interchangeable. Shaw's (1964) typology, for example, is based on task difficulty (simple or complex), while Steiner's (1972) categories (additive, conjunctive, or disjunctive) are based on how individuals contribute to the group process. Since the focus in the current study is on team performance on creative tasks, a typology that emphasizes the behavior requirements of different tasks is desired. Therefore, the task typologies of McGrath (1984) and Hackman (1968) are of greater interest.

While McGrath's (1984) tasks are categorized by four basic group processes (idea generation, choose, negotiate, and execute), Hackman (1968) uses three properties to describe tasks (problem-solving, production, and discussion). Both imply that different behaviors are required by different task types. More importantly, they provide an effective means for linking personality traits with task types (Driskell, Hogan, & Salas, 1987). Idea generation from McGrath's (1984) typology involves the development and identification of new products or solutions at the group level. The problem-solving tasks of Hackman's (1968) typology refer specifically to team tasks demanding imaginative and novel ideas and solutions through collaboration. Thus, both of these categories describe the behaviors specific to the creative tasks of interest

to this study.

In addition to the characteristics of tasks defined in the above typologies, the level of interdependence required of a group tasks also will influence group processes and outcomes. Referring to the degree to which team members rely on each other to perform their given task effectively (Georgopoulos, 1986), interdependence represents the interconnections among the behaviors of group members (Saavedra, Earley, & Van Dyne, 1993). In previous research, task interdependence has influenced the interpersonal interactions among members of a team (Kelly & McGrath, 1985). The level of interdependence affects the order in which information, materials, and other resources are transferred among team members, for example (Shea & Guzzo, 1987).

Early work concerning task interdependence began with Thompson (1967), who theorized that task interdependence could be hierarchically based on the level of information and resource exchange among group members. He established three categories of interdependence, including pooled, sequential, and reciprocal tasks. In sequential interdependence tasks, for example, one member of a group must act before another member can act, as in an assembly line. Van de Ven, Delbecq, and Koenig (1976) later added a fourth category, team interdependence, to make an exhaustive list of categories. An empirical study by Saavedra, Earley, and Van Dyne (1993) utilizing these four categories of task interdependence demonstrated that the level of interdependence of a task based on these categories has direct effects on both the quality and quantity of group performance. Their results suggest that these categories

are appropriate for classifying level of task interdependence in group research.

The tasks of interest to the current study, creative tasks, can be categorized as team interdependent tasks based on typology. Specifically, team interdependent tasks refer to the those in which team members jointly diagnose, problem solve, and collaborate to complete the task (Saavedra, Earley, & Van Dyne, 1993). These types of tasks are typically taken on by groups such as product development teams and other groups in which members have great flexibility in designing the course of their interaction. Simultaneous work interactions and group discretion in deciding the flow of inputs and outputs among individuals characterizes this level of interdependence (Saavedra, Earley, & Van Dyne, 1993). Thus, creative tasks have a high level of interdependence, whereby the group members dictate the course of interaction and subsequent outcomes.

Creative Task Research

Researchers have predominantly agreed that creativity is a multidimensional construct, representing an individual's capacity to produce inventions, ideas, insights, restructurings, and products which can be evaluated as being of high aesthetic, social, scientific, or technological value (Vernon, 1989). In organizations, such creativity may be expressed in groups such as quality improvement teams, task project teams, and research and development groups (Yanushefshi, 1996). Determined by the performance processes involved, creative/problem-solving tasks include the arrangement, invention, or production of expressive products (Driskell, Hogan, &

Salas, 1987), and frequently, these products serve to benefit an individual, group, or a larger component of society (Mumford & Gustafson, 1988; West & Anderson, 1996). The creative behaviors characteristic of these tasks include originality, flexibility, elaboration, and ideational spontaneity (Guilford, 1962). Solutions may require individuals or groups to generate unusual or novel ideas, often going against conventional ways of approaching tasks (Strenberg, 1988). Ideally, creative teams are the mechanisms for developing new niches and exploring areas previously untapped in the market (Peters, 1988).

Despite the availability of clearly defined task typologies as described above, group research has often failed to specify either the type of task or the characteristics of the selected task (McGrath, 1984). At the same time, even though the amount of research concerning various personality characteristics and team effectiveness is considerable, there is little convergence of this literature (Hogan, Raza, & Driskell, 1988). Thus, one explanation for the slow accumulation of knowledge concerning personality and team performance is that much of the earlier research ignored the impact of the task on performance. As mentioned previously, the type of task given to a group influences their interrelations, and subsequently, overall group performance (Hackman & Oldham, 1975). Goodman's (1986) extensive work concerning task types and performance demonstrates the value of considering the group in its context. Morris (1967) found the team's task was the single strongest influence on behavior, and Sorenson (1973) predicted member traits were linked to performance through behaviors

associated with specific tasks as well. "Relationships…appear to depend substantially on the properties of the group task being performed" (Hackman, 1983, p.7).

McGrath (1984) asserts that the assessment of any group performance must begin with an understanding of the nature of the given task. Without successful definition of task properties, it is unlikely substantial advances in group research will be achieved, and consequently, it is essential that group tasks and their characteristics be specified in research (Campion et al., 1993). For example, individuals with strong interpersonal skills may be effective team performers on social tasks, but ineffective team members on mechanical and precision tasks. Driskell, Hogan, and Salas (1987) supported this, proposing that personality traits will differentially influence performance across task types. They suggested that highly social individuals would be disruptive rather than helpful when precision tasks were performed by teams. In contrast, individuals' social skills would be critical for tasks requiring extensive verbal and interpersonal interactions among team members. Thus, in order to capitalize on the synergistic potential of group work, task demands need to be considered (Saavedra, Earley, & Van Dyne, 1993).

Hackman and Morris (1975) showed that most of the variance in performance effectiveness is accounted for by either the level of effort expended by the group or the knowledge and skill of group members, depending on the task at hand. Performance on tasks that require a high level of effort may be more strongly affected by personality than performance on skill-based tasks. Given that creative task performance is more

often associated with the level of group effort, relative to technical or mechanical tasks which rely on specialized skills and abilities (Hackman & Morris, 1975), it is felt that a creative task would maximize the relationship between personality characteristics and team performance in the present research.

In addition, creative tasks are frequently organized at the group level within organizations (Yanushefski, 1996). The current rapid pace of environmental change may hinder individual creativity, so organizations are increasingly relying on teams as agents of creativity and innovation (Garvin, 1993). Empirical evidence supports the proposition that the collaboration and frequent information exchange among team members is related to effective innovative performance (Brown & Duguid, 1991; Payne, 1990). The diverse perspectives offered by team members facilitate the proliferation of one individual's idea into multiple ideas (Morgan, 1996). Kanter (1988) has argued that integration and collaboration among individuals is critical for the generation of new ideas, whereas segmentation of individual ideas is the bane of creative and innovative performance.

Because creative task groups are typically organized for generating unique or new ideas and products, it is essential that they are composed in ways that are the most conducive to high group performance. Further, because of the open-ended nature of creative tasks, performance is often evaluated according to multiple qualitative criteria, including the rapidity of problem solutions, uniqueness of these solutions, and quality of ideas, in addition to quantitative measures (Stone, 1971). Both Amabile (1987) and

MacKinnon (1962) emphasized the importance of multiple measures of the end product of creative activities. In particular, creative responses must be not only original but also appropriate solutions to the task at hand (Amabile, 1987). "Novelty or originality of thought or action, while a necessary aspect of creativity, is not sufficient…it must serve to solve a problem, fit a solution, or accomplish some reasonable goal" (MacKinnon, 1962, p.485). Thus, creative task responses are most effectively characterized by originality, realization, and adaptiveness (MacKinnon, 1962).

A preponderance of the creativity literature has addressed ways in which responses to creative tasks, and the generation of ideas in particular, can be effectively assessed (Amabile, 1990; Taylor, 1975). Although some researchers prefer the measurement of the number of creative solutions produced by a group without regard for overall quality (e.g., Osborn, 1957), the majority advocate multiple measures of the quality of creative responses in addition to the quantity of group responses (Buyer, 1988; Newell, Shaw, & Simon, 1962). Furnham and Yazdanpanahi (1995), for example, derived five different criteria for assessing creative ideas including average creativity ratings and proportion of superior responses. These criteria were congruent with Newell, Shaw, and Simon's (1962) specification of appropriate criteria of quality. Additionally, Taylor (1975) specifically focused on multiple measures of the quality of products generated through creative group interactions in the development of the Creative Product Inventory. As the above proposed criteria of Furnham and Yazdanpanahi (1995) adequately assess the multiple components of creative products,

they will be utilized in the current study.

Big Five Personality Characteristics

The importance of focusing on personality factors in any comprehensive assessment of creative performance has been documented by several researchers (Feldman & Goh, 1995; Montgomery et al., 1992). Creativity researchers in general agree that personality factors are related to group performance on creative tasks (Runco & Albert, 1990). Mumford, Costanza, & Threlfall (1993), for example, determined that personality traits were effective for identifying individuals who could generate high quality, creative solutions to novel, ill-defined tasks. West and Anderson (1996) found that the propensity to innovate was primarily influenced by individual personality differences. Dacey (1989) identified multiple personality factors, such as flexibility, risk taking, and tolerance of ambiguity, related to creative performance. Several other researchers (Davis & Rimm, 1985; Woodman & Schoenfeldt, 1989) have extracted personality traits reflective of creativity as well.

As discussed above, there has been little cummulation of knowledge regarding the impact of personality traits on group performance. The lack of control for differences in group tasks offers one explanation for this. In addition, the available studies may have yielded equivocal results because this research domain has lacked an agreed-upon, common definition of personality (Baydoun et al., 1996; Campion, Papper, & Medsker, 1995; Hogan et al., 1988). Consequently, the disjointed accumulation of research may be due partly to the lack of consensus regarding how

personality characteristics should be defined and measured (Driskell, Hogan, & Salas, 1987). With numerous different ways to measure personality used in previous studies of team performance, this literature domain has been "test rich and integration poor" (Mann, 1959, p.242). It is only with greater consistency in definition and measurement of personality that any substantial conclusions may be drawn about its relationship to group effectiveness (Shaw, 1981). It is felt the use of the Big Five personality taxonomy in the current study, with its extensive history of empirical research development (e.g., Goldberg, 1990), will provide further insight into the team personality and performance relationship.

Only a few studies have tested the relationship between more general personality factors, such as the Big Five, and team effectiveness (e.g., Baydoun, Emperado, & Neuman, 1996; Hogan, Raza, & Driskell, 1988; Wagner, Neuman, & Christiansen, 1996). Although these studies suggest at least some of the Big Five personality characteristics may be effective for the selection and performance of work team members, this literature base is far from establishing any substantial conclusions (Baydoun, Emperado, & Neuman, 1996). Instead, this research indicates additional empirical studies are needed to assess the impact of personality on group effectiveness. Therefore, the current study will explore the relationship between the Big Five personality characteristics of team members and team creative performance.

The Big Five personality characteristics offer a parsimonious taxonomy by which personality can be consistently defined and measured. A brief history of this

taxonomy reveals that after decades of research (e.g., Cattell, 1946; Eysenck, 1953; McCrae & Costa, 1985; Norman, 1963), personality psychologists have generally agreed with L.L. Thurstone's assertion over sixty years ago that "the scientific description of personality may not be quite so hopelessly complex as it is sometimes thought to be" (Thurstone, 1934, p.14). Although some disagreement regarding the number of personality factors continues, ranging from Peabody's (1984) three personality factors to Cattell's (1945) sixteen factors, there is general consensus among psychologists that a five factor structure is remarkably robust (Goldberg, 1990). This common taxonomic structure of personality could provide a framework for integrating research studies as well as offer a foundation for cumulative advances in numerous psychological domains (Botwin & Buss, 1989).

Even with consensus as to the number of factors in a comprehensive model of personality, there is less agreement as to the labels and precise meanings of each factor. While the five-factors derived by Norman (1963) were described as Surgency, Agreeableness, Conscientiousness, Emotional Stability, and Culture, other authors have argued that these labels do not accurately reflect the underlying meaning of the constructs (Digman & Inouye, 1986). Most often, there is consensus regarding Extroversion (Surgency) and Agreeableness, while disagreements are associated with the latter constructs, particularly Neuroticism (Emotional Stability) and Openness to Experience (Culture).

The labeling scheme that will be used in the current study will be based on the

Big Five taxonomy as defined by McCrae and Costa (1987). Specifically, McCrae and Costa (1987) identified the five factors as Extraversion, which is associated with being outgoing, sociable, confident, and enthusiastic; Conscientiousness, which is associated with being responsible, ambitious, industrious, and thorough; Openness to Experience, which is associated with being broad-minded, imaginative, original, and curious; Agreeableness, which is associated with being cooperative, good-natured, forgiving, and generous; and Neuroticism, which is associated with being moody, worrying, insecure, and inhibited. For further clarification, the six facets that represent the specific components of the five factors is presented in Table 1.

- Insert Table 1 here -

Although all of the Big Five characteristics may be related to performance at the group level, the author has developed a priori predictions about only three of the factors, based on previous research findings. Because of the positive relationship found between Extraversion and Conscientiousness and work performance at the individual level, to be discussed below, predictions will be made using these two traits at the group level. In addition, the innovativeness and broad-mindedness associated with Openness to Experience logically suggests that this particular trait may be predictive of creative task performance. Therefore, the hypotheses in the current study will focus on these three personality characteristics of the Big Five factors.

Five Factor Research: Individual Level

Research conducted at the individual level suggests that the Big Five personality

tests are useful for assessing the fit between applicants and job openings (Barrick & Mount, 1991; Costa, 1996). Barrick and Mount's (1991) extensive meta-analytic study of the relationship between the Big Five personality dimensions and job performance within most occupational groups revealed a strong association between Conscientiousness and performance in all of these occupational groups, while Extraversion and Openness to Experience significantly predicted some performance criteria, such as training proficiency. These findings suggest "there are differential relations between the personality dimensions and … performance criteria" (Barrick & Mount, 1991, p.17). While it may be that these personality traits also are associated with performance at the group level, this has yet to be studied empirically.

Some additional individual level research investigated the association between the Big Five and vocational interests and showed high levels of Extraversion were strongly related to interest in vocations requiring social skills (Costa, McCrae, & Holland, 1984). Other studies have also suggested high levels of Extraversion predict versatility and success at interpersonal relationships (Costa, 1992; Piedmont & Weinstein, 1994). Littlepage et al. (1995) found that extraverts had higher levels of participation in groups than less extraverted individuals. Based on these findings, it may be that individuals with high levels of Extraversion, because they prefer working with others, will benefit from jobs designed within highly interdependent work teams.

A study of personality and attitudes by Thoms, Moore, and Scott (1996) showed that individuals with higher levels of Extraversion and Conscientiousness also had more

positive attitudes towards the possibility of team participation. In addition, the individuals with high levels of these two traits had higher self-efficacy for participation in team projects. The high amount of social interaction within groups may appeal to the Extraverts, while the focus on explicit team goals may attract individuals with high levels of Conscientiousness.

In addition to Barrick and Mount's (1991) meta-analysis, other research has shown a relationship between Conscientiousness and performance. Zander and Forward (1968) demonstrated that individuals with high levels of achievement motivation (a characteristic associated with Conscientiousness) were more likely to attempt to complete tasks successfully, regardless of their group roles. Barrick et al. (1993) showed that the relationship between Conscientiousness and performance was mediated by commitment to established goals.

With regard to creative task performance, research by McCrae (1987) found that creative individuals had higher scores on Extraversion and Conscientiousness than those that were less creative. Further, Belbin (1981) study of the personality characteristics of management team members showed that those individuals possessing the characteristics of sociability and enthusiasm (traits assocaited with Extraversion) were perceived as the most creative individuals of a group. This is congruent with Barron's (1969) work which demonstrated that creative mathematicians were described more frequently as extraverted and "open" than other mathematicians, and Helson's (1985) finding that creative potential was associated with Conscientiousness. Thus,

individuals possessing high levels of these traits may be better adjusted, sociable, and achievement-oriented than others. "Conscientious individuals may complete their creative projects more often; extraverts may exhibit them more readily" (McCrae, 1987, p.1264).

Of the three personality traits, Openness to Experience has the closest association with creative interests and innovative performance. Costa, McCrae, and Holland (1984), for example, found that Openness to Experience was related to individuals' investigative/creative interests. In a study by Holland, Johnston, Hughey, and Asama (1991), Openness to Experience was again associated with creativity, suggesting that individuals with high levels of Openness to Experience will have greater success in tasks that require creative thinking. This is consistent with McCrae and Costa's (1987) descriptors of individuals with high levels of Openness to Experience, which include imaginative, broad-minded, and original. Other descriptors of Openness to Experience such as intellectual curiosity, emotional differentiation, and aesthetic sensitivity, as well as tolerance of ambiguity and independence of judgement are often used to describe creativity (Barron & Harrington, 1981). Interestingly, Johnson (1994) found that the central core of Factor Five (Openness to Experience) represented Creative Mentality, while Hofstee (1994) labeled this factor Creative Imagination.

In another study of creativity, Bull, Montgomery, and Baloche (1995) found that Openness to Experience was the most important personality characteristic for effective creative performance in college-level courses. McCrae (1987) theorized that

individuals low on Openness to Experience may have little motivation to be creative, preferring the familiar rather than trying something new, whereas those with higher levels of Openness to Experience may enjoy novel situations and unfamiliar challenges in a group setting. Overall, these findings suggest that Openness to Experience may be directly indicative of creative task performance.

Five Factor Research: Group Level

The current study is based on the assumption that the combination of individuals' personalities within a group is related to the performance of that group. Given the number of individual level studies demonstrating a positive association between Big Five personality characteristics and performance, there are relatively few studies of these personality traits and performance at the group level (Barry & Stewart, 1997). However, a review of the available research does indicate that a relationship between personality and performance at the group level does exist.

An empirical study by McCrae (1987) showed that creativity was associated with Openness to Experience at the group level. Specifically, groups with higher levels of Openness to Experience had higher levels of divergent thinking, a greater number of novel ideas, and higher expressional and word fluency. From this, he concluded that the trait of Openness to Experience may be valuable for selecting potentially creative group members. A more recent study of team creativity demonstrated that as the proportion of innovative team members increased, the level of creativity of generated ideas also increased (West & Anderson, 1996).

In addition, the level of Conscientiousness of a group may impact task performance. Schneider and Delaney (1972) found that as groups' scores on achievement motivation increased, their ability to solve problems presented to the group increased as well. Just as high need for achievement (i.e., Conscientiousness) was associated with higher performance by individuals, it is likely that it is associated with higher performance by groups. Similarly, LePine, Hollenbeck, Ilgen, and Hedlund (1997) showed that the decision accuracy of teams was highest when both the team and their leader had high levels of Conscientiousness. These findings support the proposition that groups with high levels of Conscientiousness are most likely to stay focused on the task at hand, committing themselves to successful task completion (Barrick & Mount, 1993).

In a study designed to compare students' self-report ratings of team effectiveness (i.e., performance, involvement) with personality dimensions, Baydoun et al. (1996) relied on a derivative of the Big Five personality taxonomy. Their findings demonstrated that Conscientiousness and Openness to Experience had highly significant relationships with the team performance criteria. Specifically, those subjects highest on Openness to Experience were most likely to voluntarily get involved with teams, felt most comfortable in a team setting, and were the most committed to team goals. Those with high levels of Conscientiousness were also the most committed to team goals, and had the highest attendance at team meetings as well. Baydoun et al. (1996) suggested these personality characteristics reflect group members' openness to diverse

characteristics and viewpoints, which helps to foster creativity and facilitate successful idea generation. If this is the case, then clearly Conscientiousness and Openness to Experience are important traits for enhancing performance on creative tasks.

Although the results of Baydoun et al's (1996) study should be interpreted cautiously due to the nature of the data (self-report) and the heterogeneity of the team tasks in the sample, it is felt the highly significant findings warrant further exploration. Additional research may support the proposition that the Big Five personality traits are effective criteria for team member selection. "Teambuilding…may be clearly enhanced with the knowledge of each team member's unique personality tendencies, strengths, and weaknesses" (Baydoun et al., 1996, p.12).

A field study by Wagner et al. (1996) demonstrated that not only the level of Big Five personality traits but also the variability of these traits within groups affects performance. These authors supported Baydoun et al.'s (1996) findings, showing higher group levels of Conscientiousness and Openness to Experience were associated with significantly higher levels of group performance. Extraversion, on the other hand, was associated with greater performance only when teams were composed of members with heterogenous extraversion scores. Thus, at the group level, complimentary rather than congruent personalities were more effective with regard to Extraversion.

Extraversion, characterized by gregariousness, assertiveness, and warmth, also has been measured in earlier group research. A study by Miesing and Preble (1985) found groups of MBA students with the highest levels of performance on a simulation

task had only moderate levels of gregariousness (i.e., extraversion). Again, these researchers suggested that *moderate* rather than high levels of extraversion led to higher group performance (Miesing & Preble, 1985). Although extraverted individuals may have high levels of participation in groups, if other team members have similarly high levels of extraversion, their personalities may compete rather than compliment each other. In a group setting, more moderate levels of extraversion may foster more effective interactions.

Barry and Stewart (1997) supported these findings in an empirical group study. These authors found that Extraversion at the group level was curvilinearly related to the performance of the group. Specifically, groups with 20 to 40 percent of their members with high extraversion scores had better task performance than groups with either more or fewer extraverts. As suggested above, it may be that groups with too many extraverts experience conflict as members attempt to talk all at once, and compete for the fulfillment of the dominant, leader roles within the group. Groups with too few extraverts, on the other hand, may perform poorly because they lack members who will initiate verbal exchanges and accept leadership roles (Barrick & Stewart, 1997).

Barry and Stewart's (1997) findings may also have implications regarding the similarity of group member's personality traits. Groups with either large or small numbers of extraverts did not perform as well as groups with moderate numbers of extraverts, suggesting than *similarity* of personality traits (i.e., most members have high levels of extraversion, or most members have low levels of extraversion) was

detrimental to group performance. Those groups of individuals with more *variable* levels of extraversion (i.e., 20 to 40 percent of members had high levels of extraversion, meaning the remaining members had moderate or low levels of extraversion)

Personality Patterns in Groups

This literature provides evidence that the Big Five personality dimensions are relevant to performance on group tasks. In the current study of the Big Five traits and performance, a pattern approach will be utilized for the prediction of team performance on creative tasks. Although patterns have not been used extensively in many domains of research, psychologists are increasingly realizing that an empirically derived, pattern-oriented strategy may uncover relationships that would not be revealed with more traditional analyses (Gustafson & Mumford, 1995).

The traditional approach in psychology is concerned with the statistical relationship among a combination of variables in isolation from other variables. This approach assumes that the relationship among the variables studied *across* individuals is indicative of the relationship among the variables *within* individuals as well (Magnusson, 1996). Because variables are the fundamental unit of analysis, the generalization of empirical results refers to the specified variables and the criterion, rather than persons in their entirety (Magnusson, 1995). Thus, as the focus in this approach is on a few isolated variables of interest, the integration of these variables into the totality of the individual is lost.

Another limitation of the traditional designs used in personality research is the number of personality variables that can be studied simultaneously. Moderator designs that use only one or two personality variables, for example, often show inconsistent results as demonstrated by the previous review of group personality studies (Hogan, 1991). Expanding a moderator design employing one or two moderators to a design with multiple moderators would potentially yield more meaningful results, but the complexity of such designs limits their applicability.

Designs based on specified *patterns* of scores across theoretically meaningful moderators offer one alternative to traditional moderator designs. The pattern-oriented approach is theoretically founded on an integrated, holistic view of individuals. In essence, this approach represents a favorable way of subgrouping individuals based on their profiles across several personality dimensions (Owens, 1978). By clustering subjects by their similarity across multiple personality variables in a pattern approach, researchers are effectively dealing with multiple moderators (Gustafson & Mumford, 1995). Each piece of data about an individual gets its meaning from its position in a pattern of data for that individual, and together, the pattern represents the individual's position on the latent dimensions of interest (Magnusson, 1996). Therefore, instead of conceptualizing persons as a summation of variables, they are viewed as a hierarchically organized totality (Magnusson, 1996). The advantage of this approach is that the results of empirical research can be generalized to individuals rather than to variables.

Another advantage of utilizing a pattern approach is that the subsequent analysis is based on a non-linear methodology (Gustafson & Mumford, 1995). Despite the sophistication of multivariate techniques such as multiple regression and structural equation modeling, these forms of analyses are necessarily linear because of their reliance on correlation or covariance matrices. The strategies based on these matrices may mask higher-order interactions and subsequently cloud the interpretation of results (Pervin & Lewis, 1978). Pattern analysis, however, allows for the assessment of both pattern level and shape. This results in absolute rather than relative comparisons, unlike correlation coefficients, which are relative measures and insensitive to absolute differences among groups (Gustafson & Mumford, 1995; Newton & Keenan, 1991). It is proposed that the pattern approach defined in this study will identify meaningful relationships between group personality patterns and measures of group effectiveness which cannot be detected with bivariate designs.

In prior psychological research, pattern-oriented approaches specific to personality have been explored extensively by Holland (1985), who developed a personality typology relevant to vocational interests. Relationships between Holland's (1985) theoretical personality patterns and other variables such as job satisfaction and academic grades have been established (Camp & Chartrand, 1992). Based on Holland's (1985) work, it is assumed that patterns of personality traits such as the Big Five are more likely to confirm theoretical predictions than individual personality scores alone. This is consistent with the work concerning the development of other

personality "type" indicators, such as the Myers-Briggs Type Indicator (Myers & McCaulley, 1985), which has been influential in domains including vocational counseling and executive decision-making (Nutt, 1986).

As suggested above, the research utilizing patterns thus far has focused predominantly on an individual level of analysis (Gustafson & Mumford, 1995; Holland, 1987). The current study extends this level of analysis, specifying Big Five personality patterns at the group level. Despite this distinction, the present pattern approach is similar to Holland's (1985) approach in that an ideal personality "type" is specified at the group level a priori. Thus, the optimal group personality pattern is reflected in the combined Big Five personality patterns (i.e., Extraversion, Conscientiousness, and Openness) of individual group members. Ideally, this more sensitive pattern approach will uncover relationships between these personality characteristics and measures of group effectiveness.

Group Personality Patterns for Creative Tasks

Although previous research concerning the Big Five characteristics of groups does not specify group personality patterns, the evidence from these studies indicates that a relationship between the Big Five traits and team performance may exist at the group level (e.g., Baydoun et al. 1996). A pattern including the three traits of interest - Extraversion, Conscientiousness, and Openness - can be identified from the synthesis of studies involving only one or two of the Big Five personality traits, as well as those including all five characteristics. Thus, the accumulated body of individual and group

personality research presented in the literature review provides the basis for identifying an optimal group personality pattern for creative tasks.

Probably the most highly studied characteristic of the Big Five traits is Extraversion. This characteristic has been continually associated with the tendency to "seek out" interpersonal relationships such as those found in group settings (Piedmont & Weinstein, 1994). Although higher levels of Extraversion have been related to higher individual performance (Littlepage et al., 1995), average levels of Extraversion appear to be more appropriate for group level interactions, as described previously (Barry & Stewart, 1997; Miesing & Preble, 1985; Wagner et al., 1996). Therefore, it is predicted that the optimal group personality pattern includes an average, rather than high, level of Extraversion.

Not only has Conscientiousness been shown to be the Big Five characteristic with the strongest relationship with performance at an individual level (Barrick & Mount, 1991), but also at a group level (Baydoun et al., 1996; Wagner et al., 1996). Creative potential in particular has been directly associated with high scores on Conscientiousness (Helson, 1985), bolstering the relationship between this personality characteristic and group performance on creative tasks. Therefore, a high level of group Conscientiousness is specified in the optimal personality pattern in this study.

Finally, since Openness to Experience has frequently been defined with qualities associated with creativity (Costa, McCrae, & Holland, 1984), this Big Five trait is expected to be identified with higher creative performance in groups. Since groups

with high levels of Openness may tend to exhibit more "flexible" thinking, including more innovative and imaginative ideas, an optimal group personality pattern would include high levels of Openness to Experience across team members. Taken together, the specified levels for each of these three Big Five personality characteristics presented here represent the predicted optimal pattern of group personality for group performance on creative tasks.

Group Personality and Cohesion

Since the earliest investigations into group cohesion (e.g., Festinger, Schachter, & Back, 1950), there has been widespread agreement that the concept has considerable importance as both a practical characteristic essential to group preservation (Piper, Marrache, Lacroix, Richardsen, & Jones, 1983) and a theoretical construct facilitating the understanding group phenomena (Mudrack, 1989). Previous researchers have demonstrated the effects of cohesion on group effectiveness in a variety of group settings including psychotherapy groups (Bednar et al., 1974), task groups (Cartwright, 1968), military tank crews (Tziner & Vardi, 1983), and even bar bands (Dyce & O'Connor, 1992). Further, cohesion has been shown to be a contributing factor in multiple group processes such as conformity (O'Keefe et al., 1975), group behavior change (Yalom, 1975), and goal achievement (Newcomb et al., 1965). Overall, there appears to be a consensus that cohesion is an important characteristic of effectively functioning groups (Stokes, 1983).

Most important to the current research is how these findings are applicable to

organizational work groups. As organizations are relying more often on teams to perform the tasks once divided among individuals, they have a particular interest in designing work groups where members can work effectively together in order to reach a common goal (Tjosvold, 1991). Altering the cohesiveness of a group affects the nature of group output, and ultimately, the ability of the group to reach their goals (Goodman, Ravlin, & Schminke, 1987). Through empirical studies, researchers may increase their understanding of group cohesiveness, and subsequently, offer ways in which organizational groups could be designed to enhance cohesion among its members.

Although cohesion is intuitively easy to describe and understand, the construct has proven difficult to define. In recent years, there has been a paucity of research in the domain of cohesiveness, and this has been largely attributed to the lack of a clear definition and standard of measurement of group cohesiveness (Evans & Jarvis, 1980; Forsythe, 1990). Probably the most commonly used definition of group cohesion is that of Festinger, Schachter, and Back (1950): "the total field of forces which act on members to remain in a group" (p.164). This vagueness of this definition has made cohesion difficult to operationalize, as "a field of forces" is neither specified nor measured clearly across studies (Piper et al., 1983).

Other frequently cited definitions of group cohesiveness emphasize the attraction of individuals to the group (Libo, 1953; Lott, 1961). Research using this definition has focused on the effects of attraction among members on overall group cohesiveness,

typically showing that higher levels of attraction result in higher group cohesion (Cartwright, 1968; Lott, 1961; Piper et al., 1983). Even if such definitions are easier to operationalize, they focus only on attraction among individuals at the expense of other factors specific to the group, such as the task (Goodman, Ravlin, & Schminke, 1987). Rather than utilizing only one of these dimensions, a more comprehensive definition of group cohesion refers to both the attraction among group members and their focus on the task. Such an emphasis already exists in the domain of sport psychology, where cohesiveness historically has been based on goal attainment and task completion (Carron, 1982). Since organizations are ultimately concerned with the productivity of teams to a greater extent than the level of attraction among group members, the definition of group cohesiveness in the current study will be adopted from the sport psychology literature. According to Carron (1982), cohesiveness is "a dynamic process which is reflected in the tendency for a group to stick together and remain united in the pursuit of its goals and objectives" (p.124). The advantage of this definition is its multidimensionality, including both the interpersonal component (desire to "stick together") and task component (pursuit of goals) of group cohesiveness (Zaccaro, 1991).

Although there are few empirical studies directly indicating that specific personality characteristics of group members will enhance cohesiveness, the group cohesion literature has led to suggestions by researchers that such a relationship exists. Evans and Jarvis (1980), for example, suggested that complimentary personality

characteristics of group members may lead to more cohesive groups, even though they did not refer to specific personality traits. Earlier studies found that groups were more cohesive and performed better on laboratory tasks when group members' personality characteristics complemented each other (Rychlak, 1965; Schutz, 1958). In the current study, group cohesion will be treated as a mediator, altering the relationship between group personality (patterns of Extraversion, Openness to Experience, and Conscientiousness) and group performance.

Given that groups of individuals with optimal personality patterns are more cohesive than those groups with other personality patterns, how will cohesiveness impact group performance? The assumption commonly portrayed in the research literature is that greater levels of group cohesion will contribute to greater productivity. Although this relationship between cohesion and performance may be reasonable and seemingly straightforward, it has generated considerable controversy (Mullen & Copper, 1994). As a result of the lack of clarity in defining and measuring group cohesion (Evans & Jarvis, 1980), the utilization of this construct has not been adequately accompanied by empirical and theoretical advances. More significantly, little of the vast expanse of research on cohesiveness can be integrated into comprehensive, meaningful conclusions (Widmeyer, Brawley, & Carron, 1992).

Stogdill's (1972) early review of the literature concerning the association between cohesion and productivity demonstrated substantial inconsistency, suggesting that cohesion does *not* always improve performance. Although a majority of the

studies in his review showed a positive relationship between cohesion and performance, a substantial number found a negative relationship or no relationship at all. Stogdill (1972) concluded that the effects of cohesiveness on performance are indirect, mediated by other factors. However, several authors have questioned Stogdill's (1972) review (Mudrack, 1989), claiming his conclusions were unwarranted since none of the studies operationalized group cohesiveness in the same way and some studies neglected to define the construct at all (e.g., Likert, 1961). More recently, Summers, Coffelt, and Horton (1988) directly contradicted Stogdill's (1972) findings, concluding that cohesion promotes productivity. Based on their comprehensive review of the available literature, these authors determined that the facilitation of group cohesion had a positive influence on group productivity and group satisfaction as well.

Just as other studies within the domain of team performance have often failed to consider the effects of task type, so too the research on group cohesion has typically overlooked this issue. Consequently, the cohesion literature does not offer many findings regarding creative tasks specifically. An early study by Cohen, Whitmyre, and Funk (1960), however, was the exception. In their research concerning creative thinking, Cohen, Whitmyre, and Funk (1960) found that highly cohesive groups had significantly better performance on brainstorming tasks than less cohesive groups. Cohesiveness resulted not only in a greater number of creative solutions, but also in qualitatively more unique ideas. These results provide additional evidence in support of the conclusions of Summers et al. (1988) that cohesiveness can enhance group

performance, particularly when tasks require creative solutions.

Summary and Hypotheses

The burgeoning use of groups in organizations today has redefined researchers' interests in studying groups and performance. As the use of work groups becomes commonplace, greater understanding of factors than enhance and detract from group performance is essential for maintaining high levels of organizational productivity (Larson & LaFasto, 1989). The personality characteristics of group members in particular may influence the way in which groups interact, ultimately affecting both the efficiency and effectiveness of their task performance. Further, creative tasks are often presented to employees today as companies strive to develop new ideas and products that set them apart in a competitive marketplace (Fisher, 1993). Ideally, identifying optimal group personality patterns, such as the pattern of three of the Big Five personality characteristics proposed here, will enhance group member selection for such tasks.

Prior research also indicates that group cohesion may significantly influence group interactions and subsequent group performance (Stokes, 1983). Given that groups with high levels of cohesiveness often demonstrate higher levels of performance than groups with lower levels of cohesiveness (Summers et al., 1988), specifically during creative tasks (Cohen et al., 1960), this construct will likely affect the relationship between the group pattern of Big Five personality characteristics and performance in this study. As a mediator, higher group cohesion may improve team

performance, attenuating the impact of the group personality patterns on performance on creative tasks.

Based on the above discussion, it is hypothesized that there is an optimal group-level pattern of Extraversion, Openness to Experience, and Conscientiousness, which will predict higher levels of group performance. In addition, the relationship between personality and group performance is mediated by the level of cohesion within the group. The Optimal pattern consists of moderate levels of Extraversion, high levels of Openness to Experience, and high levels of Conscientiousness. The hypotheses derived from this pattern are as follows:

Hypothesis 1. Groups with the Optimal pattern of Extraversion, Openness to Experience, and Conscientiousness, will produce a higher *quantity* of responses on a creative task than groups with a personality pattern that varies across any of these Big Five factors (Contrast groups).

Hypothesis 2. Groups with the Optimal pattern of Extraversion, Openness to Experience, and Conscientiousness, will produce higher *average creativity scores* on a creative task than groups with a personality pattern that varies across any of these Big Five factors (Contrast groups).

Hypothesis 3. Groups with the Optimal pattern of Extraversion, Openness to Experience, and Conscientiousness, will produce a higher *number of creatively superior responses* than groups with a personality pattern that varies across any of these Big Five factors (Contrast groups).

Hypothesis 4. Groups with the Optimal pattern of Extraversion, Openness to Experience, and Conscientiousness, will produce a higher *percentage of creatively superior responses* than groups with a personality pattern that varies across any of these Big Five factors (Contrast groups).

Hypothesis 5. Group cohesion will mediate the relationship between the personality patterns and group performance such that higher levels of cohesion will increase the *quantity* of ideas generated by groups on a creative task.

Hypothesis 6. Group cohesion will mediate the relationship between the personality patterns and group performance such that higher levels of cohesion will result in a higher *average number of creative ideas* generated by groups on a creative task.

Hypothesis 7. Group cohesion will mediate the relationship between the personality patterns and group performance such that higher levels of group cohesion will increase the *number of creatively superior responses* produced by groups.

Hypothesis 8. Group cohesion will mediate the relationship between the personality patterns and group performance such that higher levels of group cohesion will result in a higher *percentage of creatively superior responses* produced by groups.

Exploratory Hypothesis

The group-level personality patterns explored in this study are derived by aggregating the personality scores of individuals in a group. Despite the frequent use of aggregated scores in psychological research, considerable controversy has

surrounded the rationale behind transformations from individual scores to group-level characteristics (e.g., George & James, 1993). Personality traits describe individuals, not teams, and consequently, several researchers have questioned whether aggregation can add meaning to individual-level data (Rousseau, 1985). Aggregation of group members' scores on personality traits, however, provides a method for studying group composition (LePine et al., 1997). By combining individual scores, researchers can test whether or not the trait composition of a group impacts the performance of a group. Individual team member traits of Extraversion, Openness to Experience, or Conscientiousness, for example, can be considered resources that influence team performance. It is with this perspective in mind that the present study proposes the group-level personality patterns described above.

To derive the group-level patterns, individual team members may have personality patterns that are the same as the specified group pattern, *or* patterns that vary from the group pattern - and each other - but fit the group pattern when averaged together. This fact raises an important question concerning the decision criteria for assigning individuals to groups. Specifically, will the performance of groups composed of individuals with homogenous personality patterns (i.e., every group member has the desired group-level personality pattern) differ from the performance of groups composed of individuals with heterogenous personality patterns, who create the desired group pattern only when their patterns are averaged together?

Prior research addressing this question has led to inconclusive findings. Seltzer

and Kilmann (1977) found no differences in performance between groups of people with either homogenous or heterogenous personal preference characteristics. Aamodt and Kimbrough (1982) showed that groups of students with heterogenous personality profiles had superior performance on a discussion task to groups of students with homogenous profiles, and Barry and Stewart (1997) found that teams with a moderate proportion of members with high Extraversion scores outperfomed teams with either a low or high proportion (i.e., homogenous levels) of such members. In contrast, other findings demonstrated that groups with members possessing similar leadership styles were more productive than those with dissimilar leadership styles (Hewett, O'Brien, & Hornik, 1974). These inconsistencies indicate that further research is needed before generating any conclusions on this issue.

In the current design, the Optimal group-level pattern contains moderate levels of Extraversion, high levels of Openness to Experience, and high levels of Conscientiousness. In a group of three people, this group-level pattern would result when a) all three group members have the Optimal pattern (Same pattern), *or* b) one member has the Optimal pattern, one member has low levels of Extraversion, high levels of Openness to Experience, and moderate levels of Conscientiousness, and one member has high levels of Extraversion, moderate levels of Openness to Experience, and high levels of Conscientiousness (Variable pattern). Will the performance of Same-pattern groups differ significantly from the performance of Variable-pattern groups? In order to answer this question, an exploratory study was conducted, as

explained below.

METHOD

Exploratory Study

Before data for the Contrast group conditions was collected, an exploratory study was conducted to assess whether performance would differ between groups of individuals with homogenous personality patterns and groups of individuals with heterogenous personality patterns. To do this, approximately one-half of the groups in the Optimal condition ($n = 11$) were composed so that all three members had the *same*, group-level pattern (Same-pattern groups). The other half of the groups in the Optimal condition ($n = 12$) were formed so that individual members possessed *variable* patterns, but their patterns matched the group pattern when averaged together (Variable-pattern groups). Groups in both pattern conditions completed the creative task, as described in the Procedure below. Following this, t-tests were conducted to analyze the group-level results.

Independent samples t-tests revealed that there were no significant differences between the Same-pattern groups and the Variable-pattern groups on any of the dependent variables: quantity of creative ideas ($M = 14.29$ and $M = 14.78$, respectively), average creativity score ($M = 3.33$ and $M = 3.31$, respectively), quantity of superior ideas ($M = 6.43$ and $M = 6.78$, respectively), and percentage of superior ideas ($M = 45.14$ and $M = 46.44$, respectively, $p > .05$). Therefore, these two types of groups were combined to form the Optimal condition in the present study ($N = 23$). Given these results, it appears that group performance on a creative task is

not significantly affected by the personality patterns of individual group members as long as the group-level personality patterns are the same.

However, it may be that the variability among individuals' patterns in the groups was not extreme enough to create group performance differences. A closer look at the individual personality patterns within the Variable-pattern groups, presented in Appendix A, further clarifies the findings. Although the Variable-pattern groups consisted of individuals with patterns that differed from the Optimal pattern, the patterns did not differ extensively. Specifically, the Variable-pattern groups did not contain any members with personality traits that varied from the Optimal group pattern by more than one level. For example, the Optimal pattern specifies a high level of Conscientiousness, and none of the individual group members had low levels of Conscientiousness in any of the twelve Variable-pattern groups. At most, one or two group members in the Variable-pattern groups had moderate levels of Conscientiousness.

Because the heterogeneity of individual personality patterns in this exploratory study was minimal, the findings were treated cautiously. As it was found that individuals' personality patterns did not vary by more than one level from the group pattern, all of the remaining groups in the study (i.e., the Contrast conditions) were also formed such that personality traits of group members did not vary by more than one level from the group pattern, as shown in Appendix A. Thus, the criterion used for the formation of the Contrast groups was that the *average* of all three individual

personality patterns matched the group-level pattern.

Pilot Study

In addition to the exploratory study, a pilot study was conducted in order to identify the most common patterns of Extraversion, Openness to Experience, and Conscientiousness in the student population. By applying cluster analytic techniques, the author was able to determine the plausibility of finding individuals who possessed one of the four proposed personality patterns in the student sample. Thus, this study was undertaken for the purpose of ensuring that the proposed personality patterns existed in the student sample.

Subjects. The subjects in the pilot study were obtained from data collected by Church (1994). These subjects were selected because of their similarity to the subject pool to be used in the focal study. Church's (1994) sample consisted of undergraduate student volunteers ($N = 610$) from a large northwestern state university who received extra credit points for their participation in his study. The students consisted of 187 males (31%) and 413 females (68%), with 10 subjects not reporting gender. For comparison, the subject pool of the focal study consisted of undergraduate psychology students from a large southeastern university who were also predominantly female.

The subjects completed two questionnaires, including the NEO PI (Costa & McCrae, 1985), which were administered as a component of a larger study. Only the Extraversion, Openness to Experience, and Conscientiousness scores on the NEO PI were analyzed in this pilot study.

Procedure. The subjects' scores on each of three personality traits were standardized based on scale norms (Costa & McCrae, 1985). The resulting scores were then analyzed with two separate clustering programs: Ward's (1963) hierarchical clustering procedure and the K-means clustering procedure. First, using SLEIPNER (Bergman & El-Khouri, 1995), Ward's (1963) hierarchical clustering procedure was conducted on the standardized scores. This clustering procedure was selected based on prior research demonstrating that the procedure was superior to other methods of cluster analysis (Blashfield, 1976; Milligan, 1981). Starting with each case as a separate cluster, the procedure combines the two cases that minimize the increase in the within-groups (error) sums of squares. The process continues by combining cases into fewer clusters until all cases are joined together as one cluster. Squared Euclidian distance was used as the measure of distance between cases.

Two criteria were used to determine the appropriate number of clusters to retain from the hierarchical procedure. The size of the increase in within-groups sums of squares given a particular number of clusters, compared with the within-groups sums of squares for the iteration containing one additional cluster was the first criterion (Gustafson, 1994). Similar to looking for "breaks" in a Scree plot, the determination of an optimal number of clusters is a somewhat subjective procedure (Gustafson & Magnusson, 1991). Second, the percentage reduction in explained error sum of squares (PR) attributed to a particular number of clusters was compared to the total sample variance (Bergman, 1988). This PR statistic is similar to the statistic "percent

variance explained" that is used in factor analysis (Gustafson & Mumford, 1995).

As the assignment of individual cases to clusters in Ward's hierarchical clustering procedure is final, the cluster means may "drift" as more cases are added to the cluster (Everitt, 1974). Therefore a second clustering program, the K-means clustering procedure, was conducted following Ward's clustering analysis. The K-means procedure corrects for the drift of cluster means and confirms membership of individual cases to clusters (Feild & Schoenfeldt, 1975). The SLEIPNER RELOCATE procedure was used to perform this analysis (Bergman & El-Khouri, 1995).

In the K-means procedure, the initial cluster centers were those determined by Ward's hierarchical analysis, using the two criteria specified above. Cluster membership was then calculated by assigning each individual case to the cluster with the smallest distance between the individual case and the center of the cluster (centroid). Next, the means of each cluster were recomputed, and again, individual cases were allocated to the nearest centroid. This process continued until there were no changes in the cluster means (Lorr & Strack, 1993).

Results. Based on the cluster analysis and the two criteria specified above, a five-cluster solution was selected to represent the data. Compared to a one-cluster solution (i.e., the entire sample as one large cluster), this five-cluster solution resulted in a 56 percent reduction in error variance. Additionally, there was a "break" in the within-groups sums of squares for the five-cluster solution, as the error variance increased minimally from the six- to the five-cluster solution, but increased more dramatically

from the five- to the four-cluster solution.

The interpretation of the five clusters was based on Costa and McCrae's (1985) standardized population norms (i.e., T scores, with a $\underline{M} = 50$, $\underline{SD} = 10$). The mean of each personality factor (Extraversion, Openness to Experience, and Conscientiousness) in each cluster was interpreted as follows: high levels of a personality trait were reflected by T scores greater than 55, moderate levels by T scores between 45 and 55, and low levels by T scores of less than 45. The personality patterns of each cluster are presented in Table 2.

- Insert Table 2 here -

In addition, the homogeneity coefficients of the five clusters were inspected to determine the relative variability among the clusters. From cluster one to cluster five, the homogeneity coefficients were: .84, .76, .87, .70, and .85, respectively. Analysis of these coefficients revealed that they did not differ significantly from one another ($p > .05$).

Inspection of the three personality factor means within the first cluster suggests a pattern consisting of moderate levels of Extraversion, high levels of Openness to Experience, and high levels of Conscientiousness. Reflecting 16 percent of the student sample ($\underline{N} = 96$), this personality pattern is the same as the Optimal pattern proposed in the current study. Because the clusters reveal the *average* of each personality trait, however, the personality patterns of individuals within the clusters was also explored to determine the percentage of students who matched the desired group-level pattern

exactly. In this first cluster, 54 percent (n = 52) of the students possessed the Optimal personality pattern.

The second cluster consists of individuals with moderate levels of Extraversion, moderate levels of Openness to Experience, and low levels of Conscientiousness. Containing 27 percent of the student population (N = 162), this is the largest of the five clusters. As shown in Table 2, the second cluster most closely resembles the Contrast C pattern in this study; it is the same as Contrast C except for the moderate rather than the proposed high levels of Openness to Experience. Thirty percent of the students in this cluster (n = 48) possessed the Contrast C pattern.

The third cluster, containing 18 percent of the sample (N = 106), shows a pattern of moderate levels of Extraversion, high levels of Openness to Experience, and low levels of Conscientiousness. Therefore, this cluster matches the Contrast C pattern exactly (see Table 2). Additional analysis revealed that 71 percent (n = 80) of the students in this cluster have the Contrast C pattern.

The fourth cluster represents individuals with high levels of Extraversion, high levels of Openness to Experience, and moderate levels of Conscientiousness (17 percent of the population; N = 134). This cluster closely resembles the Contrast A pattern. However, while this cluster shows moderate levels of Conscientiousness, the Contrast A pattern specifies *high* levels of Conscientiousness. Inspection of individual patterns within the fourth cluster reveals that 34 percent (n = 36) of the students in this cluster possess the Contrast A pattern exactly.

Finally, with high levels of Extraversion, low levels of Openness to Experience, and high levels of Conscientiousness, the fifth cluster most closely resembles the Contrast B pattern. This cluster represents 22 percent of the student sample ($\underline{N}$ = 112). Inspection of individual patterns within this cluster shows that 19 percent of the students ($\underline{n}$ = 26) have the exact Contrast B pattern. Thus, the Contrast B pattern appears to exist in only a small percentage of the student population.

These results suggest that the Optimal pattern and the Contrast C pattern are found in reasonably high numbers within the student population, as these patterns formed clusters containing 16 percent and 18 percent of the population, respectively. In addition, the percentage of individuals within each of these clusters possessing the proposed personality patterns is also high (i.e., greater than 50 percent). As such, it is concluded that these two personality patterns exist in adequate numbers for the present study.

Given that a perfect match was not found between either the Contrast A or Contrast B patterns and one of the five clusters, it appears that these two patterns exist in lower numbers in the student population. The Contrast B pattern in particular (moderate levels of Extraversion, low levels of Openness to Experience, and high levels of Conscientiousness) appears to exist in only a small percentage of the student population. However, the results of the exploratory study (described above) support the use of *variable* individual patterns within groups: the task performance of groups of individuals with homogenous patterns (i.e., all members have the group-level pattern)

did not differ significantly from the performance of groups of individuals who had heterogenous patterns. Therefore, a practical approach is taken in the current study, described previously, whereby individual members of groups can have patterns that vary from the group-level pattern, as long as the group average matches the specified pattern. This approach satisfies the practical concern of finding students with personality patterns that meet the criteria for inclusion in one of the four groups. In addition, the external validity of the study is enhanced to the extent that organizations employ work teams of individuals possessing a variety of personality patterns, rather than teams of individuals possessing the same personality pattern.

Focal Study

Subjects

Undergraduate psychology students from Virginia Polytechnic Institute and State University were recruited for the study and compensated with extra credit points. During Phase I of the study, 231 students completed the Revised NEO Personality Inventory (NEO PI-R; Costa & McCrae, 1991; Appendix B). The students who received scores on the NEO PI-R that matched one of the proposed personality patterns, or that varied from the one of the proposed patterns by only one level, were assigned to three-person groups for Phase II of the experiment. 195 of the 231 students met this criterion, and were placed in one of the corresponding Contrast A, Contrast B, or Contrast C group conditions. The subjects in the Optimal condition were assigned to groups as described previously in the exploratory study. Thus, 195 subjects (62 males,

133 females) participated in Phase II of the study, for a total of 65 groups.

Task

The creative task used in this study was an adaption of an interactive brainstorming task developed by Morgan (1996; Appendix C). As a group, the subjects were asked to generate ideas the university could use to address transition issues facing incoming students. Specifically, each group was instructed to "Please generate suggestions for how the university could help ease the transition to college in terms of social issues (not related to academics)." Before engaging in this task, participants were given a "warm-up" brainstorming task. For the warm-up task, the subjects were given three minutes to "Generate suggestions for ways the class registration process could be improved".

Independent Measures

Subjects were administered the NEO PI-R (Costa & McCrae, 1991) in order to assess their standing on three of the Big Five personality factors: Extraversion, Openness to Experience, and Conscientiousness. The participants were asked to respond to each of the 240 items (e.g., "I really like most people I meet."; "I never seem to be able to get myself organized.") on a five-point Likert-type scale ranging from *strongly disagree* to *strongly agree*. The total score for each of the personality factors was determined by summation of six defining facet scales, while each facet scale was derived from the summation of eight specified questionnaire items. The scores were standardized based on the college-age norms presented by Costa and

McCrae (1991). Participants' scores on the NEO PI-R were used to determine their placement into one of the four group conditions.

Extensive testing of this personality inventory has yielded measures of internal consistency ranging from .86 to .92 (Costa & McCrae, 1991). In the present study, internal consistency (coefficient alpha) for the three scales of interest - Extraversion, Openness to Experience, and Conscientiousness - was .88, .89, and .91, respectively. Further, although there are concerns of the fakability of personality tests, research has found little evidence that individuals seriously misrepresent themselves on personality tests such as the NEO (Hough et al., 1990; Michaelis & Eysenck, 1971).

Dependent Measures

Group performance - quantity. The quantitative measure of group performance was the total number of non-redundant ideas generated by each group during the creative task. This was determined by transcription of an audiotape after the task was completed by each group.

Group performance - quality. The qualitative measures of group creativity was based on three indices developed by Furnham and Yazdanpanahi (1995). These indices included a) the mean creativity score, b) number of superior responses, and c) percentage of superior responses to the idea generation task. In order to generate these indices, the Creative Product Inventory, a theoretically-based assessment tool proposing several different measures for the evaluation of creative products, was used (Taylor, 1975; Appendix D). This inventory measures the creativity of group ideas with seven

criteria: 1) *originality*, the uncommonness or rarity of the idea, 2) *relevancy*, the extent to which the idea solves the problem presented, 3) *generation*, the power of the idea to stimulate further idea creation, 4) *reformulation*, the extent to which the idea produces change, 5) *complexity*, the intricacy of information involved, 6) *condensation*, the degree to which the idea integrates or simplifies other ideas, and 7) *hedonics*, the impact or popularity of the idea.

The responses generated by each group were rated on the above seven criteria using a five-point scale, where *1 = extremely below average* and *5 = extremely above average*. The summation of these criteria represented the total creativity score for each response. The first qualitative index, mean creativity score, was then calculated by averaging the total creativity scores for each group. The second index, the number of superior responses, was operationalized as the total number of group responses receiving a mean creativity score of 4 or 5. Finally, the percentage of superior responses reflected the creative production rate, or the number of superior responses as a function of the total number of responses generated by the group.

Taylor's (1975) study demonstrated high reliability of the Creative Products Inventory when trained raters assessed products and ideas using these criteria. Other research has also demonstrated that creative responses can be successfully evaluated with trained raters (Amabile, 1990). As such, three trained raters - the primary researcher and two other individuals familiar with the study - evaluated the ideas generated by the groups according to the criteria above. In order to calibrate their

ratings, the raters first looked through approximately fifty percent of the written responses together to get a sense of the range of ideas produced by the students. Next, the three raters discussed the level of creativity in these responses, using the Creative Product Inventory as a guide. The responses were discussed until the raters reached consensus as to what constituted high, average, and low creative responses.

Consistent with the process used by other creativity researchers (Stone, 1971; Taylor, 1975) each rater then scored the responses on the dimensions individually. By removing all codes on the written response sheets that identified the group patterns, the raters were blind to the experimental conditions. After all ratings were completed, interrater agreement was calculated, indicating that agreement was .78. Finally, for the remaining discrepant ratings, the three raters discussed the scores until consensus was reached.

Group cohesiveness. A modified version of the Group Cohesiveness Scale developed by Dobbins and Zaccaro (1986; Appendix E) was used to assess respondents' perceptions of cohesiveness within their group. One item from this eight-item scale was dropped because it did not make sense in the current context. The remaining seven items were reworded by replacing the term "squadron" with "group" (e.g., "The members of my group got along well together"). Responses were made to the seven items on a 5-point Likert scale anchored by *1 = strongly disagree* to *5 = strongly agree*. The summation of all seven items was used as the index of each subject's perception of cohesiveness. The average of the three members' cohesiveness scores

was calculated to reflect cohesiveness at the group level.

In the current sample, the coefficient alpha of the Group Cohesiveness Scale was .83, while previous research has shown that the scale has a coefficient alpha as high as .91 (Dobbins & Zacarro, 1986). The lower reliability estimate in this study may have resulted from dropping one of the original scale items. In addition, one particular item in the seven-item scale may be pulling down the reliability estimate. Additional tests (coefficient alpha) were conducted by dropping each item and then recalculating the reliability estimate with the remaining six items. These tests did not indicate that a particualr item was causing the lower reliability, as the inital estimate of .83 did not vary.

Cognitive ability. The Wesman Personnel Classification Test (Wesman, 1965) was administered to the subjects after completion of the group task. This cognitive ability test focuses predominantly on verbal reasoning skills, particularly the ability to effectively think and reason with new information. The measure was intended to serve as a control, due to the strong relationship between cognitive ability and both Openness to Experience (McCrae & Costa, 1987) and group performance (Terborg, Castore, & DeNinno, 1976).

Procedure

Phase I. The subjects initially completed the NEO PI-R in large groups. The experimenter explained to the subjects that after completing the questionnaire, they would be called back to participate in the second part of the experiment (Phase II).

After filling out this 240-item questionnaire, individuals' scores on the three personality factors of interest (Extraversion, Conscientiousness, and Openness to Experience) were computed in order to determine placement in one of the four conditions (Optimal, Contrast A, Contrast B, or Contrast C).

Placement in these groups was based on NEO PI-R standardized college-age norms (Costa & McCrae, 1991). Similar to the practice used in the pilot study, trait scores were converted to T scores ($\underline{M} = 50$, $\underline{SD} = 10$), and those subjects' scoring above $T = 55$ were categorized as "high" on that personality characteristic, subjects' scoring between 45 and 55 were "moderate" on that trait, and subjects' scoring below $T = 45$ were classified as "low" on that personality factor. As described in the Exploratory Study, participants were placed in the Optimal condition so that for one-half of the groups ($\underline{n} = 11$), all of the members had moderate levels of Extraversion, high levels of Openness to Experience, and high levels of Conscientiousness. For the other half of the groups ($\underline{n} = 12$) participants were selected so that the *average* of three participant scores was moderate for Extraversion and high for both Openness to Experience and Conscientiousness. For the Contrast conditions (control groups), subjects were placed in groups so that the average of the three team members personality scores matched the specified personality patterns at the group level. The personality patterns for each of these conditions is presented in Table 3.

- Insert Table 3 here -

Phase II. Subjects returned for the second part of the experiment in three-person

groups, as designated by the experimenter. The subjects were seated around a circular table facing each other. The experimenter explained that the purpose of the study was to examine students' ideas about college experiences and indicated that their responses during the course of the study would be audiotaped. The participants then were told that they would engage in brainstorming task after completing a warm-up exercise to familiarize themselves with the task. The experimenter emphasized that brainstorming was an interactive process, and so individuals should share any ideas they had with the other team members. Next, the experimenter answered any questions and handed out written copies of the warm-up task to each group member. The subjects then engaged in the three-minute warm-up session while the experimenter monitored the session to ensure that all of the group members understood the process.

After the warm-up exercise, the group members were given a copy of the creative brainstorming task. The experimenter read the task statement aloud and then informed the subjects that they had 15 minutes to brainstorm on the issue (see Appendix C). After any questions were answered, the audiotape was turned on and the subjects engaged in the task until the experimenter signaled them to stop at the end of 15 minutes. During the 15 minute session, the experimenter wrote down the ideas the group generated. Following completion of the task, the audiotape was turned off and the experimenter asked the subjects to complete the Wesman Personnel Classification Test and the Group Cohesiveness Scale. After completing both measures, the subjects were debriefed and excused.

Analysis

After completion of the creative task by the groups (Phase II), group-level descriptive statistics were calculated initially. For subsequent analysis of the hypotheses, a series of multiple regression equations were created with the group as the level of analysis. Because group condition was a categorical independent variable, the four group conditions (the Optimal group and three Contrast groups) were initially coded into dummy variables. Specifically, three dummy variables were created in which the Optimal group always received a code of "0" and a Contrast group received a code of "1" in each dummy variable, respectively.

In each of the regression equations, cognitive ability was entered in the first step, as a control variable. For hypotheses one through four, the dummy-coded group condition variable was then entered in the second step. Separate regression equations were constructed for each of the four dependent variables - quantity of creative responses, mean creativity score, quantity of superior responses, and percentage of superior responses.

Hypotheses five through eight were analyzed using mediated regression analyses. For each hypothesis, three separate regression equations were constructed. First, group cohesion (the mediator) was regressed on group condition (the independent variable). In the second equation, the dependent variable (quantity of creative responses, mean creativity scores, number of superior responses, and percentage of superior responses) was regressed on group condition. In the third equation, the

dependent variable was regressed on both group condition and group cohesion.

RESULTS

Descriptive Statistics

The means, standard deviations, and zero-order correlations for all of the variables used in the analyses are presented in Table 4. The relationships between the personality variables were predominantly nonsignificant, except for the positive correlation between Extraversion and Conscientiousness. Interestingly, groups with higher levels of Conscientiousness also had significantly higher levels of Extraversion ($\underline{r} = .35$, $\underline{p} < .01$). This finding is uncharacteristic of research using the Big Five traits, as a correlation between these two variables is typically not found (e.g., Barry & Stewart, 1997; Wagner, Neuman, & Christiansen, 1996).

- Insert Table 4 here -

The correlations reveal several significant relationships between the three personality traits and the dependent variables. Groups with higher levels of Openness to Experience had significantly higher numbers of superior creative responses than groups with lower levels of Openness to Experience ($\underline{r} = .26$, $\underline{p} < .05$). This is consistent with some prior research findings that also demonstrated that Openness to Experience was positively related to the generation of qualitatively creative ideas (Barron & Harrington, 1981; Costa, 1996). Groups with higher levels of Extraversion had significantly lower mean creativity scores ($\underline{r} = -.25$, $\underline{p} < .05$). Although this finding was not predicted by any of the hypotheses, it supports the theoretical rationale presented in the Introduction. Namely, as group levels of Extraversion increase,

members more often compete with one another for talking time, impeding their productivity of creative ideas.

Several significant relationships emerged among the dependent variables. The average creativity score was positively related to the number of superior ideas ($\underline{r} = .36$, $\underline{p} < .01$), and the number and percentage of superior ideas were positively correlated ($\underline{r} = .82$, $\underline{p} < .01$). In addition, the number of creative ideas was positively and significantly related to average creativity score ($\underline{r} = .41$, $\underline{p} < .01$) and number of superior ideas ($\underline{r} = .58$, $\underline{p} < .01$). This suggests that those groups producing a higher quantity of ideas are also producing ideas that are more creative than those groups producing fewer ideas. It is consistent with the findings of Furnham and Yazdanpanahi (1995) who found that the quantity of creative ideas and superiority of ideas were positively related, and West and Anderson (1996) who demonstrated that creative idea quantity was related to qualitative measures of team innovation.

In order to further describe the group conditions, means and standard deviations on the personality traits and the dependent variables for each of the four group patterns are presented in Table 5.

- Insert Table 5 here -

Analysis of Hypotheses: *Group Pattern Effects*

For hypotheses one through four, a series of multiple regression equations were constructed. For each equation, average cognitive ability score was entered in the first step as a control variable, and then group condition (as a dummy-coded variable) was

entered in the second step. The regression analyses revealed that cognitive ability did not significantly predict the quantity of creative responses, mean creative scores, quantity of superior responses, or percentage of superior responses. Inspection of the mean cognitive ability scores in Table 5 indicates that there was minimal variability on the ability test scores among the four group conditions. Consequently, the following analysis will focus on the impact of the independent variable (i.e., group condition) only. The overall results of the regression analyses are presented in Table 6.

- Insert Table 6 here -

After controlling for cognitive ability, group condition significantly affected the quantity of creative ideas generated by groups ($\underline{R}^2 = .320$, $\underline{p} < .01$), supporting hypothesis one. Subsequent main effects were determined by using the $\underline{t}$ ratios associated with the regression analysis (Dunnett's t-test; Pedhazur, 1982). This analysis showed that Optimal groups produced a significantly greater quantity of creative responses ($\underline{M} = 13.4$) than Contrast A ($\underline{M} = 9.7$), $\underline{t}(34) = -3.48$, $\underline{p} < .01$, Contrast B ($\underline{M} = 9.1$), $\underline{t}(35) = -4.10$, $\underline{p} < .01$, and Contrast C ($\underline{M} = 8.7$), $\underline{t}(36) = -4.64$, $\underline{p} < .01$. However, there were no significant differences in the average number of creative responses between any of the Contrast patterns ($\underline{p} > .05$).

The average creativity scores also differed significantly among the four group conditions ($\underline{R}^2 = .382$, $\underline{p} < .01$), lending support to hypothesis two. Analyses between each of the four group conditions revealed that, as above, Optimal groups generated a significantly higher number of creative ideas ($\underline{M} = 3.2$) than Contrast A

($\underline{M}$ = 2.7), $\underline{t}(34)$ = -4.94, $\underline{p} < .01$, Contrast B ($\underline{M}$ = 2.7), $\underline{t}(35)$ = -4.44, $\underline{p} < .01$, and Contrast C ($\underline{M}$ = 2.7), $\underline{t}(36)$ = -5.25, $\underline{p} < .01$. As the average creativity scores of all three Contrast conditions suggest, the differences between each of these groups was not significant ($\underline{p} > .05$).

Hypothesis three was partially supported, as the quantity of superior responses differed significantly between the group conditions ($\underline{R}^2 = .129$, $\underline{p} < .05$). Groups possessing the Optimal pattern generated significantly more superior responses than the Contrast B pattern ($\underline{M}$ = 1.6), $\underline{t}(35)$ = -2.83, $\underline{p} < .01$, but did *not* generate a significantly greater number of superior responses ($\underline{M}$ = 3.5) than groups with the Contrast A ($\underline{M}$ = 2.2) or Contrast C patterns ($\underline{M}$ = 2.3), $\underline{p} > .05$. Further, there were no significant differences between any of the Contrast patterns ($\underline{p} > .05$). Significant group differences in the number of superior ideas, therefore, existed between the Optimal and Contrast B patterns only.

The percentage of superior creative responses did not differ significantly between the four group types ($\underline{p} > .05$), failing to support hypothesis four. As shown in Table 5, the average percentage of superior ideas was higher for groups with the Contrast C pattern ($\underline{M}$ = 26.1) than for groups with the Optimal pattern ($\underline{M}$ = 25.7), Contrast A pattern ($\underline{M}$ = 23.2), or Contrast B pattern ($\underline{M}$ = 18.2).

Analysis of Hypotheses: Group Cohesion Effects

Hypotheses five through eight stated that the impact of group patterns on the group performance variables would be mediated by group cohesion. In order to test

these mediation hypotheses, three regression equations were constructed for each of the four hypotheses, as described above. To establish mediation, the first two equations (i.e., regression of group cohesion on group condition, and regression of the dependent variable on group condition) must be significant, while the third equation (i.e., regression of the dependent variable on both group cohesion and group condition) must be non-significant for complete mediation, or significant for partial mediation (Baron & Kenny, 1986).

The test of the first mediation equation, regressing of group cohesion on group condition, was not significant ($p > .05$). Contrary to prediction, this result suggests that group cohesiveness is not affected by the personality patterns of groups. Given that the first mediated regression equation was not significant, an analysis of the second and third regression equations was not conducted.

As shown in Table 5, there was very little variance in the group cohesion means among the four group conditions. The average scores on the Group Cohesiveness Scale across the group conditions ranged from 26.65 (Contrast B groups) to 27.99 (Contrast A groups). Due to the insignificant relationship between group condition and group cohesion, there is no support for either the complete mediation or partial mediation model. Therefore, group cohesion does not mediate the relationship between group personality patterns and performance, failing to support hypotheses five through eight.

DISCUSSION

The discovery that personality characteristics - Big Five personality characteristics in particular - impact team performance is not new. Several authors (e.g., Barry & Stewart, 1997; Wagner et al., 1996) have demonstrated that performance is enhanced when groups are composed of members with optimal levels of various Big Five traits. Wagner et al. (1996), for example, demonstrated that Conscientiousness was a significant predictor of team job performance, while Neuman et al. (1997) found that Openness to Experience was related to teamwork, and Barry and Stewart (1997) showed that Extraversion was curvilinearly related to group performance on a production task. The unique contribution of the current study, therefore, is not the test of the relationship between specific Big Five characteristics and task performance, but the establishment of *patterns* of three Big Five traits as potential predictors of group performance on creative tasks.

The support generated for the first two hypotheses suggest that there is an optimal group-level pattern of Big Five characteristics, and teams possessing this pattern perform significantly better on some measures of creative task performance than groups without this personality pattern. The optimal pattern consists of moderate levels of Extraversion, high levels of Openness to Experience, and high levels of Conscientiousness. The pattern across all three Big Five traits, rather than a single personality trait, was the predictor of these group performance outcomes, as evidenced by the insignificant results between the three control groups. That is, the insignificant

differences in performance among the three Contrast patterns indicate that the catalyst for group performance was the holistic pattern of personality traits rather than one specific personality trait. When group levels of Conscientiousness were high, for example, group performance (as measured by quantity of ideas and average creativity score) was not significantly better than other groups *unless* levels of Openness to Experience were also high and Extraversion levels were moderate. Thus, some of the results were driven by the group pattern of Big Five personality characteristics rather than the level of a single personality trait.

The more powerful effects of a pattern approach compared to a variable approach has been promoted by Magnusson (1995). Envisioning individuals by their patterns of characteristics, rather than isolated and segmented variables, establishes research endeavors in terms of integrated, organized totalities (Magnusson, 1995). Specifically referring to personality patterns, Costa (1996) suggested that the patterning of Big Five traits offered more sophisticated and enriched interpretations of personality. "The profile, or patterning, of the various traits…contextualizes the meaning of a particular trait score considered in isolation" (Costa, 1996, p. 236). Ideally, future research will continue this effort by specifying desirable personality patterns of work teams.

As predicted in hypothesis one, groups with this optimal personality pattern generated more creative ideas than groups with other personality patterns. In order to generate a large quantity of creative ideas, it may be that the groups needed the

combination of a) moderate levels of Extraversion, whereby the talkativeness and gregariousness of group members was high enough to promote conversation and the sharing of ideas, but not so high that individuals competed with one another to voice their opinions, b) high levels of Openness to Experience, manifested by a greater willingness to consider new ideas and ability to generate novel ways of accomplishing tasks, and c) high levels of Conscientiousness, whereby group members possessed the achievement motivation and discipline to stay focused on the task at hand (Barry & Stewart, 1997; McCrae & Costa, 1987). When any of the three traits varied from these levels, disrupting the optimal pattern, the quantity of creative ideas generated by the groups declined.

Similarly, group average creativity scores, as determined by trained raters, declined significantly when group-level patterns deviated from the Optimal pattern. Inspection of the group means demonstrates that there was little variation in average creativity scores among the three Contrast conditions (ranging from $\underline{M} = 2.67$ in the Contrast A and C conditions to $\underline{M} = 2.72$ in the Contrast B condition). It appears that Optimal groups not only generated a higher quantity of ideas, but also generated higher quality ideas, on average. This lends further support to the proposition that an ideal pattern of Extraversion, Openness to Experience, and Conscientiousness promoted the creative performance of groups.

However, the quantity of *superior* ideas generated by groups with the Optimal pattern was only significantly higher than the quantity of superior ideas generated by

the Contrast B groups. The Contrast B groups were distinguishable from the other group conditions by their low levels of Openness to Experience. With low levels of Openness to Experience, Contrast B groups potentially did not have the proclivity to create ideas that were as original as those of the Optimal groups. This interpretation is supported by Costa (1996), who found that when tasks required original and creative ideas, groups with higher levels of Openness to Experience will likely be more successful than other groups. In addition, West and Anderson (1996) suggested that propensities towards innovation may be the most important contributor to the generation of creative ideas within management teams.

While this finding is consistent with some of the prior literature regarding Openness to Experience, it deviates from the findings of hypotheses one and two because it does not suggest that a pattern of personality traits predicts group performance. Rather, the single personality characteristic of Openness to Experience is driving the creative performance of groups, at least when quantity of superior ideas is the selected measure. This finding bolsters the argument that Openness to Experience is effective as a single predictor of group-level creative performance, as measured by the number of superior ideas, regardless of the levels of other personality traits.

The final measure of creative performance, percentage of superior creative responses, did not differ significantly between any of the group conditions. This is somewhat surprising given the results of the other three creative performance measures. The groups possessing the Optimal pattern were more prolific, as the sheer quantity of

ideas the groups produced was higher than the control groups, and on average, generated significantly more qualitatively creative responses. However, this did not translate into higher ratio of superior ideas, suggesting that, similar to the control groups, the creatively superior responses of the optimal groups were combined with a number of less creative ideas.

Taken together, the findings of this study emphasizes the importance of selecting creativity measures that are most relevant to the context and objectives at hand. The support of an individual personality trait (Openness to Experience) as a predictor, rather than a pattern of personality traits, highlights the importance of selecting meaningful criteria. The results of this study for the first three hypotheses suggest that a *pattern* of personality traits are predictive of some kinds of creative performance (i.e., quantity of ideas and average creativity scores), while a *single* personality trait may be all that is needed to predict other creative outcomes (i.e., quantity of superior ideas).

While a quantitative measure offers a simple and objective gauge of creativity, it does not tell the entire story. Some authors advocate the use of single qualitative measures instead (Newell, Shaw, & Simon, 1962), but the present findings suggest that this too may contribute to misleading results. As advocated by the preponderance of researchers (e.g., Buyer, 1988), it appears that the use of both quantitative and qualitative measures of creativity is an ideal solution, keeping in mind the given context. For example, when the generation of a large number of creative ideas is

desired, measures of idea quantity may be the most appropriate measure. In another scenario, the generation of extremely innovative, unique ideas may be the goal, and thus, measures of superiority would be more appropriate. Clearly, the numerous ways in which creativity can be measured provide a wealth of options from which both researchers and practitioners and select their criteria.

In the present study, the implementation of several quantitiative and qualitative measures made it possible to identify the ways in which the Optimal-pattern groups excelled creatively, and the ways in which their performance did not differ from groups with different personality patterns. If this study had measured only average creativity scores and quantity of ideas, then all of the creativity measures would have been significant and suggestive that the Optimal personality pattern was the appropriate predictor of group creativity. In future research, the use of multiple measures of creative performance would serve to clarify the relationship between group personality and specific indices of creativity.

Creative Tasks and Group Performance

It is critical to limit the current findings to problem-solving, creative tasks similar to the idea generation task used in this study. The development of task typologies, such as those of Hackman (1968) and McGrath (1984), exemplify the need for the specification of task types in any research efforts. In addition, there was a high degree of interdependence in the current creative task, relative to other task types such as pooled and sequential group tasks (Saavedra, Earley, & Van Dyne, 1993). Group

members were required to jointly collaborate and generate solutions to the given problem rather than operate independently in well-defined group roles. Team effectiveness in such open-ended, creative tasks, compared with more structured tasks, may be heavily influenced by the personalities of team members (Jackson, 1996).

More specifically, the extensive interactions among group members, combined with the unstructured, open-ended nature of the task, likely enhanced the influence of personality traits compared to other types of group tasks (Barry & Stewart, 1997). For some tasks, such as technical tasks, it is likely that most of the variance in measured performance could be accounted for by cognitive ability or group member expertise (Hackman, Brousseau, & Weiss, 1976). Other tasks, including sequential tasks (e.g., group assembly lines), may require minimal levels of interaction, and thus, will be more affected by the specific skills of individual group members than the group's level of personality traits. The group task of LePine et al. (1997), for example, required group members to participate in very differentiated, well-defined roles within hierarchical teams. The creative task in this study, on the other hand, did not have different member roles and did not require particular skill prerequisites. Member expertise and hierarchical role differentiation are just a few factors that may attenuate the impact of personality patterns on group performance (Driskell, Hogan, & Salas, 1987).

Cognitive Ability and Group Performance

It is surprising that cognitive ability was not significantly related to either

Openness to Experience or group performance. First, prior research has found that the correlation between ability and Openness to Experience to be as high as .31 (Costa, 1996). Several studies have investigated the relationship between cognitive ability and group performance, and the preponderance of this research has shown that ability is positively related to performance on group tasks (Bouchard, 1969; Kabanoff & O'Brien, 1979; Futrell & Sundstrom, 1996; Terborg, Castore, & DeNinno, 1976). Like the present study, however, O'Brien and Owens (1969) found no significant relationship between cognitive ability and group performance on an interactive task.

One explanation for the insignificant findings may be that performance on interactive, creative tasks is not as affected by cognitive ability as extensively as other task types. Group performance on structured team tasks requiring specific knowledge or expertise, such as the tasks mentioned above (e.g., LePine et al., 1997), may be weighted more heavily by ability than the more ambiguous task used in the present research. Second, the results revealed that there was minimal variation in ability scores among the groups (see Table 5). With such low variability in the cognitive ability measure, it was unlikely that cognitive ability would impact group performance. Finally, the particular test used in this study (Wesman Personnel Classification Test) is a strong measure of verbal ability, but does not tap into other aspects of cognitive ability, including mathematical and spatial abilities. Other researchers such as Neuman et al. (1997) demonstrated that cognitive ability was positively related the performance of retail teams using measures of both verbal and mathematical ability. It may be that a

more comprehensive measure of cognitive ability would have detected greater differences in students' abilities.

Group Cohesion and Performance

Although it was predicted that group cohesion would mediate the relationship between group personality patterns and performance, this relationship failed to emerge. None of the four group personality patterns affected the cohesiveness of the group, indicating that personality patterns impacted creative task performance directly, rather than indirectly through the construct of group cohesion. Further, group cohesion did not demonstrate a direct relationship with group performance. This is contradictory to some of the findings of previous research (e.g., Mullen & Copper, 1994; Smith et al., 1994). In particular, reviews of the relevant literature by Summers et al.(1988) and Widmeyer, Brawley, and Carron (1992) concluded that group cohesiveness promoted productivity.

At the same time, other findings in the literature support the present result that there is no relationship between group cohesion and performance (e.g., Steiner, 1972; Stogdill, 1972). Forsythe (1990), for example, concluded that while cohesive groups were frequently more satisfied than less cohesive groups, they were not always more productive. More recently, Duffy, Shaw, and Stark (1997) did not find any significant relationships between group cohesiveness and performance on classroom assignments. It appears that the findings of the present study simply contribute to the disparate findings that plague the group cohesion literature. Or as other authors have suggested

(e.g., Mullen & Copper, 1994), these findings may offer more evidence that additional contextual factors impact the cohesiveness-performance relationship. These contextual factors need to be defined and measured by researchers in order to clearly uncover the relationship between these two factors.

In the current study, contextual factors that may have impacted the cohesiveness-performance relationship include the use of experimental rather than naturally-occurring groups and the short-term duration of the groups. First, there is some concern that ad hoc, laboratory groups differ from naturally-occurring groups. "There are palpable differences between ad hoc groups of strangers…and real groups that interact on multiple occasions and provide members with longer and deeper experiences with the group" (Mullen & Cooper, 1994, p. 213). The students in these groups did not know each other before arriving for the study and were fully aware that their requirements as a group ended after the experimental session. Even though the issue for discussion was one that should have been meaningful for them, the students also knew that their group was not designed to follow through with the suggestions that were generated.

Another factor that potentially affected the development of group cohesion more significantly was the limited duration of the groups. The teams in this study existed for a short time only, hindering the development of group cohesiveness that more frequently characterizes groups of greater duration and history (Klein & Mulvey, 1995). It may be that group members realized that they would not have to work

together on future assignments, and therefore, members' motivation to build relationships and establish group norms during their 15-minute session was limited. The time limitation also focused the group immediately on the task, failing to allow for additional discussions of a more spontaneous, social nature. Such discussions may have enhanced the cohesiveness among group members. Instead, the reliance on short-term, artificial groups may have the stalled any natural, impromptu interactions among team members, and consequently, attentuated the effect of cohesiveness on group performance. Additional research could combat these shortcomings by utilizing existing, ongoing work groups in organizations.

Limitations and Future Research

The overall results of this study suggest several avenues of future research. First, there are multiple research questions that can be addressed with a pattern-oriented approach instead of the traditional variable approach. Rather than isolating specific personality traits and assessing their impact on performance, patterns consider the individuals or groups personalities in their entirety. As such, this gestalt approach "has properties which cannot be derived from the investigation of one variable after another" (Magnusson, 1996, p. 3).

Additionally, the personality patterns in the current study were limited to three of the Big Five characteristics. Research on group personality and performance using a pattern consisting of all Big Five personality traits has yet to be conducted, and would likely offer further insight into the team personality-performance relationship. This

could include tapping into the personality patterns of existing teams in organizations, or similar to this study, selecting individuals for team membership based on personality patterns.

As this study focused on creative tasks specifically, additional research could explore the effects of personality patterns on group performance during other types of tasks. Differences in task types reflect a major source of variation among teams, as the amount of coordination, communication, and technical demands can differ extensively among team tasks (Sundstrom, DeMeuse, & Futrell, 1990). The task typologies of Steiner (1972) and McGrath (1984), or the task interdependence model of Saavedra, Earley, and Van Dyne (1993) offer helpful frameworks for classifying the numerous tasks faced by work teams today. The use of autonomous teams versus hierarchical teams with defined leaders also needs to be clearly specified. The research by LePine et al. (1997) in particular discusses the criticality of defining such contextual team variables. Overall, the manipulation of task types may provide further insight into the role of various personality patterns on group-level performance.

In addition, the short duration of the groups' interactions in this research limits the generalizability of the findings. The use of temporary, ad hoc teams may have influenced the results. More personality research using established work teams that are implemented for a longer duration is needed to expand the application of the findings to organizational settings. Longitudinal research in particular may improve the generalizability of group-level personality patterns. Because the impact of group

cohesion may also have been attenuated due to the short-term nature of the groups, as discussed above, this is another variable that may demonstrate greater impact through longitudinal research.

Beyond this, several group composition variables could be studied as moderators between group personality patterns and performance. Group size, degree of autonomy, and member expertise may alter the impact of group-level personality patterns. The influence of group personality patterns may also be affected by external group factors, such as organizationally-defined goals, performance feedback, and team reward systems. Again, research exploring these variables would likely be most effective if existing work teams are used.

Finally, the exploratory study included in this experiment investigated the impact of homogeneity of group members' personalities on creative performance. Although no significant effects were found, the study was of limited power due to the small sample size. Additional research that manipulates the homogeneity of group member personality patterns is needed to further substantiate the results of the exploratory study. Because the differences in personality patterns between the groups with same and variable patterns were minimal (i.e., personality traits among groups did not differ by more than one level), a more powerful test could be designed by maximizing the variability among individual's personality patterns within a group. Particularly given the findings in the prior literature (e.g., Aamodt & Kimbrough, 1982), the impact of the homogeneity of team members' traits on team performance is

far from conclusive.

Overall, this study contributes to a growing body of literature suggesting that team personality impacts team performance. Because the use of creative teams by organizations is also growing, it is critical that research in this domain of psychology continues. The pace of change in business today strengthens the need for companies to stay ahead of competitors by utilizing the creative potential of their workforce through innovative teams (Filipczak, 1997). To the extent that psychological research contributes to the understanding of personality patterns of high performing innovative teams, organizations can improve the selection and development of team members, and thereby optimize team performance.

REFERENCES

Aamodt, M., & Kimbrough, W. (1982). Effect of group heterogeneity on quality of task solutions. Psychological Reports, 50, 171-174.

Adams, D., Eby, L., & Russell, J. (1996). The impact of implementing teams on attitudes, effectiveness, and customer orientation. Paper presented at the Annual Conference of the American Psychological Association, Toronto, Ontario.

Allen, N., West, M., & Nolan, J. (1996). Attribute dissimilarity and attachment to the team amongst senior managers. Paper presented at the Eleventh Annual Conference of the Society for Industrial and Organizational Psychology, San Diego, CA.

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

Amabile, T. (1987). The motivation to be creative. In S. Isaksen (Ed.), Frontiers of creativity research: Beyond the basics (pp. 223-254). Buffalo, NY: Bearly.

Amabile, T. (1990). Within you, without you: The social psychology of creativity, and beyond. In M. Runco & R. Albert (Eds.), Theories of creativity (pp. 61-91). Newbury Park, CA: Sage.

Banker, R., Field, J., Schroeder, R., & Sinha, K. (1996). Impact of work teams on manufacturing performance: A longitudinal field study. Academy of Management Journal, 39, 867-890.

Baron, R., & Kenny, D. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology, 51, 1173-1182.

Barrick, M. & Mount, M. (1991). The Big Five personality dimensions and job performance: A meta-analysis. Personnel Psychology, 44, 1-26.

Barrick, M., Mount, M., & Strauss, J. (1993). Conscientiousness and performance of sales representatives: Test of the mediating effects of goal setting. Journal of Applied Psychology, 78, 715-722.

Barron, F. (1969). Creative person and creative process. New York: Holt, Rinehart, & Winston.

Barron, F., & Harrington, D. (1981). Creativity, intelligence, and personality. Annual Review of Psychology, 32, 439-476.

Barry, B., & Stewart, G. (1997). Composition, process, and performance in self-managed groups: The role of personality. Journal of Applied Psychology, 82, 62-78.

Baydoun, R., Emperado, T., & Neuman, G. (1996). Assessing the relationship between team member personality and team performance. Paper presented at the annual meeting of the American Psychological Society, San Francisco, CA.

Bednar, R., Weet, C., Evensen, P. Lanier, D., & Melnick, J. (1974). Empirical guidelines for group therapy: Pretraining, cohesion, and modeling. Journal of Applied Behavioral Science, 10, 149-165.

Belbin, M. (1981). Management teams: Why they succeed or fail. New York: John Wiley & Sons.

Bergman, L. (1988). You can't classify all of the people all of the time. Multivariate Behavioral Research, 23, 425-441.

Bergman, L., & El-Khouri, B. (1995). SLEIPNER: A statistical package for pattern-oriented analysis. Stockholm University. Stockholm, Sweden.

Bettenhausen, K. (1991). Five years of groups research: What we have learned and what needs to be addressed. Journal of Management, 17, 345-381.

Blashfield, R. (1976). Mixture model tests of cluster analysis: Accuracy of four agglomerative hierarchical models. Psychological Bulletin, 83, 377-388.

Botwin, M., & Buss, D. (1989). Structure of act-report data: Is the five-factor model of personality recaptured? Journal of Personality and Social Psychology, 56, 988-1001.

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

Brown, J., & Duguid, P. (1991). Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation. Organizational Science, 2, 40-57.

Bucklow, M. (1966). A new role for the work group. Administrative Science Quarterly, 11, 59-78.

Bull, K., Montgomery, D., & Baloche, L. (1995). Teaching creativity at the college level: A synthesis of curricular components perceived as important by instructors. Creativity Research Journal, 8, 83-89.

Buyer, L. (1988). Creative problem solving: A comparison of performance under different instructions. Journal of Creative Behavior, 22, 55-61.

Camp, C., & Chartrand, J. (1992). A comparison and evaluation of interest congruence indices. Journal of Vocational Behavior, 41, 162-182.

Campion, M., Medsker, G., & Higgs, A. (1993). Relations between work group characteristics and effectiveness: Implications for designing effective work teams. Personnel Psychology, 46, 823-847.

Campion, M., Pappar, E., & Medsker, G. (1995). Relations between work team characteristics and effectiveness: Replication and extension. Paper presented at the annual meeting of the Society for Industrial and Organizational Psychology, Orlando, FL.

Carron, A. (1982). Cohesiveness in sport groups: Implications and considerations. Journal of Sport Psychology, 4, 123-138.

Cartwright, D. (1968). The nature of group cohesiveness. In D. Cartwright & A. Zander (Eds.), Group dynamics: Research and theory. New York: Harper & Row.

Cattell, R. (1943). The description of personality: Basic traits resolved into

clusters. Journal of Abnormal and Social Psychology, 38, 476-506.

Cattell, R. (1945). The description of personality: Principles and findings in a factor analysis. American Journal of Psychology, 58, 69-90.

Cattell, R. (1946). The description and measurement of personality. Yonkers, NY: World Book.

Chatman, J., & Barsade, S. (1995). Personality, organizational culture, and cooperation: Evidence from a business simulation. Administrative Science Quarterly, 40, 423-443.

Church, T. (1994). Relating the Tellegen and Five-Factor models of personality structure. Journal of Personality and Social Psychology, 67, 898-909.

Cohen, D., Whitmyre, J., & Funk, W. (1960). Effect of group cohesiveness and training upon creative thinking. Journal of Applied Psychology, 44, 319-322.

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

Costa, P. (1992). The Big 5: Personality and work. Paper presented at the Sixth European Conference on Personality, Groningen, The Netherlands.

Costa, P. (1996). Work and personality: Use of the NEO-PI-R in Industrial/Organizational psychology. Applied Psychology: An International Review, 45, 225-241.

Costa, P., & McCrae, R. (1985). The NEO Personality Inventory Manual Form

S and Form R. Odessa, FL: Psychological Assessment Resources, Inc.

Costa, P., & McCrae, R. (1991). The NEO Personality Inventory manual. Odessa, FL: Psychological Assessment Resources, Inc.

Costa, P., McCrae, R., & Holland, J. (1984). Personality and vocational interests in an adult sample. Journal of Applied Psychology, 69, 390-400.

Cummings, T. (1981). Designing effective work groups. In P. Nystrom & W. Starbuck, (Eds.), Handbook of organizational design. Oxford, England: Oxford University Press.

Cummings, T. (1986). Reexamining our thoughts concerning groups in organizations. In P. Goodman (Ed.), Designing effective work groups (pp.350-361). San Francisco: Jossey-Bass.

Cummings, T., & Huse, E. (1989). Organizational development and change. St Paul, MN: West.

Cutcher-Gershenfeld, J., & Associates. (1994). Japanese team-based work systems in North America: Explaining the diversity. California Management Review, 37, 42-64.

Dacey, J. (1989). Fundamentals of creative thinking. Lexington, MA: Lexington.

Davis, G., & Rimm, S. (1985). Education of the gifted and talented. Englewood Cliffs, NJ: Prentice-Hall.

Davis, L., & Wacker, G. (1987). Job design. In Salvendy, G. (Ed.), Handbook of human factors (pp. 431-452). New York: Wiley.

DeBiasio, A. (1986). Problem solving in triads composed of varying numbers of field-dependent and field-independent subjects. Journal of Personality and Social Psychology, 51, 749-754.

Diener, E., Larsen, R., & Emmons, R. (1984). Person x situation interactions: Choice of situations and congruence response models. Journal of Personality and Social Psychology, 47, 580-592.

Digman, J., & Inouye, J. (1986). Further specification of the five robust factors of personality. Journal of Personality and Social Psychology, 50, 116-123.

Dobbins, G., & Zaccaro, S. (1986). The effects of group cohesion and leader behavior on subordinate satisfaction. Group and Organization Studies, 11, 203-219.

Driskell, J., Hogan, R., & Salas, E. (1987). Personality and group performance. In Hendrick, C. (Ed.), Group processes and intergroup relations (pp. 91-112). Newbury Park, CA: Sage Publications.

Duffy, M., Shaw, J., & Stark, E. (1997). The Salieri syndrome: Consequences of envy in groups. Paper presented at the annual meeting of the Society for Industrial and Organizational Psychology, St. Louis, MO.

Dyce, J., & O'Connor, B. (1992). Personality complimentarity as a determinant of group cohesion in bar bands. Small Group Research, 23, 185-198.

Evans, N., & Jarvis, P. (1980). Group cohesion: A review and reevaluation. Small Group Behavior, 11, 359-370.

Everitt, B. (1974). Cluster Analysis. London: Heinemann.

Eysenck, H. (1953). The structure of human personality. New York: Wiley.

Feild, H., & Schoenfeldt, L. (1975). Ward and Hook revisited: A two-part procedure for overcoming a deficiency in the grouping of persons. Educational and Psychological Measurement, 35, 171-173.

Feldhusen, J., & Goh, B. (1995). Assessing and accessing creativity: An integrative review of theory, research, and development. Creativity Research Journal, 8, 231-247.

Festinger, L., schachter, S., & Back, K. (1950). Social pressures in informal groups: A study of human factors in housing. New York: Harper.

Fiedler, F. (1967). A theory of leadership effectiveness. New York: McGraw-Hill.

Filipczak, B. (1997). It takes all kinds: Creativity in the work force. Training, May, 32-40.

Fisher, K. (1993). Leading self-directed work teams. New York: McGraw-Hill.

Forsythe, D. (1990). Group dynamics. Needham Heights, MA: Allyn & Bacon.

Foushee, H. (1984). Dyads and triads at 35,000 feet: Factors affecting group process and aircrew performance. American Psychologist, 39, 885-893.

Furnham, A., & Yazdanpanahi, T. (1995). Personality differences and group versus individual brainstorming. Personality & Individual Differences, 19, 73-80.

Futrell, D., & Sundstrom, E. (1996). Cognitive ability and group productivity on an assembly task. Paper presented at the Eleventh Annual Conference of the Society for Industrial and Organizational Psychology, San Diego, CA.

Garvin, D. (1993). Building a learning organization. Harvard Business Review, 71, 78-91.

George, J. (1990). Personality, affect, and behavior in groups. Journal of Applied Psychology, 75, 107-116.

George, J., & James, L. (1993). Personality, affect, and behavior in groups revisited: Comment on aggregation, levels of analysis, and recent application of within and between analysis. Journal of Applied Psychology, 78, 798-804.

Georgopoulos, J. (1978). Organization design. Reading, MA: Addison-Wesley.

Goldberg, L. (1990). An alternative "description of personality": The Big-Five factor structure. Journal of Personality and Social Psychology, 59, 1216-1229.

Golembiewski, R. (1962). The small group: An analysis of research concepts and operations. Chicago: University of Chicago Press.

Goodman, P. (1986). Impact of task and technology on group performance. In P. Goodman and Associates (Eds.), Designing effective work groups, (pp. 120-167). San Francisco: Jossey-Bass.

Goodman, P., & Leyden, D. (1991). Familiarity and group productivity. Journal of Applied Psychology, 76, 578-586.

Goodman, P., Ravlin, E., & Argote, L. (1986). Current thinking about groups: Setting the stage for new ideas. In P. Goodman & Associates (Eds.), Designing effective work groups (pp.1-33). San Francisco: Jossey-Bass.

Goodman, P., Ravlin, E., & Schminke, M. (1987). Understanding groups in organizations. In L. Cummings & B. Staw (Eds.), Research in Organizational Behavior (Vol. 9). Greenwich, CT: JAI Press.

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

Guilford, J. (1962). Creativity: Its measurement and development. In S. Parnes & H. Harding (Eds.), A source book for creative thinking (pp. 182-208). New York: Scribners.

Gustafson, S. (1994). Female underachievement and overachievement: Parental contributions and long-term consequences. International Journal of Behavioral Development, 17, 469-484.

Gustafson, S., & Magnusson, D. (1991). Female Life Careers: A Pattern Approach, Vol. 3. Hillsdale. NJ: Erlbaum.

Gustafson, S., & Mumford, M. (1995). Personal style and person-environment fit: A pattern approach. Journal of Vocational Behavior, 46, 163-188.

Guzzo, R. (1995). At the intersection of team effectiveness and decision-making. In R. Guzzo & E. Salas (Eds.), Team effectiveness and decision making in organizations (pp. 1-8). San Francisco, CA: Jossey-Bass.

Guzzo, R., & Salas, E. (1995). Team Effectiveness and Decision Making in Organizations. San Francisco, CA: Jossey-Bass.

Guzzo, R., & Shea, G. (1992). Group performance and intergroup relations in organizations. In M.D. Dunnette & L.M. Hough (Eds.), Handbook of industrial and organizational psychology, 2nd ed., Vol.3 (pp.269-313). Palo Alto, CA: Consulting Psychologists Press.

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

Hackman, J. (1978). The design of self-managing work groups. In B. King, S. Streufert, & F. Fiedler, (Eds.), Managerial control and organizational democracy. Washington, D.C.: V.H. Winston & Sons.

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

Hackman, J. (1990). Groups that work (and those that don't): Creating conditions for effective teamwork. San Francisco: Jossey-Bass.

Hackamn, J., Brousseau, K., & Weiss, J. (1976). The interaction of task design and group performance strategies in determining group effectiveness. Organizational Behavior and Human Performance, 16, 350-365.

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

Hackman, J., & Oldham, G. (1975). Development of the Job Diagnostic Survey. Journal of Applied Psychology, 60, 159-170.

Hackman, J., & Oldham, G. (1980). Work redesign. Reading, MA: Addison-Wesley.

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

Helson, R. (1985). Which of those young women with creative potential became productive? Personality in college and characteristics of parents. In R. Hogan & W. Jones. (Eds.), Perspectives in personality (Vol.1, pp.49-80). Greenwich, CT: JAI Press.

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

Hewitt, T., O'Brien, G., & Hornik, J. (1974). The effects of work organization, leadership style, and member compatibility upon the productivity of small groups working on a manipulative task. Organizational Behavior and Human

Performance, 11, 283-301.

Hoffstee, W. (1994). Are we looking for parsimony, or what? European Journal of Personality, 8, 335-339.

Hogan, R. (1991). Personality and personality measurement. In M. Dunnette & L. Hough (Eds.), Handbook of industrial and organizational psychology (2nd ed., Vol. 3, pp. 874-919). Palo Alto, CA: Consulting Psychologists Press.

Hogan, R., Raza, S., & Driskell, J. (1988). Personality, team performance, and organizational context. In P. Whitney & R. Ochsman (Eds.), Psychology and productivity. New York: Plenum.

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

Holland, J. (1987). Some speculation about the investigation of person-environment transactions. Journal of Vocational Behavior, 31, 337-340.

Holland, J., Johnston, J., Hughey, K., & Asama, N. (1991). Some explorations of a theory of careers: VII. A replication and some possible extensions. Journal of Career Development, 18, 91-100.

Hough, L., Eaton, N., Dunnette, M., Kamp, J., & McCloy, R. (1990). Criterion-related validities of personality constructs and the effect of response distortion on those validities. Journal of Applied Psychology, 75, 581-595.

Ilgen, D., Major, D., Hollenbeck, J., & Sego, D. (1995). Raising an individual decision-making model to the team level: A new research model and paradigm. In R.

Guzzo & E. Salas (Eds.), Team effectiveness and decision making in organizations (pp.113-148). San Francisco, CA: Jossey-Bass.

Jackson, S. (1996). The consequences of diversity in multidisciplinary work teams. In M. West (Ed.), Handbook of work group psychology (pp. 53-76). Chichester, England: Wiley.

Jackson, S., Brett, J., Sessa, V., Cooper, D., Julin, J., Peyronnin, K. (1991). Some differences make a difference: Individual dissimilarity and group heterogeneity as correlates of recruitment, promotions, and turnover. Journal of Applied Psychology, 76, 675-689.

Janis, I. (1972). Victims of groupthink: A psychological study of foreign-policy decisions and fiascos. Boston: Houghton Mifflin.

Johnson, J. (1994). Clarification of Factor Five with the help of the AB5C model. European Journal of Personality, 8, 311-334.

Jones, M. (1974). Regressing group on individual effectiveness. Organizational Behavior and Human Performance, 11, 426-451.

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

Kanter, R. (1983). The change masters. New York: Simon & Schuster.

Kanter, R. (1988). Three tiers for innovation research. Communication Research, 15, 509-523.

Karau, S., & Williams, K. (1993). Social loafing: A meta-analytic review and theoretical integration. Journal of Personality and Social Psychology, 65, 681-706.

Kelly, J., & McGrath, J. (1985). Effects of time limits and task types on task performance and interaction of four-person groups. Journal of Personality and Social Psychology, 49, 395-406.

Klein, H., & Mulvey, P. (1995). Two investigations of the relationships among group goals, goal commitment, cohesion, and performance. Organizational Behavior and Human Decision Processes, 61, 44-53.

Larson, C., & LaFasto, F. (1989). Teamwork: What must go right/What can go wrong. Newbury Park, CA: Sage.

Lawler, E., Mohrman, S., & Ledford, G. (1992). Employee involvement and total quality management: Practices and results in Fortune 1000 companies. San Francisco: Jossey-Bass.

Lawler, E., Mohrman, S., & Ledford, G. (1995). Creating high performance organizations: Practices and results of employee involvement and TQM in Fortune 1000 companies. San Francisco: Jossey-Bass.

LePine, J., Hollenbeck, J., Ilgen, D., & Hedlund, J. (1997). Effects of individual differences on the performance of hierarchical decision-making teams: Much more than g. Journal of Applied Psychology, 82, 803-811.

Levine, J., & Moreland, R. (1990). Progress in small group research. Annual Review of Psychology, 41, 585-634.

Lewin, K. (1951). Field theory and social science. New York: Harper.

Libby, R., Trotman, K., & Zimmer, I. (1987). Member variation, recognition

of expertise, and group performance. Journal of Applied Psychology, 72, 81-87.

Libo, L. (1953). Measuring group cohesiveness. Ann Arbor: University of Michigan Research Center for Group Dynamics.

Lieberman, M., Yalom, I., & Miles, M. (1973). Encounter groups: First facts. New York: Basic Books.

Likert, R. (1961). New patterns of management. New York: McGraw-Hill.

Littlepage, G., Schmidt, G., Whisler, E., & Frost, A. (1995). An input-process-output analysis of influence and performance in problem-solving groups. Journal of Personality and Social Psychology, 69, 877-889.

Lorr, M., & Strack, S. (1993). Some NEO-PI five-factor personality profiles. Journal of Personality Assessment, 60, 91-99.

Lott, B. (1961). Group cohesiveness: A learning phenomenon. Journal of Social Psychology, 55, 275-286.

MacKinnon, D. (1962). The nature and nurture of creative talent. American Psychologist, 17, 484-495.

Magjuka, R., & Baldwin, T. (1991). Team-based employee involvement programs: Effects of design and administration. Personnel Psychology, 44, 793-812.

Magnusson, D. (1996). The logic and implications of a person approach. Reports from the Department of Psychology, Stockholm University.

Magnusson, D. (1995). Individual development: A holistic, integrated model. In P. Moen, Elder, G. , & Luscher, K. (Eds.), Examining lives in context:

Perspectives on the ecology of human development (pp.19-60). Washington, D.C.: American Psychological Association.

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

McClintock, C., & Liebrand, B. (1988). Role of interdependence structure, individual value orientation, and another's strategy in social decision making: A transformational analysis. Journal of Personality and Social Psychology, 55, 396-409.

McCrae, R. (1987). Creativity, divergent thinking, and openness to experience. Journal of Personality and Social Psychology, 52, 1258-1265.

McCrae, R., & Costa, P. (1983). Joint factors in self-reports and ratings: Neuroticism, extraversion, and openness to experience. Personality and Individual Differences, 4, 245-255.

McCrae, R., & Costa, P. (1985). Updating Norman's "Adequate Taxonomy": Intelligence and personality dimensions in natural language and questionnaires. Journal of Personality and Social Psychology, 49, 710-721.

McCrae, R., & Costa, P. (1987). Validation of the five-factor model of personality across instruments and observers. Journal of Personality and Social Psychology, 52, 81-90.

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

Michaelis, W., & Eysenck, H. (1971). The determination of personality

inventory factor patterns and intercorrelations by changes in real-life motivation. Journal of Genetic Psychology, 118, 223-234.

Miesing, P., & Preble, J. (1985). Group processes and performance in a complex business situation. Small Group Behavior, 16, 325-338.

Milligan, G. (1981). A review of Monte Carlo tests of cluster analysis. Multivariate Behavioral Research, 16, 379-407.

Mitchell, T., & Silver, W. (1990). Individual and group goals when workers are interdependent: Effects on task strategies and performance. Journal of Applied Psychology, 75, 185-193.

Montgomery, D., Bull, K., & Baloche, L. (1992). College level creativity course content. Journal of Creative Behavior, 26, 228-234.

Morgan, S. (1996). Facilitating idea generation in a team context: The effects of technique, perceived organizational support, individual differences and satisfaction with idea generation. Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University, Blacksburg.

Morgan, B., & Lassiter, D. (1992). Team composition and staffing. In R. Swezey & E. Salas (Eds.), Teams: Their training and performance (pp.31-56). Norwood, NJ: Ablex Publishing.

Morris, C. (1967). Task effects on group interaction. Journal of Personality and Social Psychology, 5, 545-554.

Mudrack, P. (1989). Defining group cohesiveness: A legacy of confusion? Small Group Behavior, 20, 37-49.

Mullen, B., & Copper, C. (1994). The relation between group cohesiveness and

performance: An integration. Psychological Bulletin,, 115, 210-227.

Mumford, M. & Gustafson, S. (1988). Creativity syndrome: Integration, appplication, and innovation. Psychological Bulletin, 103, 27-43.

Mumford, M., Costanza, D., & Threlfall, V. (1993). Personality variables and problem-construction activities: An exploratory investigation. Creativity Research Journal, 6, 365-389.

Myers, I., & McCaulley, M. (1985). Manual: A guide to the development and use of the Myers-Briggs Type Indicator. Palo Alto, CA: Consulting Psychologists Press.

Neuman, G., Christiansen, N., Wagner, S., & Kickul, J. (1997). Understanding team effectiveness. Paper presented at the annual meeting of the Society for Industrial/Organizational Psychology, St. Louis, MO.

Newcomb, T., Turner, R., & Converse, P. (1965). Social Psychology. New York: Holt, Rinehart, & Winston.

Newell, A., Shaw, J., & Simon, H. (1962). The process of creative thinking. In Gruber, H., Terrell, G., & Wertheimer, M. (Eds.). Contemporary approaches to creative thinking. New York: Atherton Press.

Newton, T., & Keenan, T. (1991). Further analyses of the dispositional argument in organizational behavior. Journal of Applied Psychology, 76, 781-787.

Nolan, J., Lee, K., & Allen, N. (1997). Work group heterogeneity, performance, and turnover. Paper presented at the Twelfth Annual Conference of the

Society for Industrial and Organizational Psychology, St. Louis, MO.

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

Nutt, P. (1986). Decision style and strategic decisions of top executives. Technological Forecasting and Social Change, 30, 39-62.

O'Brien, G., & Owens, A. (1969). Effects of organizational structure upon correlations between member abilities and group productivity. Journal of Applied Psychology, 53, 525-530.

O'Keefe, R., Kernaghan, J., & Rubenstein, A. (1975). Group cohesiveness: A factor in the adoption of innovations among scientific work groups. Small Group Behavior, 6, 282-292.

Olson, A., Johnson, J. (1996). Relationships between team diversity and satisfaction with team performance. Paper presented at the Eleventh Annual Conference of the Society for Industrial and Organizational Psychology, San Diego, CA.

O'Reilly, C., & Roberts, K. (1977). Task group structure, communication, and effectiveness in three organizations. Journal of Applied Psychology, 62, 674-681.

Orsburn, J., Moran, L., Musselwhite, E., Zenger, J., & Perrin, C. (1990). Self-directed work teams: The new American challenge. New York: Irwin.

Osborn, A. (1957). Applied imagination: Principles and procedures of creative thinking. New York: Scribner.

Owens, W. (1978). Moderators and subgroups. Personnel Psychology, 31, 243-247.

Payne, R. (1990). The effectiveness of research teams: A review. In M. West & J. Farr (Eds.), Innovation and creativity at work (pp. 102-122). Chichester, UK: John Wiley & Sons.

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

Pearce, J., & Ravlin, E. (1987). The design and activation of self-regulating work groups. Human Relations, 40, 751-782.

Pedhazur, E. (1982). Multiple regression in behavioral research. Harcourt Brace Jovanovich: Orlando, FL.

Pervin, L., & Lewis, M. (1978). Overview of the internal-external issue. In L. Pervin & M. Lewis (Eds.), Perspectives in interactional psychology. New York: Plenum.

Peters, T. (1988). Thriving on chaos. New York: Knopf.

Piedmont, R., & Weinstein, H. (1994). Predicting supervisor ratings of job performance using the NEO Personality Inventory. Journal of Psychology, 128, 255-265.

Piper, W., Marrache, M., Lacroix, R., Richardsen, A., & Jones, B. (1983). Cohesion as a basic bond in groups. Human Relations, 36, 93-108.

Porter, L., Lawler, E., & Hackman, J. (1987). Ways groups influence individual work effectiveness. In Steers, R., Porter, L. (Eds.), Motivation and work behavior (5th ed., pp. 199-207). New York: McGraw-Hill.

Pritchard, R., Jones, S., Roth, P., Stuebing, K., & Ekeberg, S. (1988). Effects of group feedback, goal setting, and incentives on organizational productivity. Journal of Applied Psychology, 73, 337-358.

Richardson, D. (1996, August). Teams not always the best way to get work done. HR News, p.11.

Rousseau, D. (1985). Issues of level in organizational research: Multi-level and cross-level prespectives. In L.L. Cummings & B.M. Staw (Eds.), Research in organizational behavior (Vol.7, pp.1-37). Greenwich, CT: JAI Press.

Rubenstein, A., Barth, R., & Douds, C. (1971). Ways to improve communications between R&D groups. Research Management, 14, 49.

Runco, M., & Albert, R. (1990). Theories of creativity. Newbury Park, CA: Sage.

Rychlak, J. (1965). The similarity, compatibility, or incompatibility of needs in interpersonal selection. Journal of Personality and Social Psychology, 2, 334-340.

Saavedra, R., Earley, C., & Van Dyne, L. (1993). Complex interdependence in task-performing groups. Journal of Applied Psychology, 78, 61-72.

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

Schutz, W. (1958). A three-dimensional theory of interpersonal behavior. New York: Holt, Rinehart, & Winston.

Seltzer, J., & Kilmann, R. (1977). Effect of group composition on group process: Homogeneity vs heterogeneity on task and people dimensions. Psychological Reports, 41, 1195-1200.

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

Shaw, M. (1971). Group dynamics. New York: McGraw-Hill.

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

Shea, G., & Guzzo, R. (1987). Groups as human resources. Research in Personnel and Human Resources Management, 5, 323-356.

Shonk, J. (1992). Team-based organizations: Developing a successful team environment. Homewood, IL: Business One Irwin.

Sims, H., & Szilagyi, A. (1976). Job characteristic relationships: Individual and structural moderators. Organizational Behavior and Human Performance, 17, 211-230.

Sinclair, A. (1992). The tyranny of a team ideology. Organization Studies, 13, 611-626.

Smith, K.A., Smith, K.G., Olian, J., Sims, H., O'Bannon, D., & Scully, J. (1994). Top management team demography and process: The role of social integration and communication. Administrative Science Quarterly, 39, 412-438.

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

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

Sternberg, R. (1988). The nature of creativity: Contemporary psychological perspectives. New York: Cambridge University Press.

Stogdill, R. (1972). Group productivity, drive, and cohesiveness. Organizational Behavior and Human Performance, 8, 26-43.

Stokes, J. (1983). Components of group cohesion: Intermember attraction, instrumental value, and risk taking. Small Group Behavior, 14, 163-173.

Stone, T. (1971). Effects of mode of organization and feedback level on creative task groups. Journal of Applied Psychology, 55, 324-330.

Stoneman, K., & Dickinson, A. (1989). Individual performance as a function of group contingencies and group size. Journal of Organizational Behavior Management, 10, 131-151.

Strube, M., Keller, N., Oxenberg, J., & Lapidot, D. (1989). Actual and perceived group performance as a function of group composition: The moderating role of the Type A and B behavior patterns. Journal of Applied Social Psychology, 19, 140-158.

Summers, I., Coffelt, T., & Horton, R. (1988). Work group cohesion. Psychological Reports, 63, 627-636.

Sundstrom, E., DeMeuse, K., & Futrell, D. (1990). Work teams: Applications and effectiveness. American Psychologist, 45, 120-133.

Taylor, I. (1975). An emerging view of creative actions. In A. Taylor & J. Getzels (Eds.), Perspectives in creativity (pp. 297-325). Chicago: Aldine.

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

Thompson, J. (1967). Organizations in action. New York: McGraw-Hill.

Thoms, P., Moore, K., & Scott, K. (1996). The relationship between self-efficacy for participating in self-managed work groups and the Big Five personality dimensions. Journal of Organizational Behavior, 17, 349-362.

Thurstone, L. (1934). The vectors of mind. Psychological Review, 41, 1-32.

Tjosvold, D. (1991). Team organization: An enduring competitive advantage. New York: John Wiley & Sons.

Tjosvold, D. (1995). Cooperation theory, constructive controversy, and effectiveness: Learning from crisis. In R. Guzzo & E. Salas (Eds.), Team effectiveness and decision making in organizations (pp.79-112). San Francisco, CA: Jossey-Bass.

Trist, E., Susman, G., & Brown, G. (1977). An experiment in autonomous working in an American underground coal mine. Human Relations, 4, 175-185.

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

Tziner, A., & Vardi, Y. (1983). Ability as a moderator between cohesiveness and tank crews performance. Journal of Occupational Behavior, 4, 137-143.

VandeVen, A., Delbecq, A., & Koenig, R. (1976). Determinants of coordination modes within organizations. American Sociological Review, 41, 322-338.

Vernon, P. (1989). The nature-nurture problem in creativity. In J. Glover, R. Ronning, & C. Reynolds. (Eds.), Handbook of creativity (pp. 93-110). New York: Plenum.

Wagner, S., Neuman, G., & Christiansen, N. (1996). The composition of personalities in work teams and team job performance. Paper presented at the Eleventh Annual Conference of the Society for Industrial and Organizational Psychology, San Diego, CA.

Wall, T., Kemp, N., Jackson, P., & Clegg, C. (1986). Outcomes of autonomous workgroups: A long-term field experiment. Academy of Management Journal, 29, 280-304.

Walton, R. (1977). Work innovation at Topeka: After six years. Journal of Applied Behavioral Science, 13, 422-433.

Ward, J. (1963). Hierarchical grouping to optimize an objective function. Journal of the American Statistical Association, 58, 236-244.

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

Watson, D. (1989). Strangers' ratings of the five robust personality factors: Evidence of a surprising convergence with self-report. Journal of Personality and Social Psychology, 57, 120-128.

Weldon, E., Jehn, K., & Pradhan, P. (1991). Processes that mediate the relationship between a group goal and improved group performance. Journal of Personality and Social Psychology, 61, 555-569.

Wesman, A. (1965). Wesman Personnel Classification Test. The Psychological Corporation.

West, M., & Anderson, N. (1996). Innovation in top management teams. Journal of Applied Psychology, 81, 680-693.

Whitney, K. (1994). Improving group task performance: The role of group goals and group efficacy. Human Performance, 7, 55-78.

Widmeyer, W., Brawley, C., & Carron, A. (1992). Group dynamics in sport. In T. Horn (Ed.), Advances in sport psychology (pp. 124-139). Champaign, IL: Human Kinetics.

Woodman, R., & Schoenfelt, L. (1989). Individual differences in creativity: An interactionist perspective. In J. Glover, R. Ronning, & C. Reynolds (Eds.), Handbook of Creativity (pp. 71-91). New York: Plenum.

Woodman, R., & Sherwood, J. (1980). The role of team development in organizational effectiveness: A critical review. Psychological Bulletin, 88, 166-186.

Yalom, I. (1975). The theory and practice of group psychotherapy. New York:

Basic Books.

Yanushefski, A. (1996). Demonstration of a method for the development of a team classification system. Paper presented at the Annual Convention of the American Psychological Association, Toronto, Ontario.

Zaccaro, S. (1991). Nonequivalent associations between forms of cohesiveness and group-related outcomes: Evidence for multidimensionality. Journal of Social Psychology, 131, 387-399.

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

APPENDIX A:

INDIVIDUAL PERSONALITY PATTERNS

Appendix A. Individual Personality Patterns within Groups

Optimal Condition					
Group	Individual	Extraversion	Openness	Conscientiousness	Pattern
1	1	129	146	136	M H H
	2	128	135	133	M H H
	3	120	129	139	M H H
2	1	105	116	128	L M H
	2	116	138	139	M H H
	3	124	130	128	M H M
3	1	130	130	129	M H H
	2	109	125	138	M H H
	3	129	153	137	M H H
4	1	107	129	132	M H H
	2	133	131	138	M H H
	3	108	129	129	M H H
5	1	103	127	128	L H H
	2	131	131	124	M H M
	3	110	131	132	M H H
6	1	141	147	128	H H H
	2	130	131	141	M H H
	3	110	138	126	M H M
7	1	125	134	129	M H H
	2	124	131	128	M H H
	3	116	130	129	M H H
8	1	116	141	126	M H M
	2	136	120	134	H M H
	3	116	128	129	M H H
9	1	118	122	118	M M M
	2	127	127	136	M H H
	3	127	133	127	M H H
10	1	116	128	149	M H H
	2	112	131	129	M H H
	3	112	145	143	M H H
11	1	127	120	131	M M H
	2	111	131	150	M H H
	3	114	140	104	M H M
12	1	115	159	128	M H H
	2	116	138	139	M H H
	3	130	129	130	M H H
13	1	137	117	141	H M H
	2	129	133	125	M H M
	3	114	132	127	M H H
14	1	130	131	141	M H H
	2	120	161	125	M H H
	3	135	130	127	M H H
15	1	127	138	138	M H H
	2	112	128	129	M H H
	3	124	141	137	M H H
16	1	114	132	128	M H H
	2	110	121	115	M M M
	3	122	132	139	M H H
17	1	127	128	130	M H H
	2	130	125	137	M M H
	3	135	133	132	H H H
18	1	118	130	128	M H H
	2	125	138	141	M H H
	3	127	128	128	M H H
19	1	127	129	130	M H H
	2	126	120	130	M M H
	3	130	142	128	M H H
20	1	108	128	130	M H H
	2	113	147	128	M H H
	3	119	133	134	M H H
21	1	134	152	131	M H M
	2	115	135	125	H H H
	3	116	130	153	M H H
22	1	127	156	127	M H M
	2	125	127	133	M H H
	3	126	136	136	M H H
23	1	118	135	130	M H H
	2	116	129	142	M H H
	3	125	139	133	M H H

Appendix A. Individual Personality Patterns within Groups (cont.)

Contrast A Condition					
Group	Individual	Extraversion	Openness	Conscientiousness	Pattern
1	1	150	135	139	H H H
	2	148	123	136	H M H
	3	139	126	133	H H H
2	1	151	127	136	H H H
	2	142	130	127	H H H
	3	149	130	128	H H H
3	1	142	123	145	H H H
	2	147	142	125	H H H
	3	143	135	124	H H M
4	1	142	152	120	H H M
	2	145	122	149	H M H
	3	137	120	124	H M H
5	1	135	132	150	H H H
	2	153	125	121	H M M
	3	160	132	158	H H H
6	1	152	142	132	H H H
	2	146	123	129	H M H
	3	164	125	153	H M H
7	1	138	131	141	H H H
	2	154	129	163	H H H
	3	150	132	141	H H H
8	1	148	121	135	H M H
	2	130	134	127	H H H
	3	140	129	136	H H H
9	1	169	142	135	H H H
	2	161	150	150	H H H
	3	140	155	127	H H H
10	1	138	151	138	H H H
	2	167	166	142	H H H
	3	147	137	128	H H H
11	1	149	120	121	H M H
	2	147	140	138	H H H
	3	137	135	141	H H H
12	1	156	129	144	H H H
	2	130	134	137	M H H
	3	134	128	136	H H H
13	1	144	141	120	H H M
	2	141	122	129	H M H
	3	137	135	144	H H H

Appendix A. Individual Personality Patterns within Groups (cont.)

Contrast B Condition					
Group	Individual	Extraversion	Openness	Conscientiousness	Pattern
1	1	137	107	126	H L H
	2	1123	115	134	M M H
	3	130	100	128	M L H
2	1	115	108	129	M L H
	2	138	113	127	H M M
	3	108	99	135	M L H
3	1	123	81	134	M L H
	2	128	111	136	H M H
	3	131	93	123	H M M
4	1	120	114	128	M M H
	2	117	97	128	M L H
	3	127	103	133	H L H
5	1	149	101	127	H L H
	2	121	102	133	M L H
	3	123	98	130	M L H
6	1	146	100	128	H L H
	2	128	105	170	M L H
	3	95	86	118	L L M
7	1	123	97	123	M L M
	2	124	96	134	M L H
	3	105	99	129	L L H
8	1	106	82	124	M L M
	2	121	108	130	M L H
	3	129	100	129	M L H
9	1	134	97	126	H L M
	2	116	99	132	M L H
	3	107	115	146	L M H
10	1	126	106	134	M L H
	2	108	105	144	M L H
	3	115	93	127	M L H
11	1	124	105	122	M L M
	2	115	93	129	M L H
	3	122	115	139	M M H
12	1	134	105	130	H L H
	2	123	108	144	M L H
	3	130	106	123	M L M
13	1	113	99	137	M L H
	2	125	100	122	M L M
	3	124	105	134	M L H
14	1	122	111	124	M M M
	2	119	109	141	M L H
	3	134	104	122	M L M

Appendix A. Individual Personality Patterns within Groups (cont.)

Contrast C Condition					
Group	Individual	Extraversion	Openness	Conscientiousness	Pattern
1	1	125	135	107	M H L
	2	137	156	100	H H L
	3	126	129	73	M H L
2	1	98	119	56	L M L
	2	119	129	103	M H L
	3	133	131	109	M H M
3	1	119	148	85	M H L
	2	116	138	66	M H L
	3	125	131	97	M H L
4	1	134	140	111	M H M
	2	124	137	100	M H L
	3	116	128	98	M H L
5	1	113	127	92	M H M
	2	116	121	81	M H L
	3	130	137	91	M H L
6	1	108	121	89	M H L
	2	130	132	104	H H L
	3	114	134	97	M H L
7	1	136	134	71	H H L
	2	128	132	95	H H L
	3	122	132	102	M H L
8	1	109	137	88	M H L
	2	112	128	87	M H L
	3	114	132	102	M H L
9	1	105	121	100	M M L
	2	105	139	92	H H L
	3	134	128	74	M H L
10	1	123	129	91	M H L
	2	152	142	91	H H L
	3	115	129	108	M H L
11	1	116	138	66	M H L
	2	114	122	60	M M L
	3	109	137	88	M H L
12	1	125	123	78	M M L
	2	134	117	104	H M M
	3	125	144	113	M H M
13	1	122	122	90	M M L
	2	128	138	89	M H L
	3	148	155	79	H H L
14	1	140	158	82	H H L
	2	127	156	117	M H M
	3	106	130	91	M H L
15	1	106	130	91	M H L
	2	119	129	75	M H L
	3	127	125	98	M M L

APPENDIX B:

NEO PERSONALITY INVENTORY

NEO PERSONALITY INVENTORY

INSTRUCTIONS:

Please read each of the following items carefully and fill in the answer that best corresponds to your agreement or disagreement. There are no right or wrong answers, and you need not be an "expert" to complete this questionnaire. Describe yourself honestly and state your opinions as accurately as possible. Record your responses by filling in the appropriate circle on the op-scan as follows:

1 = "Strongly Disagree (**SD**)", or the statement is definitely false.
2 = "Disagree (**D**)", or the statement is mostly false.
3 = "Neutral (**N**)", or the statement is equally true or false.
4 = "Agree (**A**)", or the statement of mostly true.
5 = "Strongly Agree (**SA**)", or the statement is definitely true.

PLEASE DO NOT WRITE ON THIS QUESTIONNAIRE!

1. I am not a worrier.
2. I really like most people I meet.
3. I have a very active imagination.
4. I tend to be cynical and skeptical of others' intentions.
5. I'm known for my prudence and common sense.
6. I often get angry at the way people treat me.
7. I shy away from crowds and people.
8. Aesthetic and artistic concerns aren't very important to me.
9. I'm not crafty or sly.
10. I would rather keep my options open than plan everything in advance.
11. I rarely feel lonely or blue.
12. I am dominant, forceful, and assertive.
13. Without strong emotions, life would be uninteresting to me.

14. Some people think I'm selfish or egotistical.

15. I try to perform all the tasks assigned to me conscientiously.

16. In dealing with other people, I always dread making a social blunder.

17. I have a leisurely style in work and play.

18. I'm pretty set in my ways.

19. I would rather cooperate with others than compete with them.

20. I am easy-going and lackadaisical.

21. I rarely overindulge in anything.

22. I often crave excitement.

23. I often enjoy playing with theories and abstract ideas.

24. I don't mind bragging about my talents and accomplishments.

25. I'm pretty good about pacing myself so as to get things done on time.

26. I often feel helpless and want someone else to solve my problems.

27. I have never literally jumped for joy.

28. I believe letting students hear controversial speakers can only confuse and mislead them.

29. Political leaders need to be more aware of the human side of their policies.

30. Over the years I've done some pretty stupid things.

31. I am easily frightened.

32. I don't get much pleasure chatting with people.

33. I try to keep all my thoughts directed along realistic lines and avoid flights of fancy.

34. I believe that most people are well-intentioned.

35. I don't take civic duties like voting very seriously.

36. I'm an even tempered person.

37. I like to have a lot of people around me.

38. I am sometimes completely absorbed in music I am listening to.

39. If necessary, I am willing to manipulate people to get what I want.

40. I keep my belongings neat and clean.

41. Some times I feel completely worthless.

42. I sometimes fail to assert myself as much as I should.

43. I rarely experience strong emotions.

44. I try to be courteous to everyone I meet.

45. Sometimes I am not as dependable or reliable as I should be.

46. I seldom feel self-conscious when I'm around people.

47. When I do things, I do them vigorously.

48. I think it's interesting to learn and develop new hobbies.

49. I can be sarcastic and cutting when I need to be.

50. I have a clear set of goals and work toward them in an orderly fashion.

51. I have trouble resisting my cravings.

52. I wouldn't enjoy vacationing in Las Vegas.

53. I find philosophical arguments boring.

54. I'd rather not talk about myself and my achievements.

55. I waste a lot of time before settling down to work.

56. I feel I am capable of coping with most of my problems.

57. I have sometimes experienced intense joy or ecstasy.

58. I believe that laws and social policies should change to reflect the needs of a changing world.

59. I'm hard-headed and tough-minded in my attitudes.

60. I think things through before coming to a decision.

61. I rarely feel fearful or anxious.

62. I'm known as a warm and friendly person.
63. I have an active fantasy life.
64. I believe that most people will take advantage of you if you let them.
65. I keep myself informed and usually make intelligent decisions.
66. I am known as hot-blooded and quick-tempered.
67. I usually prefer to do things alone.
68. Watching ballet or modern dance bores me.
69. I couldn't deceive anyone even if I wanted to.
70. I am not a very methodical person.
71. I am seldom sad or depressed.
72. I have often been the leader of groups I have belonged to.
73. How I feel about things is important to me.
74. Some people think of me as cold and calculating.
75. I pay my debts promptly and in full.
76. At times I have been so ashamed I want to hide.
77. My work is likely to be slow but steady.
78. Once I find the right way to do something, I stick with it.
79. I hesitate to express my anger even when it is justified.
80. When I start a self-improvement program, I usually let it slide after a few days.
81. I have little difficultly resisting temptation.
82. I have sometimes done things just for "kicks" or "thrills".
83. I enjoy solving problems or puzzles.
84. I'm better than most people, and I know it.
85. I am a productive person who always gets the job done.
86. When I'm under a great deal of stress, sometimes I feel like I'm going to pieces.

87. I am not a cheerful optimist.

88. I believe we should look to our religious authorities for decisions on moral issues.

89. We can never do too much for the poor and elderly.

90. Occasionally I act first and think later.

91. I often feel tense and jittery.

92. Many people think of me as somewhat cold and distant.

93. I don't like to waste my time daydreaming.

94. I think most people I deal with are honest and trustworthy.

95. I often come into situations without being fully prepared.

96. I am not considered a touchy or temperamental person.

97. I really feel the need for other people if I am by myself for long.

98. I am intrigued by the patterns I find in art and nature.

99. Being perfectly honest is a bad way to do business.

100. I like to keep everything in its place so I know just where it is.

101. I have sometimes experienced a deep sense of guilt or sinfulness.

102. In meetings, I usually let others do the talking.

103. I seldom pay much attention to my feelings of the moment.

104. I generally try to be thoughtful and considerate.

105. Sometimes I cheat when I play solitaire.

106. It doesn't embarrass me too much if people ridicule and tease me.

107. I often feel as if I'm bursting with energy.

108. I often try new and foreign foods.

109. If I don't like people, I let them know it.

110. I work hard to accomplish my goals.

111. When I am having my favorite foods, I tend to eat too much.

112. I tend to avoid movies that are shocking or scary

113. I sometimes lose interest when people talk about very abstract, theoretical matters.

114. I try to be humble.

115. I have trouble making myself do what I should.

116. I keep a cool head in emergencies.

117. Sometimes I bubble with happiness.

118. I believe that the different ideas of right and wrong that people in other societies have may be valid for them.

119. I have no sympathy for panhandlers.

120. I always consider the consequences before I take action.

121. I'm seldom apprehensive about the future.

122. I really enjoy talking to people.

123. I enjoy concentrating on a fantasy or daydream and exploring all its possibilities, letting it grow and develop.

124. I'm suspicious when someone does something nice for me.

125. I pride myself on my sound judgment.

126. I often get disgusted with people I have to deal with.

127. I prefer jobs that let me work alone without being bothered by other people.

128. Poetry has little or no effect on me.

129. I would hate to be thought of as a hypocrite.

130. I never seem to be able to get organized.

131. I tend to blame myself when anything goes wrong.

132. Other people often look to me to make decisions.

133. I experience a wide range of emotions or feelings.

134. I'm not known for my generosity.

135. When I make a commitment, I can always be counted on to follow through.

136. I often feel inferior to others.

137. I'm not as quick and lively as other people.

138. I prefer to spend my time in familiar surroundings.

139. When I've been insulted, I try to forgive and forget.

140. I don't feel like I'm driven to get ahead.

141. I seldom give in to my impulses.

142. I like to be where the action is.

143. I enjoy working on "mind-twister"-type puzzles.

144. I have a very high opinion of myself.

145. Once I start a project, I almost always finish it.

146. It's often hard for me to make up my mind.

147. I don't consider myself especially "light-hearted".

148. I believe that loyalty to one's ideals and principles is more important than "open-mindedness."

149. Human needs should always take priority over economic considerations.

150. I often do things on the spur of the moment.

151. I often worry about things that might go wrong.

152. I find it easy to smile and be outgoing with strangers.

153. If I feel my mind starting to drift off into daydreams, I usually get busy and start concentrating on some work or activity instead.

154. My first reaction is to trust people.

155. I don't seem to be completely successful at anything.

156. It takes a lot to get me mad.

157. I'd rather vacation at a popular beach than an isolated cabin in the woods.

158. Certain kinds of music have an endless fascination for me.

159. Sometimes I trick people into doing what I want.

160. I tend to be somewhat fastidious or exacting.

161. I have a low opinion of myself.

162. I would rather go my own way than be a leader of others.

163. I seldom notice the moods or feelings that different environments produce.

164. Most people I know like me.

165. I adhere strictly to my ethical principles.

166. I feel comfortable in the presence of my bosses or other authorities.

167. I usually seem to be in a hurry.

168. Sometimes I make changes around the house just to try something different.

169. If someone starts a fight, I'm ready to fight back.

170. I strive to achieve all I can.

171. I sometimes eat myself sick.

172. I love the excitement of roller coasters.

173. I have little interest in speculating on the nature of the universe or the human condition.

174. I feel that I am no better than others, no matter what their condition.

175. When a project gets too difficult, I'm inclined to start a new one.

176. I can handle myself pretty well in a crisis.

177. I am a cheerful, high-spirited person.

178. I consider myself broad-minded and tolerant of other people's lifestyles.

179. I believe all human beings are worthy of respect.

180. I rarely make hasty decisions.

181. I have fewer fears than most people.

182. I have strong emotional attachments to my friends.

183. As a child I rarely enjoyed games of make believe.

184. I tend to assume the best about people.

185. I'm a very competent person.

186. At times I have felt bitter and resentful.

187. Social gatherings are usually boring to me.

188. Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement.

189. At times I bully or flatter people into doing what I want them to do.

190. I'm not compulsive about cleaning.

191. Sometimes things look pretty bleak and hopeless to me.

192. In conversations, I tend to do most of the talking.

193. I find it easy to empathize - to feel myself what others are feeling.

194. I think of myself as a charitable person.

195. I try to do jobs carefully, so they wont have to be done again.

196. If I have said or done the wrong thing to someone, I can hardly bear to face them again.

197. My life is fast-paced.

198. On vacation, I prefer to go to a tried and true spot.

199. I'm hard-headed and stubborn.

200. I strive for excellence in everything I do.

201. Sometimes I do things on impulse that I later regret.

202. I'm attracted to bright colors and flashy styles.

203. I have a lot of intellectual curiosity.

204. I would rather praise others than praise myself.

205. There are so many little jobs that need to be done that I sometimes just ignore them all.

206. When everything seems to be going wrong, I can still make good decisions.

207. I rarely use words like "fantastic!" or "sensational!" to describe my experiences.

208. I think that if people don't know what they believe in by the time they're 25, there's something wrong with them.

209. I have sympathy for others less fortunate than me.

210. I plan ahead carefully when I go on a trip.

211. Frightening thoughts sometimes come into my head.

212. I take personal interest in the people I work with.

213. I would have difficulty just letting my mind wander without control or guidance.

214. I have a good deal of faith in human nature.

215. I am efficient and effective at my work.

216. Even minor annoyances can be frustrating to me.

217. I enjoy parties with lots of people.

218. I enjoy reading poetry that emphasizes feelings and images more than story lines.

219. I pride myself on my shrewdness in handling people.

220. I spend a lot of time looking for things I've misplaced.

221. Too often, when things go wrong, I get discouraged and feel like giving up.

222. I don't find it easy to take charge of a situation.

223. Odd things - like certain scents or the names of distant places - can evoke strong moods in me.

224. I go out of my way to help others if I can.

225. I'd really have to be sick before I'd miss a day of work.

226. When people do foolish things, I get embarrassed for them.

227. I am a very active person.

228. I follow the same route when I go someplace.

229. I often get into arguments with my family and co-workers.

230. I'm something of a "workaholic".

231. I am always able to keep my feelings under control.

232. I like being part of the crowd at sporting events.

233. I have a wide range of intellectual interests.

234. I am a superior person.

235. I have a lot of self-discipline.

236. I'm pretty stable emotionally.

237. I laugh easily.

238. I believe that the "new morality" of permissiveness is no morality at all.

239. I would rather be known as "merciful" than as "just".

240. I think twice before I answer a question.

APPENDIX C:

CREATIVE TASK

INTERACTIVE CREATIVE TASK

Please generate suggestions for how Virginia Tech could help ease the transition to college in terms of social issues (not related to academic issues).

Remember, as a group your goal is to come up with as many solutions and the best solutions possible, so please voice your ideas and thoughts to the rest of your group.

APPENDIX D:

CREATIVE PRODUCT INVENTORY

CREATIVE PRODUCT INVENTORY

Group _____
Coder Number _____

Criteria	Response Code				
Generation: The extent to which the response generates new ideas. (fruitfulness)					
Reformulation: The extent to which the response introduces significant change in the product. (restructuring)					
Originality: The degree of the usefulness and uncommonness of the response. (uniqueness)					
Relevancy: The extent to which the response provides a satisfactory solution to the problem. (appropriateness)					
Hedonics: The degree of attraction, or the appreciation and popularity, of the response. (elegance)					
Complexity: The degree of depth, range, or intricacy of the information contained in the response. (completeness)					

Condensation: The degree to which the response simplifies or unifies the problem. (integration)					
Total Response Score					

APPENDIX E:

GROUP COHESION SCALE

GROUP COHESION SCALE

The following questions concern your feelings toward and evaluations of your group. Please circle the response which best reflects your opinion.

1. If given the chance, I would choose to leave my group and join another.

1	2	3	4	5
strongly disagree	disagree	neither disagree nor agree	agree	strongly agree

2. The members of my group get along well together.

1	2	3	4	5
strongly disagree	disagree	neither disagree nor agree	agree	strongly agree

3. I feel that I am really a part of my group.

1	2	3	4	5
strongly disagree	disagree	neither disagree nor agree	agree	strongly agree

4. I would look forward to being with members of my group for another assignment.

1	2	3	4	5
strongly disagree	disagree	neither disagree nor agree	agree	strongly agree

5. I find that I generally do not get along with the other members of my group.

1	2	3	4	5
strongly disagree	disagree	neither disagree nor agree	agree	strongly agree

6. The group to which I belong is a close one.

1	2	3	4	5
strongly disagree	disagree	neither disagree nor agree	agree	strongly agree

7. I enjoyed belonging to this group because I think I could be friends with many of its

members.

1	2	3	4	5
strongly disagree	disagree	neither disagree nor agree	agree	strongly agree

TABLES

Table 1

Subfacets of Big Five Personality Factors: Extraversion, Openness to Experience, and Conscientiousness

NEO Personality Factor	Subfacets	
Extraversion	• Warmth • Gregariousness • Assertiveness	• Excitement-Seeking • Positive Emotions • Activity
Openness to Experience	• Fantasy • Aesthetics • Feelings	• Ideas • Values • Actions
Conscientiousness	• Competence • Order • Dutifulness	• Self-Discipline • Deliberation • Achievement Striving

Table 2

Personality Patterns Within the Five-Cluster Solution

Cluster Number	N	NEO Personality Trait Level			Most Similar Group Condition
		E	O	C	
1	96	M	H	H	Optimal[a]
2	162	M	M	L	Contrast C
3	106	M	H	L	Contrast C[a]
4	134	H	H	M	Contrast A
5	112	H	L	H	Contrast B

Note. L = low trait levels, M = moderate trait levels, H = high trait levels.

E = Extraversion, O = Openness to Experience, C = Conscientiousness.

[a] Cluster pattern matches the specified group pattern exactly.

Table 3

Group Personality Patterns Within Group Conditions

Group Condition	NEO Personality Trait		
	Extraversion	Openness to Experience	Conscientiousness
Optimal	Moderate	High	High
Contrast A	*High*	High	High
Contrast B	Moderate	*Low*	High
Contrast C	Moderate	High	*Low*

Table 4

Descriptive Statistics and Correlations for Group Level Variables

Variable	M	SD	1	2	3	4	5	6	7	8	9
1. Extraversion	126.8	11.1	-								
2. Openness	126.7	14.2	.25	-							
3. Conscientiousness	123.0	18.6	.35**	-.19	-						
4. Cognitive Ability	23.2	3.0	-.03	.22	.09	-					
5. Cohesion	27.1	3.2	.21	-.15	-.02	-.15	-				
6. Idea Quantity	10.6	3.6	-.17	.21	.23	.10	-.07	-			
7. Creativity Score	2.9	.36	-.25*	.16	.24	.22	-.14	.41**	-		
8. # Superior Ideas	2.6	1.9	-.08	.26*	.10	.19	-.13	.58**	.36**	-	
9. % Superior Ideas	23.7	15.1	.04	.19	-.06	.18	-.07	.11	.20	.82**	-

*$p < .05$. **$p < .01$.

$N = 65$.

Table 5

Variable Means and Standard Deviations as a Function of Group Pattern

Variable	Group Pattern			
	Optimal (n = 23)	Contrast A (n = 13)	Contrast B (n = 14)	Contrast C (n = 15)
Idea Quantity	13.39	9.69	9.07	8.67
	(3.47)	(2.18)	(3.81)	(2.06)
Mean Creativity Score	3.18	2.67	2.72	2.67
	(.26)	(.27)	(.21)	(.36)
Quantity of Sup. Ideas	3.52	2.23	1.64	2.27
	(2.15)	(1.59)	(1.34)	(1.58)
Percent. of Sup. Ideas	25.65	23.23	18.21	26.07
	(12.34)	(15.53)	(14.41)	(17.42)
Extraversion	121.78	146.15	122.71	121.73
	(5.12)	(5.51)	(4.89)	(6.66)
Openness to Exper.	133.70	133.46	102.00	133.20
	(4.98)	(7.52)	(4.30)	(5.95)
Conscientiousness	131.70	135.85	131.29	90.67
	(3.35)	(5.29)	(3.05)	(7.67)
Cohesion	26.72	27.99	26.65	27.23
	(4.70)	(2.88)	(1.61)	(1.35)
Ability	24.28	22.59	22.09	23.11
	(1.62)	(4.78)	(1.74)	(3.51)

Note. Standard deviations are presented in parenthases below the variable means.

Table 6

Results of Regressing Dependent Variables on Cognitive Ability and Group Condition

Variables[a]	t	R^2	F
Idea Quantity			
1. Cognitive Ability	.81	.01	.66
2. Contrast A	-3.48**	.33**	7.39**
Contrast B	-4.10**		
Contrast C	-4.64**		
Mean Creativity Score			
1. Cognitive Ability	1.77	.05	3.12
2. Contrast A	-4.94**	.43**	11.28**
Contrast B	-4.44**		
Contrast C	-5.25**		
Quantity of Sup. Ideas			
1. Cognitive Ability	1.52	.04	2.30
2. Contrast A	-1.92	.16*	2.95*
Contrast B	-2.83**		
Contrast C	-2.01		
Percentage of Sup. Ideas			
1. Cognitive Ability	1.47	.03	2.16
2. Contrast A	-.22	.06	.98
Contrast B	-1.10		
Contrast C	.25		

Note. N = 65. Negative t-values indicate that the scores on the dependent variable were lower for the Contrast condition than the Optimal group.

[a] The group condition variable was dummy coded so that in Step 2, scores represent a comparison between each Contrast condition and the Optimal condition.

* $p < .05$. ** $p < .01$.

LAURIE BIRCH BUCHANAN
6608 Melrose Drive
McLean, VA 22101
(703) 748-0669
lobirch@aol.com

EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY, Blacksburg, VA

- Ph.D. in Industrial/Organizational Psychology, February, 1998
  Dissertation Title: Effects of Big Five Personality Characteristics on Team Performance.
- M.S. in Psychology, May, 1995
  Thesis Title: Emergent Female Leaders: Effects of Tasks, Self-Monitoring, and Priming.

HAVERFORD COLLEGE, Haverford, PA

- B.A. in Psychology, May 1991
  Thesis Title: Action Slips in Children as Evidence for an Organized Cognitive Structure.

PROFESSIONAL EXPERIENCE

PERSONNEL DECISIONS INTERNATIONAL
Arlington, VA
Consultant, August 1997 - present.

- Conducts individual assessments, including interviews, test interpretation, simulations, feedback for purposes of selection and development of executives.
- Development of organizational competency models and selection systems.
- Training and implementation of organizational 360 feedback systems.

AMERICAN SOCIETY FOR TRAINING AND DEVELOPMENT
Alexandria, VA
Research Officer, January 1997 - July 1997.

- Conducted research on current trends in organizational training practices and wrote related articles for publication.
- Determined companies with Best Practices in training and conducted case studies at these companies.
- Analyzed data on training practices in Fortune 500 companies.

STATE FARM INSURANCE COMPANIES
Bloomington, IL
Human Resources Intern, May 1996 - August 1996.
• Developed employee opinion survey on organizational climate and job satisfaction. Conducted focus groups to expand and improve survey content.
• Analyzed survey data to identify predictors of satisfaction and organizational effectiveness. Presented findings and recommendations to management teams.
• Validated employee selection test battery. Conducted item analyses on ability tests.
• Assisted development of behaviorally-anchored managerial performance appraisal system.

STATE COUNCIL OF HIGHER EDUCATION FOR VIRGINIA
Richmond, VA
Research Analyst, August 1995 - May 1996.
• Conducted research and statistical analyses on educational data, used for regulating and administrating educational programs. Reported results to state government administrators.
• Analyzed academic performance measures and researched other issues in higher education for public and private educational institutions.

FU ASSOCIATES, LTD., Arlington, VA
Human Resources Research Analyst, 1992-1993.
• Consulted the Federal Aviation Administration's (FAA) Office of Human Resource Development. Developed and implemented a strategic human resource planning system for selecting and training air traffic controllers.
• Managed production and publication of the FAA's Demographic Profiles of the Airway Facilities Work Force, designed to forecast and plan employee selection and training.

RELEVANT SKILLS AND COURSEWORK

• Advanced seminar in job analysis: Task- and worker-oriented methods, rating scale metric issues and methods of collecting data. Applied work with The Dictionary of Occupational Titles (DOT), Common Metric Questionnaire (CMQ), Position Analysis Questionnaire(PAQ), and Functional Job Analysis.
• Performance appraisal, selection, testing, training, validation, utility, fairness, EEOC guidelines, Title VII, ADA.
• Psychometric theory, multiple regression, factor analysis, structural equation

modeling, Item Response Theory, Computerized Adaptive Testing.
- Proficiency in SAS, SPSS-X, BMDP, WESTLAW, WordPerfect 6.0, Microsoft Word, AmiPro, Harvard Graphics, Microsoft Excel, Presentation Team, Freelance Graphics.

PAPERS AND PRESENTATIONS

- Buchanan, L. (April, 1997). Understanding Demographic Differences in Attitudes Towards Affirmative Action. Paper presented at the annual conference of the Society for Industrial and Organizational Psychology, St. Louis, MO.
- Buchanan, L., Eckel, C., & Grossman, P. (November, 1996). To Give or Not To Give: Effects of Altruism and Recognition on Philanthropic Gifts. Paper presented at the Southern Economic Association Annual Meetings, Washington, D.C.
- Buchanan, L., & Foti, R. (April, 1996). Emergent Female Leaders: Effects of Self-Monitoring, Priming, and Task Characteristics. Paper presented at the annual conference of the Society for Industrial and Organizational Psychology, San Diego, CA.
- Smith, J., Buchanan, L., & Hauenstein, N. (May, 1995). Goal setting and human performance. Paper presented at the annual conference of the Society for Industrial and Organizational Psychology, Orlando, FL.

PUBLICATIONS

- Smith, J., Hauenstein, N., & Buchanan, L. (1996). Goal setting and exercise performance, Human Performance, 9, 141-154.
- Buchanan, L., Campbell, L., Bradburn, W., & Khan, S. (1992). Demographic Profiles of the Airway Facilities Work Force. Fu Associates, Ltd.

PROFESSIONAL AFFILIATIONS

- American Psychological Association
- Society for Human Resource Management
- Society for Industrial and Organizational Psychology

152