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The Usefulness of Personality Measures in Predicting Performance across and within Canadian Forces Job Families

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This piece of work in dedicated to the memory of my father William O'Keefe, 1930-1963.

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Abstract

This study investigated the relationship between personality measures and job performance within the Canadian Forces (CF). It addressed whether personality measures can predict performance both within and across job families, and attempted to predict membership in job families using personality measures.

Canadian Forces (CF) members (n=757) and Saint Mary's University (SMU) students (n=330) completed the Measures of Personal Attributes (MPA); a version of the US Army's occupational personality instrument 'Assessment of Background and Life Experiences'. CF members completed the MPA as part of a 1996 CF Omnibus survey. In December 1997, SMU students completed the MPA and rated 20 CF occupations in order of preference. Students were used to generalize the findings from the military sample to potential CF applicants.

Across occupations, Dominance, Achievement, Internal Control and Physical Condition predicted performance for military members. MPA constructs predicted performance in four of the five CF job families. Dominance predicted performance in one job family, Physical Condition predicted performance in another family, and Dominance and Achievement predicted performance in two families. None of the results were generalized to the student sample.

Discriminant analysis of the five CF job families using the MPA scales found that only the Dependability factor discriminated among the occupational families. The results were replicated with the student sample.

Cluster analysis using MPA scores produced a four cluster solution. Discriminant analysis of the four MPA job clusters produced three significant functions (Physical Condition, Dependability and Dominance), accounting for 24% of the variance. The results were not replicated in the student sample.

An examination of the matrix of the CF entry-level job families and MPA job clusters suggest some relationship between ability-based families and personality-based families.

While preliminary, the results of this study suggest that personality measures can meaningfully predict performance across and within CF job families and also can be used to predict membership in ability-based job families. However, further studies are needed before these results are used in any practical personnel selection setting.

INTRODUCTION

The use of personality measures in personnel selection has long been debated in Industrial/Organizational Psychology. Personality measures - such as the MMPI - designed to indicate personality disorders, are often used in personnel selection. Such instruments are useful in helping to screen out potential problem employees; however, they provide very little information regarding the candidate's suitability for the job. In recent years, there has been renewed interest in the role of personality measures in personnel selection.

While the use of cognitive ability tests has been successful in assigning candidates who are usually able to succeed in training, it places no emphasis on the relationship between the type of person applying (e.g.; using interest or personality measures) and the type of job assigned. Tests measuring other human attributes may be important predictors as well. In the 1980s, the US Army commissioned Project A to evaluate and amend the army's selection and classification system. Project A involved validating a variety of selection tools including; cognitive ability tests, interest inventories and personality measures (Campbell, 1990).

Project A showed that job performance for enlisted personnel is multidimensional, involving 'can-do' components and 'will-do' components. Traditional aptitude and cognitive ability tests measure the 'can-do' component. Temperament or personality scales may be more appropriate measures of the 'will-do' component. Personality measures are currently being used by the US Army in a battery of selection tests. Preliminary results indicate that these

measures have little overlap with measures of cognitive ability and supplement traditional selection methods (White, Nord, Mael, & Young, 1993).

In the early 1990s, the Canadian Forces Personnel Applied Research Unit (CFPARU)[1] undertook a similar research project to develop new selection procedures and testing methods for Non-Commissioned Members (NCMs). One of the first steps was to cluster the 66 CF entry-level occupations into distinctive job families. That initial research established five clearly defined job families (Catano & Ibel, 1995). The next step is to develop valid measures to predict performance in each of the families. To this end, the CF Personnel Research Team (PRT) is developing a new aptitude and cognitive ability test to replace the instruments currently in use. Other projects involve relating measures of interest and personality to performance within and across CF Job Families (Halliwell, & Spinner, 1991).

The purpose of this study is to investigate the relationship between personality measures and job performance within the Canadian Forces (CF). The study addresses whether personality measures can predict performance both within and across job families. Additionally, the study attempts to predict membership in job families using personality measures.

[1] The unit has been renamed to the Canadian Forces Personnel Research Team (PRT) and moved from its former location in Toronto to Ottawa.

JOB FAMILIES

For years, personnel psychologists have studied ways of grouping jobs into families to improve selection. Court challenges in the 1970s questioned the selection procedures used by a number of organizations. These challenges led to a heightened need to develop legally defensible selection systems. Researchers have responded by developing several occupation clustering methods that lead to legally defensible selection systems.

The categorization of jobs into job families serves several purposes. Job families have been developed for use with vocational guidance, job placement, personnel classification, career progression and pay structures. The Uniform Guidelines on Employee Selection Procedures (1978) Section 7, part B, states that comparison between jobs can only be made when incumbents in each job perform substantially the same major work behaviors, thus the need for job classification schemes (Cited in, Lissitz, Mendoza, Huberty & Markos, 1979).

Techniques to Develop Job Families

Statistical methods such as cluster analysis, factor analysis and analysis of variance have all been used to cluster jobs. There is ongoing debate concerning which of these methods is best.

The most commonly used statistical clustering method is the cluster analysis approach. The technique was first proposed in the 1930s, but didn't gain acceptance until the 1960s with the advent of computers which made the analysis relatively easy. The most common method of cluster analysis is

Hierarchical Cluster Analysis (HCA). This method requires the formation of a matrix in which clusters are built by placing similar entities into the same cluster. This procedure involves a number of steps in which similarity between entities is recalculated in order to confirm the relationship between new clusters (Blashfield, 1976).

The most commonly used HCA method is the minimum variance method or Ward's method. This method clusters entities so that the error sum of squares among the members of each cluster is minimal. Ward's approach begins by grouping each case as one group and then sequentially finds the minimum within-group, and maximum between-group variation at every step in the process. This method places each entity into one and only one cluster which is very desirable when developing job families. (Blashfield, 1976; Mobley & Ramsay, 1973; Garwood, Anderson, & Greenhart, 1991).

While HCA is widely used in the classification of jobs, there are a few drawbacks to the procedure. HCA groups entities into one and only one cluster, which may not reflect a true classification of the job. It may be more realistic to expect that job families would share many similarities in knowledge, skills and abilities, but differ on others, suggesting that there may be some overlap between job families (Colihan & Burger, 1995).

Another drawback is that there may be some ambiguity present when trying to determine the number of job clusters. The optimal number of job clusters is based on the judgment of the researcher. To date, there is no method available which determines the correct number of clusters. Researchers use

several rules-of-thumb to determine the number of clusters. Consequently, two different researchers may decide on very different job clusters using the same data (Harvey, 1986).

The Development of Job Families in the CF

As part of the project to develop new selection procedures and testing methods for NCMs, Catano (1995) clustered the 66 entry-level NCM occupations into job families. To this end, Catano & Ibel (1995) collected ability data from 2501 Subject Matter Experts (SMEs) in the 66 entry-level occupations. Using Ward's HCA method, the 66 entry-level MOCs were clustered into five jobs families: Military (e.g. Combat arms), Operator (e.g. Air Traffic Controller, Radio Operator), Administrative (e.g. Finance Clerk, Postal Clerk), Technical A (e.g. Radio Technician, Radar Technician), and Technical B (e.g. Hull Technician, Vehicle Technician).[2]

They validated the five cluster solution by a review of the clusters by SMEs and through a discriminant analysis. The discriminant analysis indicated that 73% of all the MOCs were correctly classified into the appropriate family. The classification by family was Military (84%), Operator (79%), Administrative (73%), Technical A (76%), and Technical B (62%). Technical A and Technical B groups were the most similar of all the families and as a result, 16% of the Technical B cases were misclassified into the Technical A family (Catano & Ibel, 1995).

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[2] See Appendix A for a list of the MOCs in the each job family.

Using a step-wise discriminant analysis, Catano (1995) identified nine primary abilities associated with the five clusters of these entry-level MOCs which could then be used to differentiate between MOC families. The primary predictor variables for each MOC family are outlined in Table 1. The mean scores differed significantly across the five job families and the nine factors accounted for 60% of the variance of the data. The nine primary abilities are:

1. Strength and Movement; e.g. Trunk and Dynamic Strength
2. Vision;
3. Audition;
4. Controlled reaction; e.g. Reaction Time, Perceptual Speed.
5. Analytical ability; e.g. Mathematical Reasoning, Visualization.
6. Information processing; e.g. Spatial Orientation, Manual Dexterity
7. Cognition;
8. Verbal ability; and
9. Fine motor control.

Table 1:
CF Job Families and associated Primary Predictors

Job Family	**Primary Predictor**
Military	Strength and movement Controlled reaction Vision
Operator	Audition Information processing Vision
Administrative	No primary predictors.
Technical A	Fine Motor Control Analytical Ability Cognition Vision
Technical B	Strength and Movement Controlled Reaction Fine Motor Control Analytical Ability Cognition

Five of the nine predictors are not measured in current CF selection tests. These include; Strength and Movement, Controlled Reaction, Vision, Audition, and Fine Motor Control. The current CF selection system involves the use of a General Learning Abilities Test (GC) and the Canadian Forces Classification Battery (CFCB). The GC is a test of general cognitive ability and the CFCB assesses a number of aptitudes including; arithmetic knowledge, automotive knowledge, electronic knowledge, mechanical knowledge, pattern analysis, science information and word knowledge (Catano, 1995).

With the advent of high speed computers and valid clustering methods, jobs can now be grouped into families with relative ease. Properly clustered job families makes the work of validating a selection system much easier. The next step is to develop appropriate selection tests.

PERSONALITY MEASURES IN PERSONNEL SELECTION

In the 1950s and 1960s, there appeared to be a glut of personality tests in the industrial setting. However, very few showed any promise in personnel selection. Guion and Gottier (1965), after an extensive review of a number of personality tests used in industrial settings, stated that none of the conventional personality measures demonstrated any real usefulness as selection tools in employment practice. Personality testing in the workplace was almost nonexistent until the 1980s, and still then, the intended use of personality tests was met with much controversy over their utility.

Personality assessments have been used to select applicants for occupations such as police officers, flight attendants, and firefighters. Rather than being used to identify personality types associated with specific jobs, they are used to screen out those applicants with psychological problems (Irving, 1993). In the 1980s, researchers started investigating the use of personality tests, coupled with cognitive ability and interest tests, as a means to predict occupational success.

The Big Five Factor Model of Personality Dimensions

Occupational personality research in recent years has focused on the domain of personality attributes defined by five superordinate constructs. This 'Big Five' factor structure, more than any other structure of personality, has profoundly influenced the study of individual differences (Goldberg, 1993). These broad domains incorporate hundreds of traits and are described as; **Neuroticism**, or emotional instability as opposed to adjustment; **Extraversion**, described by a need for stimulation, activity, assertiveness, and quantity and intensity of interpersonal interaction; **Openness**, represented by flexibility of thought and tolerance of, and sensitivity and openness to, feelings, experiences, and new ideas; **Agreeableness**, represented by a compassionate rather than antagonistic interpersonal orientation; and **Conscientiousness**, or the degree of organization, persistence, and motivation in goal-directed behavior. (Bateman & Crant, 1993).

The roots of the Big Five extend back to the insights of Sir Francis Galton, and later L. L. Thurstone. Galton was one of the first scientists to recognize the

lexical hypothesis - "namely, that the most important individual differences in human transactions will come to be encoded as single terms in some or all of the world's languages" (Goldberg, 1993, pg.26). His insights were later used by other investigators to construct a structural representation of personality.

The present version of the Five Factor model of personality was developed by McCrae and Costa, and operationalized in the NEO Personality Inventory (NEO-PI). The NEO-PI is an extension of an earlier personality inventory developed by Costa and McCrae (1983), which measured three constructs of personality; Neuroticism, Extraversion and Openness. The later inventory included scales to measure the remaining two constructs; Agreeableness and Conscientiousness (McCrae & Costa, 1987).

Assuming that personality traits are stable and expressed in our everyday life, personality measures should be able to predict work behavior and, consequently, the selection of personnel. While there is agreement that there is a relationship between personality and job performance, the degree or magnitude of this relationship is uncertain.

Barrick and Mount (1991) used meta-analysis to investigate the relationship between the Big Five personality dimensions and three job performance criteria (job proficiency, training proficiency and personnel data) for five occupations (professionals, police, managers, sales, and skilled/semi-skilled). One scale - Conscientiousness - was related to all job performance criteria in all occupational groups with correlations ranging from .20 to .23. Additionally, Extraversion was related to the sales and managers occupational

groups with correlations of .18 and .15, respectively. Openness to Experience and Extraversion were related to training proficiency across all occupations with correlations of .25 and .26, respectively. Barrick and Mount suggested that rather than concentrating on the relatively small correlation coefficients, research should identify which dimensions are the best predictors for specific occupations and criterion types.

Tett, Jackson, and Rothstein (1991), questioned the meta-analytic method used by Barrick and Mount (1991). Results of their own meta-analysis were significantly different. All five factors of personality were related to job performance; Neuroticism (r=-.22), Extraversion (r=.16), Openness (r=.27), Agreeableness (r=.33), Conscientiousness (r=.18), and Locus of Control (r=.13).

Tett et al. (1991) argued that the difference between the results of the two studies was due to the strategy used to select studies for inclusion in the meta-analysis. Barrick and Mount selected studies based on an exploratory approach where any study dealing with personality was used regardless of whether there was any clear rationale for expecting significant correlations. Tett et al. (1991) used a confirmatory approach where the researchers indicated an explicit rationale for examining specific traits in relation to performance. Personality traits selected for use in research with job performance had to be chosen on the basis of conceptual linkages with performance criteria. In other words, researchers were required to conduct a job analysis specific to the occupation in question in order to determine if personality variables were related to success in that occupation .

Ones, Mount, Barrick and Hunter (1994) cited technical errors in Tett's et al. study and questioned the validity of their research. Ones et al. (1994) stated that while both studies summarized the same body of literature, the number of studies and sample size in the Tett, et al. meta-analysis was much smaller than those used in the Barrick and Mount (1991) study. For example, Tett et al. used seven studies (N = 450) for the Conscientiousness factor, while Barrick and Mount used ninety-two (N = 12,893). Ones et al. argued that by reducing the number of studies analyzed, Tett, et al. reduced the statistical power of the findings, thereby, reducing the likelihood of accurately assessing the magnitude of the relationship between personality and job performance. They also claimed that Tett et al. made a number of statistical errors leading to doubts about their findings.

Tett, Jackson, Rothstein and Reddon (1994) countered Ones et al.'s (1994) criticisms by stating that the primary objectives of the studies were different. Barrick and Mount's study tested whether particular personality dimensions were linked to certain occupational groups which required the use of directional validities. Tett et al., on the other hand, were interested in the overall validity of personality in predicting job performance regardless of job type. Tett et al. argued that it was fruitless to perform predictive validity measures with the Extraversion scale using managerial occupations without first doing a comprehensive job analysis. Extraversion may be positively correlated with one type of managerial occupation but negatively correlated with another. The

resulting validity coefficient would be small and not reflect the true correlational relationships.

Tett et al. (1994) justified the small number of statistics used in their meta-analysis based on the confirmatory research strategy which had a greater potential for describing personality-job performance relationships. Even after addressing Ones et al.'s (1994) statistical concerns, the overall corrected validity was still almost twice as high as that reported by Barrick and Mount (Tett, et al. 1994). Both meta-analytic studies highlighted several areas of concern pertaining to the study of relationships between personality and job performance.

There may be a number of influencing factors which could moderate the relationship between personality and job performance. Barrick and Mount (1993), in a study of 146 managers, reported that two Big Five personality dimensions, Conscientiousness (r=.25) and Extraversion (r=.14), were significantly related to job performance. Furthermore, the relationships were higher for those managers who had high autonomy in their job compared to those who had little autonomy. The study also reported a negative correlation between Agreeableness and job performance. They concluded that Conscientiousness, Extraversion and Agreeableness predicted performance better in jobs where there was high autonomy. Additionally, in high-autonomy jobs, managers low in Agreeableness performed better than those high in Agreeableness.

Personality research findings must be tempered with the fact that the majority of results are obtained using one method of investigation: self-report inventories. These measures, while convenient, may not be accurate measures.

"There is some evidence that self-ratings of personality have lower correlations with measures of academic achievement as the criterion, than personality ratings obtained from other sources. [Additionally] .... Other evidence ... suggests that observers' ratings of personality predict behavior as well as, if not better than, self-reports" (Mount, Murray & Strauss, 1994, pg. 273). Hough, Dunnette, Eaton, Kamp & McCloy (1990) reported in a literature review that Achievement and Dependability (personality constructs similar to Conscientiousness) from self-report personality measures correlated positively (r=.30 and r=.15, respectively) with academic performance of high school and college students. In contrast, Smith (1967) reported peer ratings of Conscientiousness (described as Strength of Character) correlated higher with academic performance of college students (r=.43). This is a very important point to consider when drawing conclusions based solely on self-report measures.

The results of personality questionnaires may also be situationally biased by the reason for administering the test. Individuals taking the test as part of a job selection process may be motivated to choose those responses they believe will be linked to a successful outcome. While personality measures have social desirability scales built into the questionnaire to deal with these situations, care must still be taken when making personnel selection decisions (Schmit, & Ryan, 1993).

The Assessment of Background and Life Experiences (ABLE)

While the Big Five factor model of personality has made a significant contribution to I/O psychology, greater care is needed in the application of the

model to personnel selection. Specifically, the Big Five factor model may be too broad a measure to have predictive usefulness. In response to this concern, Hough (1992) developed the Assessment of Background and Life Experiences (ABLE).

Hough (1992) argued that the Big Five factor model was too heterogeneous and incomplete. She proposed a ten-scale taxonomy intended to measure six temperament constructs. Beginning with the Five Factor model and using a number of outcome measures including job proficiency, training and educational success, and commendable and law abiding behavior, Hough and associates developed the ABLE. The ABLE is a ten-factor taxonomy of personality which include the following temperament scales: Dominance, Work Orientation, Self-Esteem, Energy Level, Emotional Stability, Cooperativeness, Traditional Values, Nondelinquency, Conscientiousness and Internal Control. The scales and underlying construct definitions are shown in table 2.

Three additional scales, Physical Condition, Social Desirability and Nonrandom Response were added to a later version of the ABLE. Physical Condition measures one's participation in sports, exercise, and other physical activities. The Social Desirability scale detects inaccuracy in examinees' responses to look good. The Nonrandom Response scale is meant to detect inaccuracy in one's responses due to random/careless responding (White, Nord, Mael, & Young, 1993).

Table 2:
ABLE Temperament Scales and Related Constructs

ABLE Temperament Scales	**Related Constructs**
Dominance	**Surgency**: The tendency to enjoy positions of leadership and influence over others.
Work Orientation (Competence) Self-Esteem (Confidence) Energy Level (Enthusiasm)	**Achievement**: The tendency to strive energetically for competence in one's work.
Emotional Stability (Tolerance for stress)	**Adjustment**: The tendency to have an even and positive affect and the ability to perform well under stress.
Cooperativeness	**Agreeableness**: The tendency to show pleasantness in interpersonal relationships. A cooperative person is easy to get along with, and a team player.
Traditional Values (Respect for authority) Nondelinquency (Acceptance of laws and regulations) Conscientiousness (Reliability)	**Dependability**: The tendency to be disciplined, obey and be respectful of rules and regulations, and accepting of authority.
Internal Control	**Locus of control**: The tendency to perceive reinforcements as being under one's own control.

Validation studies report alpha coefficients for content scale intercorrelations from .69 to .84 with a median of .81. Test-retest reliability's ranged from .69 to .85 with a median of .78. Criterion-related validity studies using 9,359 US military enlisted personnel in 19 military occupations report that all six temperament constructs were significantly related to performance criteria such as, effort and leadership, personal discipline, physical fitness and military bearing. The Surgency and Achievement temperaments constructs correlated with the effort and leadership and physical fitness and military bearing criteria; the Dependability and Agreeableness temperament constructs correlated with the personal discipline criterion; and the Physical Condition scale correlated with

the physical fitness and military bearing criterion (Hough, Dunnette, Eaton, Kamp, & McCloy, 1990).

Predictive validity studies involved the administration of a test battery (including the ABLE) to recruits entering the US Army and monitoring performance criteria over several years. Results were similar to the criterion-related validation study. All ABLE temperament constructs correlated significantly with the motivational aspects of performance that they were developed to predict (White, & Moss, 1995). These results are reported in the Table 3 [3]:

Table 3:
Correlations between ABLE constructs and motivational aspects of performance

ABLE Construct	**Effort**	**Leadership**	**Personal Discipline**	**Fitness & Bearing**
Achievement		.13**		.14**
Dominance	.10*	.15**		.15**
Dependability	.10*	.16**	.20**	
Adjustment				
Cooperativeness		.09*	.13**	.09*
Internal Control		.11*		
Physical Condition				.28**

N = 590 *:p<.05 **:p<.01

The CF adopted the ABLE as a means to incorporate personality measures into selection systems. Items on the ABLE were reworded to suit CF personnel and the instrument was retitled the Measures of Personal Attributes (MPA). It consists of 133 items which measure seven temperament constructs and two validity scales (Table 4).

[3] See White & Moss (1995, pg. 7-8) for a description of the instruments used to assess the constructs in Table 3.

Table 4:
MPA Temperament and Validity Scales

Temperament Scales	**Number of Items**	**Maximum Scale Score**
Achievement: The tendency to strive for excellence in the completion of work-related tasks. Persons high on this construct enjoy challenging activities, and set high standards of performance for themselves. They consistently work very hard to meet these high standards.	28	84
Dominance: The tendency to seek out and enjoy being in leadership positions. Persons high on this construct are confident of their abilities, speak up when they have something to contribute, and succeed in persuading others. They feel comfortable directing the activities of other people, and are looked up to when decisions have to be made.	19	57
Dependability: The tendency to respect and obey rules, regulations, and authority figures. Persons high on this construct stay out of trouble, avoid physical violence, and like to plan ahead for their future.	21	63
Adjustment: The tendency to have a uniformly positive affect. Persons high on this construct maintain a positive outlook on life, are free of excessive fears and worries, and have a feeling of self-control. They maintain their positive affect and self-control even when faced with stressful circumstances.	15	45
Cooperativeness: The tendency to interact with others in a pleasant manner. Persons high on this construct get along and work well with others. They show kindness, while avoiding arguments and negative emotional outbursts directed at others.	10	30
Internal Control: The tendency to believe that positive life outcomes are under an individual's control; as opposed to simply happening by chance. Persons high on this construct believe that any person's success is largely a result of his/her initiative and effort. These individuals also have a great respect for authority and discipline.	13	39
Physical Condition: The tendency to seek out and participate in physically demanding activities. Persons high on this construct routinely participate in vigorous sports or exercise and enjoy doing hard physical work.	8	24
Validity Scales		
Social Desirability: The tendency to respond in a way that will make one look good. Persons who score high in this scale are intentionally or subconsciously attempting to make themselves look good. High scores on this scale should raise a red flag reference the validity of the test score.	11	33
Nonrandom Response: The tendency to respond to questions in a random or careless manner. Persons who score high on this scale may not be responding to questions as prudently as required. Low scores on this scale should raise a red flag reference the validity of the test score.	8	8

Relationship Between the Big Five and the ABLE/MPA

White and Moss (1995) showed several interesting links between the five Big Five constructs and the seven ABLE temperament scales. Conscientiousness correlated positively with all the ABLE constructs, but the highest with Achievement. Neuroticism correlated negatively with six of the seven ABLE constructs, with Dependability the only exception. Extraversion correlated positively with all ABLE constructs except Dependability. Agreeableness correlated positively with Dependability, Cooperativeness, and Internal Control, and negatively with Dominance, and Physical Condition. Openness correlated negatively with Dependability.

Day, Methot, and Stinson (1997) reported that three of the seven temperament scales of the ABLE/MPA, were clearly linked with the Big Five constructs. Work Orientation (Achievement in the MPA), Adjustment, and Dependability corresponded to the Big Five constructs of Conscientiousness, Emotional Stability, and Agreeableness, respectively. Dominance and Dependence were less significantly related to the Big Five constructs of Extraversion and Conscientiousness, respectively.

Relationship between personality constructs and performance across and with ability-based job families.

Traditionally, researchers confined themselves to using only one type of job descriptor when clustering jobs into families. Reynolds, Laabs & Harris (1996) developed an interesting approach to clustering jobs. They used three different types of job descriptors: Task Statements from an occupational

analysis, Behavioral Descriptions using the Position Analysis Questionnaire developed by McCormick, Jeannneret & Mecham, (1972) and Ability Requirements using Fleischman's Job Ability Survey (F-JAS).

Using the Job Activities Inventory I (JAI), an instrument containing 105 items related to the three types of descriptors, job families developed from 75 US naval occupations were compared with the goal of identifying predictors for use in selection. Twenty-one items were related to Task Statements, 58 items were related to Behavioral Descriptions, and 26 items were related to Ability requirements. Using principal component analysis (PCA), 18 underlying dimensions were obtained which included; six task components, seven behavioral components, and five ability components. Using HCA for each set of components separately, six job families were yielded for the tasks components, nine job families for the behavioral components, and seven families for the ability components. Table 5 outlines the labels attached to the clusters.

Results from the Reynolds, et. al. (1996) study are significant in that they show that several types of descriptors may be used to predict membership in Job Families.

Preliminary research with the CF suggest an interesting link between personality and performance within CF job families. As part of the Occupation Abilities Survey conducted by Catano and Ibel (1995), participants were asked to describe themselves using personality constructs similar to those of the Big Five personality scale. Personality constructs were instrumental in differentiating

job families. For instance, Emotional Stability coupled with Cognitive Ability predicted membership in the Operator job family.

Table 5:
Labels attached to Job Families based on task, behaviour and ability ratings

Task- Based	Behavior-Based	Ability-Based
Electronics	Mechanical Administration	Average physical
Machinery	Personal Server	Perceptual and cognitive
Construction	Sensory Information Processing	Communication and dexterity
Communications	Construction	Fine Motor Control/ Reasoning
Administration	Technical data handling	Interpersonal communication
Weapons	Propulsion equipment	High Physical
	Skilled manual labor	Signalman
	Personnel Administrator	
	Manual Tradesman	

In a study using the CF job families developed by Catano (1995), MacLennan (1996) found that in addition to several ability scales which predicted membership in job families, personal characteristics helped differentiate job families as well. For instance, coupled with science knowledge, military potential differentiated between the Operator and Administrative job. Military potential is assessed at CF recruiting centers as part of the selection process for new recruits and include factors such as; conformity to rules, initiative, performance under stress, perseverance, physical endurance and team-work.

Based on the results of Barrick and Mount's (1991), and Tett, Jackson and Rothstein's (1991) research reference the relationship between personality

and performance, and using information from CF occupation specification literature, it appears that performance assessment within the CF is based on criteria related to MPA constructs. These include the tendency to strive for excellence (Achievement), the ability to excel in leadership positions (Dominance), the propensity to respect and obey rules and regulations (Dependability), the ability to adjust to changing situations (Adjustment), the tendency to get along with others (Cooperativeness), the tendency to show initiative (Internal Control) and the ability to participate in physically demanding activities (Physical Condition).

An examination of the types of occupations in each of the CF job families, suggests that Achievement is related to performance in all occupations, and there may be other MPA constructs related to each family. Specifically, occupations in the Military job family perform duties which involve working as a member of a team under very demanding physical and emotional conditions. While all MPA scales may be related to this job family, it is crucial that in order to maintain operational effectiveness, that soldiers in this family are confident and enjoy leadership positions (Dominance), are able to adjust to changing situations (Adjustment), show initiative (Internal Control), and be very physically fit (Physical Condition)

Occupations in the Operator job family, generally speaking, work independently or in small groups and success in this family depends on the ability to respect and obey rules (Dependability) and to show initiative (Internal Control).

Occupations in the Administrative job family, as the name suggests, work in an administrative support role, either independently or in small groups. As in the case of the Operator job family, performance in this family is contingent upon the soldiers' ability to respect rules and regulations (Dependability) and show initiative (Internal Control). Additionally, due to the supportive nature of the jobs in this family, performance is also based on the tendency of soldiers to get along with others (Cooperativeness).

Occupations in both the Technical A and Technical B job family involve employment in highly technical occupations such as, electronics and mechanical technology. Performance in both of these families requires that soldiers respect and adhere to rules (Dependability) and to show initiative (Internal Control). Additionally, due to the more physical nature of the duties in Technical B job family, the tendency to enjoy doing hard physical work (Physical Condition) is an important aspect in this job family.

Research Question

Building on research reference the relationship between occupation personality measures and performance (Tett, Jackson & Rothstein, 1991; Barrick & Mount, 1991; Hough, Dunnette, Eaton, Kamp, & McCloy, 1990) this research project involved relating personality traits to performance within and across CF entry-level job families. That is to say, this study attempts to answer the following questions: Can personality measures predict performance regardless of job

family classification, and additionally, are there personality traits specific to each job family which can be used to predict performance?

With data obtained from a sample of CF members, this thesis tested the following hypotheses:

Hypothesis 1: Performance of CF members ***across*** rank and job family will be significantly and positively correlated to the following ABLE personality dimensions: Achievement, Dominance, Dependability, Adjustment, Cooperativeness, and Internal Control.

Hypothesis 2: Performance of CF members ***within*** each job family will be significantly and positively correlated to the following ABLE personality scales: Achievement, Dominance, Dependability, Adjustment, Cooperativeness, and Internal Control.

Hypothesis 3: Personality measures will predict membership in the five CF entry-level job families as follows (Table 6):

a. the MPA constructs Achievement, Dominance, Adjustment, Internal Control and Physical Condition will predict membership in the Military job family;
b. Achievement, Dependability and Internal Control will predict membership in the Operator family;
c. Achievement, Dependability, Cooperativeness, and Internal Control will predict membership in the Administrative family;
d. Achievement, Dependability and Internal Control will predict membership in the Technical A family; and

e. Achievement, Dependability, Internal Control and Physical Condition will predict membership in the Technical B job family.

In addition to testing these specific hypotheses, this thesis will also explore the creation of job families based on the MPA constructs and then compare these families to those based on ability constructs. The MPA families may suggest personality predictors that may enhance selection into the abilities-based job families.

Table 6:
MPA constructs used to predict membership in CF job families

Job Family	MPA personality scale
Military	Achievement Dominance Adjustment Internal Control Physical Condition
Operator	Achievement Dependability Internal Control
Administrative	Achievement Dependability Cooperativeness Internal Control
Technical A	Achievement Dependability Internal Control
Technical B	Achievement Dependability Internal Control Physical Condition

Generalization of research results to potential CF recruits

Once the relationship between personality traits and performance are identified using data from current members of the CF, it is important to generalize these findings to potential recruits in order to develop valid selection

tests. A secondary goal of this study is to identify linkages between university students' personality and preference for CF occupations. The existence of such linkages would justify the inclusion of personality testing as part of the CF selection process. In general, university students represent potential CF recruits in that they are young (18-24 years), they have recently graduated from high school, and they are not familiar with the type of jobs in the CF.

Potential CF recruits make decisions on which CF occupation they will choose based on information provided to them at recruiting centres, and not based on experience with the occupation. This information is provided by means of realistic job preview videos, recruiting pamphlets, and an information interview with recruiters. CF NCM applicants are assigned an occupation following a rigorous selection procedure which include writing a battery of cognitive ability and aptitude tests and participating in a unstructured interview designed to assess attributes similar to those captured in occupation personality measures such as the MPA or NEO-PI. As well, assignment of CF recruits to specific occupations is based on occupation requirements and training availability.

With data obtained from a sample of university students, this thesis tested the following hypothesis:

Hypothesis 4: Personality/CF occupation linkages will generalize to potential CF recruits (undergraduate university students).

METHOD

Participants

Military Sample

In 1996, a stratified random sample of 1200 CF members was asked to complete the MPA. The MPA was part of an Omnibus survey which involved several instruments including a CF Diversity Project questionnaire and a CF Health and Lifestyle Questionnaire. Each questionnaire also included a self-report performance measure (PER) where participants were asked to report their most recent personnel evaluation report score. Table 7 shows the stratification of the sample across rank, gender, and primary language.

Table 7:
Stratification of CF sample across rank, gender and primary language

	Male		**Female**	
	English	***French***	***English***	***French***
Junior Non-Commissioned Member: Private to Master-Corporal	367	183	167	83
Junior Officer: Officer Cadet to Captain	167	83	100	50

The survey was distributed to Personnel Selection offices across Canada. Personnel Selection Officers were instructed to contact selected participants in their area, requesting their participation in the survey. Once completed, the MPA is a protected item and therefore, completion of the questionnaire was done in the presence of a Personnel Selection Officer or his/her representative. Once completed, the surveys were returned to CF PRT where they were scored. The results of the MPA were obtained from PRT for the purpose of this study.

Of the 1200 administered questionnaires, 754 were returned and were usable for a response rate of 63%. Table 8 outlines the number of returned questionnaires and the response rate for the military sample stratified across rank, gender and primary language.

Table 8:
Return rate for the military sample stratified across rank, gender, and language

	Male		Female	
	English	**French**	**English**	**French**
Junior Non-Commissioned Member:	253	102	113	49
Private to Master Corporal	69%	56%	67%	59%
Junior Officer:	88	42	56	18
Officer Cadet to Captain	53%	50%	56%	36%

There were 33 cases missing rank data. In all but the French Female Junior Officer category, several respondents categorized themselves as either a senior non-commissioned member (NCM) in the case of the Junior Non-Commissioned Members category, or Senior Officer in the case of the Junior Officer category. This could be the result of miscoding on behalf of the respondents or, the member having been promoted just prior to administration of the survey. In any case, participants who categorized themselves as senior NCMs were grouped with the junior NCM category, and participants who categorized themselves as senior officers were grouped with the junior officer category.

Student Sample

Saint Mary's University undergraduate Psychology students (n = 330) participated on a voluntary basis. Of the 330 SMU students, there were 99 males

and 230 females, one student did not provide data reference gender. Those who participated received bonus points awarded to their Psychology course mark.

Students who volunteered were informed that the purpose of the study was to measure the relationship between personality traits and academic performance as reflected in their cumulative Quality Point Average (QPA). Students were provided with their individual results of the MPA, compared with the normative scores from the CF study. The MPA result sheet using CF normative data provided to students is attached at Appendix D. Participants were asked to sign a consent form allowing the researcher access to their QPA reported by the registrar in December 1997. The consent is included as Appendix B.

Performance Measures

Performance Evaluation Report (used with Military sample)

The PER is a formal annual evaluation report completed for all CF members. The purpose of the personnel evaluation system is to regularly assess and report the current performance level of CF personnel. The system requires that members be evaluated bases on a number of factors which have been found to be valid indicators of effective performance. These factors include job specific skills, professional knowledge and personnel management abilities. The PER is comprised of a numerical scoring section and a supporting narrative section. The numerical scoring section provides for quantitative assessments on a variety of factors relevant to the member's observed work and leadership skills

which are summed to provide an overall score (Canadian Forces Administrative Order 26-15; 1986). The most recent self-report PER rating was coded as follows:

1. Adverse
2. Normal
3. Superior
4. Outstanding

Quality Point Average (QPA) (used with student sample)

The QPA system for Saint Mary's University is as follows:

Letter Grade	QPA	Descriptor
A+	4.300	Excellent
A	4.000	Excellent
A-	3.700	Excellent
B+	3.300	Good
B	3.000	Good
B-	2.700	Good
C+	2.300	Satisfactory
C	2.000	Satisfactory
C-	1.700	Satisfactory
D	1.000	Marginal Pass
F	0.000	Failure/Withdrawal

QPA data were coded on a five-point scale. A QPA of F was coded 1, D was coded 2, C was coded 3, B was coded 4 and A was coded 5.

Instruments

Measure of Personal Attributes (MPA):

The MPA is a version of the ABLE which has been tailored to the CF. Cronbach's Alpha reliability coefficients (Table 9) for the CF sample were .87 for Achievement scale, .84 for the Dominance scale, .80 for the Dependability scale, .80 for the Adjustment scale, .77 for the Cooperativeness, .82 for the Internal Control scale, and .82 for the Physical Condition scale.

Table 9:
Internal Consistency reliabilities for MPA using Cronbach's alpha

MPA Scale	Reliability Coefficient	Number of Items	Sample Size
Achievement	**.87**	**28**	**707**
Dominance	**.84**	**19**	**686**
Dependability	**.80**	**21**	**707**
Adjustment	**.80**	**15**	**725**
Cooperativeness	**.77**	**10**	**722**
Internal Control	**.82**	**13**	**720**
Physical Condition	**.82**	**8**	**723**

Confirmatory Factor Analysis of the MPA using the CF sample. While the ABLE has been used in selection in the US Army for several years, there is little evidence confirming the psychometric properties of the instrument. As such, the 125 items of the MPA were submitted to a confirmatory factor analysis using LISREL 7. Due to listwise deletion in the PRELIS analysis used to produce a correlation matrix for use in LISREL, the sample size was reduced from 737 to 658.

Each item was allowed to load on only its associated factor and the factors were allowed to correlate. The covariance matrix for the 125 items was analyzed. The variance for each of the factors was fixed at 1.0 and parameter

estimates were made under a maximum likelihood method. Appendix E shows factors loadings for the 125 items onto the 8 MPA scales.

Several statistics were used to assess the extent to which the model fitted the data. The X^2/df ratio (X^2 = 14979.03, p<.001 with 7597 degrees of freedom; X^2/df =1.97) met the criterion for a good fit (Pedhazur, & Pedhazur-Schmelkin, 1991). The Goodness of Fit Index (GFI =.707), and the Adjusted Goodness of Fit (AGFI=.696) indicated that MPA model did not fit the data well. The Root Mean Square Residual (RMSR=.063) indicated an adequate fit.

In an effort to improve upon the fit of the model, all items with factor loadings less than .400 were removed, resulting in a reduction from 125 to 89 items. Items 9, 12, 26, 27, 42, 70, 78, 87, 89, 97, 100, and 133, loading on the Achievement scale, were removed leaving 16 items for a maximum scale score of 48. Items 10, 60, 93, 96, 112, and 113, loading on the Dominance scale, were removed resulting in 13 items for a maximum scale score of 39. Items 15, 36, 53, 104, 110, 111, 120, 128, and 130, loading on the Dependability scale, were removed resulting in 12 items for a maximum scale score of 36. Items 13, and 131, loading on the Adjustment scale, were removed resulting in 13 items for a maximum scale score of 39. Item 83, loading on the Cooperativeness scale, was removed resulting in 9 items for a maximum scale score 27. Items 8 and 81, loading on the Internal Control scale, were removed resulting in 11 items for a maximum scale score of 33. Item 17, loading on the Physical Condition scale, was removed resulting in 7 items for a maximum scale score of 21, and items 3,

91, and 106, loading on the Social Desirability scale, were removed resulting in 8 items for a maximum scale score of 24.

The revised model provided a better fit for the data, (X^2 = 7515.11, p<.001 with 3799 degrees of freedom; X^2/df =1.97) (GFI=.780; AGFI=.769; RMSR=.059), but still was not a particularly good fit. Nonetheless, the revised model fit the data better than the original model, and therefore, was used in statistical analysis. Appendix F shows factors loadings for the 89 items onto the 8 MPA scales.

Procedure for student sample

Students completed the MPA, and then rated their preference for 20 CF occupations. Students assessed four CF occupations from each of the five job families developed by Catano (1995) for a total of 20 occupations (see Table 10). The occupations were chosen to represent typical occupations in each family and to represent a sample of Naval, Combat Arms, Air Force and support occupations.

Occupational recruiting information was provided to SMU students in the form of recruiting pamphlets outlining the duties and responsibilities for a variety of CF occupations. In an effort to maximize internal validity, the order of presentation of the occupations was randomized. Tasks carried out for each occupation were described in writing, and participants rated each occupation using a five-point scale where:

1. = I would dislike this job very much
2. = I would dislike this job somewhat
3. = I would neither like nor dislike this job
4. = I would like this job somewhat
5. = I would like this job very much

Table 10:
Occupations from Catano & Ibel (1995) Job Families used in the Student study

Job family	**Occupation**
Military	Infanteer
	Field Engineer
	Lineman
	Boatswain
Operator	Meteorological Technician
	Oceanographic Operator
	Radio Operator
	Communicator Research
Administrative	Administrative Clerk
	Supply Technician
	Steward
	Traffic Technician
Technical A	Avionics Technician
	Photographic Technician
	Dental Clinic Assistant
	Radar Technician
Technical B	Hull Technician
	Weapons Technician (Land)
	Aviation Systems Technician
	Medical Assistant

Students were categorized as preferring one of the five job families based on their ratings of the 20 occupations. Respondents were identified as preferring one of the job families based on the family which corresponded to the highest overall value. For example, a respondent whose highest aggregate value occurred in the Military job family was coded as preferring the Military job family. Respondents who identified the same preference value for two or more job

families were not coded into any family. The instructions given to participants and the description for each occupation are included as Appendix C.

Data Analysis

Descriptive statistics for the military and the student samples were analyzed to assess significant differences between subgroups. In an effort to reduce the probability of incorrectly reporting significant differences, statistical significance was determined using a family-wise Bonferonni correction with an initial alpha level of 0.05. Additionally, due to the large sample size, Cohen's medium effect size (0.50) was used as a reference point in considering the practical significance of means between groups. The following formula was used to calculate effect size; d = 2t / Square root of degrees of freedom.

The relationship between performance across and within job families and MPA constructs was investigated using correlation and hierarchical regression analysis. In the correlation analysis, small effect size was chosen due to the exploratory nature of the study. The performance measure in the military sample was the self-report PER score; in the student sample the performance measure was the students' QPA.

The relationship between the five CF job families and MPA constructs was investigated using discriminant analysis with both the military and student sample. Using the five CF job families as the grouping variable, the discriminant analysis was performed on a random sample of 70% of the entry-level junior NCM cases and cross-validated on the remaining 30% of the cases. To assess

the generalizability of the results, the discriminant analysis for the military sample was also cross-replicated on the student sample.

In the military sample, entry-level occupations were also clustered on the basis of MPA constructs following the method used by Catano & Ibel (1995). The mean standardized score was determined for each of the 60 entry-level occupations. The resulting MPA profiles were submitted to Hierarchical Cluster Analysis using Ward's method, with squared Euclidean distances as the distance measure. The accepted practice of determining the number of clusters was followed. The derived clusters were validated using discriminant analysis with the cluster solution as the grouping variable. The analysis was performed on a random sample of approximately 70% on the entry-level junior NCM cases and cross-validated using the remaining 30% of the cases, and then on the student sample to assess the generalizability of the results.

Finally, the linkages between ability-based job families and personality-based job families were investigated by examining a matrix of the MPA job clusters (and primary predictors) versus the five CF job families (and primary predictors).

Assumptions for all analyses were tested for violations. An analysis of the boxplots for all seven MPA scales across and within each job family indicates that there were some outliers located sporadically throughout the distribution. However, in all distributions, the percentage of outliers was relatively low (approximately 5% or less) which could represent extreme scores within the population. Therefore, outliers were not removed from the data prior to analysis.

An examination of the distributions of the MPA scales across and within job families indicate that apart from some negative skewness, the distributions appear to be relatively normal.

The sample size for the discriminant analysis, while unequal, satisfied the requirement for robustness (Tabachnick & Fidell, 1989). Box's M test indicated that the assumptions of homogeneity of variance and covariance had been met.

RESULTS

Descriptive Statistics for the MPA

Military Sample

Descriptive statistics for the entire sample and the respective demographic subgroups are presented in Table 11. Of the 754 remaining cases, 17 had scores less than 6 on the non-random response (NNR) scale. Low scores on this scale indicate that respondents are not attending to the tasks. As recommended by Hough (1993) all cases with an NNR score less than 6 were deleted from all analysis, thereby leaving 737 cases.

Tests for significant differences were carried out between Junior NCM and Junior Officers, Males and Females, and French and English using t tests for all 8 MPA scales. Using a family-wise Bonferroni correction, a series of 8 separate t-tests was carried out within a given set, resulting in an alpha level of 0.05/8.

Junior NCMs and Junior Officers were significantly different on the following scales : Dominance ($t = 6.25$, $p < .006$), Dependability ($t = 3.96$, $p < .006$), and Internal Control ($t = 6.09$, $p < .006$) with Officers scoring higher than

NCMs on all three scales. Males and females differed on the following scales:

Table 11:
Descriptive statistics (Mean and SD) for the military sample on MPA scales

	Entire Sample (N=737)	Junior NCM (N=515)	Junior Officer (N=204)	Male (N=480)	Female (N=240)	French (N=222)	English (N=513)
MPA							
Achievement	38.87 (5.21)	38.92 (5.17)	38.33 (5.39)	38.62 (5.39)	39.51 (4.87)	38.77 (4.85)	38.90 (5.37)
Dominance	30.53 (4.69)	29.90 (4.70)	32.25 (4.21)	30.86 (4.61)	29.86 (4.85)	30.09 (4.89)	30.72 (4.61)
Dependability	30.09 (4.00)	29.74 (4.11)	31.04 (3.61)	29.31 (4.10)	31.63 (3.33)	30.39 (4.20)	29.95 (3.91)
Adjustment	31.12 (4.45)	31.16 (4.52)	31.22 (4.17)	31.62 (4.32)	30.14 (4.51)	31.07 (4.61)	31.16 (4.39)
Cooperativeness	22.58 (2.94)	22.64 (2.96)	22.50 (2.90)	22.52 (3.00)	22.73 (2.81)	22.50 (2.71)	22.61 (3.03)
Internal Control	26.93 (4.51)	26.33 (4.58)	28.55 (3.96)	26.93 (4.52)	26.96 (4.54)	27.56 (4.16)	26.64 (4.63)
Physical Condition	15.07 (3.44)	14.99 (3.38)	15.44 (3.59)	15.54 (3.41)	14.18 (3.32)	14.77 (3.34)	15.21 (3.48)
Social Desirability	11.72 (2.87)	11.84 (2.87)	11.33 (2.77)	11.82 (2.94)	11.37 (2.60)	13.89 (3.26)	10.79 (2.08)

Adjustment ($t = 4.23$, $p < .006$), and Physical Condition ($t = 5.12$, $p < .006$) where males scored higher, and Dependability ($t = 7.58$, $p < .006$) where females scored higher. Francophones and Anglophones differed significantly on the Social Desirability scale ($t = 15.46$, $p < .006$) with Francophones scoring higher than Anglophones.

Notwithstanding the several statistical differences between the means of these groups, only two groups met the requirement for practical significance. These were the difference between Males and Females on the Dependability scale ($t = 7.58$, $p < .006$, $d=.56$), and the difference between Anglophones and Francophones on the Social Desirability scale ($t = 15.46$, $p < .006$, $d= 1.00$).

In order to carry out statistical analysis, it was necessary to code the entry-level occupations into their appropriate families as developed by Catano (1995). Since these families were created, some occupations were amalgamated and others were introduced. The three airforce electronics occupations (521, 524 & 551; clustered in the Technical A job family) have been combined into Avionics Technician (526). The airforce aviation technician occupations (511 & 512; Technical B job family) have been combined into Aviation Technician (514). To this end, Avionics Technicians (526) and Aviation Technician (514) were coded in the Technical A and Technical B job family respectively.

A number of new occupations had also been established. Three new occupations; Strategic Information Systems (225), Aerospace Telecommunications and Information Systems Technician (226), and Land Communication and Information Systems Technician (227) are very similar to the Terminal Technician (222) and Teletype and Cipher Technicians (223) which are clustered in the Technical A job family. These three new occupations were, therefore, coded into this job family. In total, there are 71 entry-level occupations, but only 60 were included in the sample. A list of the entry-level occupations used in this study is outlined in Appendix H. Descriptive statistics for the MPA scales in each Job Family are displayed in Table 12.

Student Sample

Descriptive statistics for the entire student sample and male and female subgroups are presented in Table 13. Seven respondents had scores less than 6

on the nonrandom response scale and were not used in any analyses, thereby leaving 323 cases.

Table 12:
Descriptive statistics (Mean and SD) for each Job Family on MPA scales

	Job Family				
	Military (N=110)	**Operator (N=43)**	**Admin (N=139)**	**Tech A (N=43)**	**Tech B (N=128)**
MPA					
Achievement	37.58 (5.46)	39.65 (5.68)	39.35 (5.33)	38.84 (4.63)	39.25 (4.63)
Dominance	29.75 (4.95)	30.14 (4.15)	29.95 (5.06)	29.37 (4.16)	30.05 (4.33)
Dependability	27.95 (4.43)	30.12 (3.83)	30.90 (3.57)	31.21 (3.53)	29.64 (3.99)
Adjustment	30.76 (4.82)	30.88 (3.33)	31.35 (4.90)	30.47 (4.64)	31.34 (4.38)
Cooperativeness	22.32 (2.86)	22.70 (2.97)	23.12 (2.85)	22.56 (3.19)	22.48 (2.99)
Internal Control	26.05 (4.48)	26.56 (3.97)	26.90 (4.42)	25.23 (4.77)	26.41 (4.55)
Physical Condition	15.97 (3.42)	15.37 (3.48)	14.04 (3.39)	14.19 (3.03)	14.76 (3.13)

Table 13:
Descriptive statistics (Mean and SD) for Student sample on MPA scales

	Entire Sample (N=323)	**Male (N=97)**	**Female (N=225)**
Achievement	36.43 (5.64)	36.55 (5.76)	36.39 (5.62)
Dominance	29.54 (4.68)	30.44 (4.57)	29.16 (4.70)
Dependability	29.81 (3.78)	29.10 (4.08)	30.11 (3.62)
Adjustment	28.96 (5.14)	31.43 (4.61)	27.90 (5.00)
Cooperativeness	22.74 (3.17)	22.98 (3.12)	22.63 (3.19)
Internal Control	28.34 (3.54)	28.32 (3.52)	28.35 (3.56)
Physical Condition	14.32 (3.49)	15.67 (3.43)	13.75 (3.37)
Social Desirability	9.37 (1.65)	9.53 (1.79)	9.31 (1.58)

Tests for significant differences were carried out between Males and Females, as well as between the Student and Military samples using t tests for all 8 MPA scales. Statistical difference was assessed using a family-wise Bonferonni correction with an initial alpha level of 0.05.

Males and Females were significantly different on Adjustment ($t=5.95$, $p<.006$), and Physical Condition ($t=4.67$, $p<.006$) where males scored higher on both scales. Both Adjustment ($d=.66$) and Physical Condition ($d=.52$) met the requirement for practical significance.

Overall, student participants differed significantly from military respondents on the following scales: Achievement ($t=6.82$, $p<.006$), Dominance ($t=3.16$, $p<.006$), Adjustment ($t=6.94$, $p<.006$), Internal Control ($t=4.98$, $p<.006$), Physical Condition ($t=3.24$, $p<.006$), and Social Desirability ($t=13.73$, $p<.006$) with CF members scoring higher on all but the Internal Control scales. However, only Social Desirability ($d=.84$) met the requirement for practical significance. Descriptive statistics for the MPA scales in each job family are presented in Table 14.

Relationship between MPA scales and Performance Across Job Families

Military Sample

Table 15 presents the Pearson product moment correlation matrix for the seven MPA scales and the performance criterion. Performance correlated significantly with Achievement ($r=.28$), Dominance ($r=.25$), Internal Control ($r=.12$) and Physical Condition ($r=.10$). Achievement correlated significantly with

Dominance (r=.51), Dependability (r=.13), Adjustment (r=.27), Cooperativeness (r=.23), Internal Control (r=.29) Physical Condition (r=.20) and Social Desirability (r=.20). Dominance correlated significantly with Adjustment (r=.38), Cooperativeness (r=.22), Internal Control (r=.22) Physical Condition (r=.26) and Social Desirability (r=.11). Dependability correlated significantly with Adjustment (r=.17), Cooperativeness (r=.32), Internal Control (r=.20), Physical Condition (r=-.12) and Social Desirability (r=.20). Adjustment correlated significantly with Cooperativeness (r=.38), Internal Control (r=.32) Physical Condition (r=.19), and Social Desirability (r=.27). Cooperativeness correlated significantly with Internal Control (r=.32), Physical Condition (r=.08) and Social Desirability (r=.19). Internal Control correlated significantly with Physical Condition (r=.11) and Social Desirability (r=.15).

Table 14:
Descriptive statistics for each Job Family on MPA scales for Student sample

	Job Family				
	Military (N=48)	**Operator (N=69)**	**Admin (N=71)**	**Tech A (N=35)**	**Tech B (N=31)**
MPA					
Achievement	36.15 (6.01)	37.71 (5.07)	36.27 (5.98)	36.91 (5.57)	37.68 (4.96)
Dominance	30.50 (4.81)	29.41 (5.01)	28.37 (4.84)	30.11 (4.60)	30.68 (4.16)
Dependability	28.94 (4.07)	30.81 (3.37)	30.55 (3.13)	30.54 (2.12)	27.90 (4.40)
Adjustment	30.75 (5.29)	27.94 (5.74)	28.23 (4.72)	27.69 (4.76)	30.42 (4.67)
Cooperativeness	22.23 (3.26)	23.33 (3.29)	22.63 (2.82)	22.34 (3.28)	22.90 (3.82)
Internal Control	28.60 (3.25)	28.38 (3.82)	27.86 (3.58)	28.86 (3.41)	28.48 (3.62)
Physical Condition	15.58 (3.27)	13.77 (3.54)	13.35 (3.12)	14.74 (3.66)	15.23 (3.61)

Table 15:
Pearson Product Moment Correlations for the seven MPA scales and performance measure

	PER RATE	ACH	DOM	DEP	ADJ	COOP	IC	PC	SocDes
PERRATE	1.00								
ACH	.28**	1.00							
DOM	.25**	.51**	1.00						
DEP	-.02	.13**	-.03	1.00					
ADJ	.09	.27**	.38**	.17**	1.00				
COOP	.06	.23**	.23**	.32**	.38**	1.00			
IC	.12**	.29**	.22**	.20**	.32**	.32**	1.00		
PC	.10**	.20**	.26**	-.12**	.19**	.08**	.11**	1.00	
SocDes	.06	.20**	.11**	.20**	.27**	.19**	.15**	-.01	1.00
Mean	3.78	38.95	30.65	30.17	31.13	22.56	26.88	15.02	11.69
SD	.75	5.18	4.66	3.90	4.46	2.97	4.53	3.45	2.81

**: P < .01 N = 681

Performance rating was regressed hierarchically onto Achievement, Dominance, Internal Control and Physical Condition in that order (Table 16). All four MPA constructs were significantly correlated with each other suggesting that the potential for multicollinearity be assessed. Performance was significantly predicted by Achievement (R^2 = .07, $F_{1, 679}$ = 57.78, p < .01). The prediction improved with the addition of Dominance (ΔR^2 = .02, $F_{2, 678}$ = 34.47, p < .01), but not for Internal Control (ΔR^2 = .00, $F_{3, 710}$ = .541, p =.46) and Physical Condition (ΔR^2 = .00, $F_{4, 676}$ = .45, p =.50). The inclusion of Internal Control and Physical Condition in the regression analysis added little to the prediction of performance. Achievement and Dominance accounted for 9% of the variance in Performance.

An examination of the tolerance values suggest that some multicollinearity exists, but given the relatively high values (1.00 indicating no relationship) it is safe to include the independent variables in the regression analysis.

Table 16:
Results of Hierarchical Regression Analysis

Independent Variables	B	Beta	R^2	ΔR^2	Tolerance
Step 1:					
Achievement	.04	.28	.07	.07	1.00
Step 2:					
Achievement	.03	.21	.09	.02	.74
Dominance	.02	.14			.74
Step 3:					
Achievement	.03	.20	.09	.00	.71
Dominance	.02	.13			.73
Internal Control	.00	.03			.91
Step 4:					
Achievement	.03	.20	.09	.00	.69
Dominance	.02	.13			.71
Internal Control	.00	.03			.91
Physical Condition	.00	.03			.92

Student Sample

Table 17 contains the product moment correlation matrix for the MPA scales and QPA. Achievement correlated significantly with Dominance (r=.55), Dependability (r=.22), Adjustment (r=.27), Cooperativeness (r=.23), Internal Control (r=.30), Physical Condition (r=.17) and Social Desirability (r=.34). Dominance correlated significantly with Adjustment (r=.43), Internal Control (r=.25) and Physical Condition (r=.28). Dependability correlated significantly with Cooperativeness (r=.35), Internal Control (r=.25), Physical Condition (r=-.14) and Social Desirability (r=.25). Adjustment correlated significantly with Cooperativeness (r=.36), Internal Control (r=.32), Physical Condition (r=.30) and Social Desirability (r=.19). Cooperativeness correlated significantly with Internal Control (r=.30) and Internal Control correlatively significantly with Social

Desirability (r=.16). None of the MPA scales were significantly correlated with QPA. An analysis of the partial correlations also yielded the same results.

Table 17:
Pearson Product Moment Correlations for the MPA scales and QPA

	QPA	ACH	DOM	DEP	ADJ	COOP	IC	PC	SocDes
QPA	1.00								
ACH	.12	1.00							
DOM	.13	.55**	1.00						
DEP	.01	.22**	-.02	1.00					
ADJ	.09	.27**	.43**	.14	1.00				
COOP	-.02	.23**	.12	.35**	.36**	1.00			
IC	.05	.30**	.25**	.25**	.32**	.30**	1.00		
PC	.03	.17**	.28**	-.14**	.30**	.12	.13	1.00	
SocDes	-.03	.35**	.07	.25**	.19**	.14	.16**	.02	1.00
Mean	2.83	36.43	29.54	29.81	28.96	22.74	28.34	14.32	9.33
SD	3.67	5.64	4.68	3.78	5.14	3.17	3.54	3.50	1.65

**: P < .01 N for correlations involving QPA = 318 N for all other correlations = 323

Relationship between MPA scales and Performance Within Job Families

Military Sample

Table 18 presents correlation analyses between performance and MPA scales within the five CF job families. In the Military job family, performance correlated significantly with Dominance (r=.29). In the Administrative job family, performance correlated significantly with Achievement (r=.27) and Dominance (r=.26). In the Technical A job family, performance correlated significantly with Physical Condition (r=.42). In the Technical B job family, performance correlated significantly with Achievement (r=.46), and Dominance (r=.38).

There were no significant correlations between performance and MPA scales in the Operator job family, despite the fact that some correlation coefficients were similar in value to significant results in other families. These results may be insignificant because of sample size.

Table 18:
Correlation between Performance and MPA scales within the five CF job families

Job Family	MPA Scale								
	ACH	DOM	DEP	ADJ	COOP	IC	PC	Soc Des	N
Military Performance	.22	.29**	.05	.04	.11	.14	.17	-.03	94
Operator Performance	.18	.34	.00	.22	-.03	.35	.13	.18	39
Administrative Performance	.27**	.26**	-.07	.09	.07	.15	.11	.08	136
Technical A Performance	.15	.02	-.09	.04	.03	.25	.42**	-.07	40
Technical B Performance	.46**	.38**	.15	.12	.20	.11	.04	.02	123

**: P<.01

Within each job family, performance was regressed hierarchically onto the MPA scales in which it was significantly correlated (Table 19). Within the Military job family, performance was regressed hierarchically onto Dominance. Within the Administrative family, performance was regressed onto Achievement and Dominance in that order. In the Technical A family, performance was regressed onto Physical Condition, and in the Technical B family, performance was regressed onto Achievement and Dominance in that order. Within the Operator family, performance was not significantly correlated with any of the MPA scales and therefore, was not regressed onto MPA scales.

In the Military job family, performance was significantly predicted by Dominance ($R^2 = .08$, $F_{1, 92} = 8.61$, $p < .01$). In the Administrative job family, performance was significantly predicted by Achievement ($R^2 = .07$, $F_{1, 134} = 10.75$, $p < .01$). The prediction improved with the addition of Dominance ($\Delta R^2 = .01$, $F_{2, 133} = 6.26$, $p < .01$). Achievement and Dominance accounted for 9% of the variance in performance. In the Technical A job family, performance was

significantly predicted by Physical Condition (R^2 = .18, $F_{1, 38}$ = 8.19, p < .01). In the Technical B job family, performance was significantly predicted by Achievement (R^2 = .21, $F_{1, 121}$ = 32.78, p < .01), and prediction improved with the addition of Dominance (ΔR^2 = .04, $F_{2, 120}$ = 19.52, p < .01). Dominance and Achievement accounted for 25% of the variance in performance.

Table 19:
Results of Hierarchical Regression Analysis within CF job families

Job Family	Independent Variables	B	Beta	R^2	ΔR^2	Tolerance
Military	**Step 1: Dominance**	.04	.29	.08	.08	1.00
Administrative	**Step 1: Achievement**	.04	.27	.07	.07	1.00
	Step 2: Achievement	.03	.18	.08	.01	.58
	Dominance	.02	.14			.58
Technical A	**Step 1: Physical Condition**	.10	.42	.18	.18	1.00
Technical B	**Step 1: Achievement**	.07	.46	.21	.21	1.00
	Step 2: Achievement	.06	.36	.25	.04	.76
	Dominance	.04	.21			.76

Student Sample

Results of the correlation analysis using the student sample were quite different from that of the CF data. There were only three significant correlations between academic performance and MPA scales for all five families. In the Military job family, performance correlated significantly with Physical Condition (r=-.37). In the Technical A family, performance was significantly correlated with Internal Control (r=.44), and in the Technical B family, performance was

significantly correlated with Achievement (r=.52). There were no significant correlations between Performance and MPA scales in the Operator and Administrative job families.

Within the Military, Technical A and Technical B job family, performance was regressed onto Physical Condition, Internal Control and Achievement, respectively. In the Military job family, performance was predicted by Physical Condition (R^2 = .14, $F_{1, 46}$ = 7.65, $p < .01$). In the Technical A family, performance was predicted by Internal Control (R^2 = .19, $F_{1, 33}$ = 8.05, $p < .01$), and in the Technical B family, performance was predicted by Achievement (R^2=.28, $F_{1, 27}$ = 10.52, $p < .01$).

Discriminant Analysis of entry-level CF occupations

Military Sample

A stepwise discriminant analysis was carried out in an attempt to differentiate the five CF job families using the seven MPA subscales. Standardized scores were used in the discriminant analysis. Appendix G presents the results of the stepwise discriminant analysis. The analysis produced one significant discriminant function confirming that the composite variables differed across the five job families. The function accounted for 7% of the variance (the square of the canonical correlation). As indicated by Wilk's Lambda, Dependability produced the largest effect, which was substantially greater than the effects of the rest of the factors. In the stepwise entry, only

Dependability reduced Wilk's lambda significantly enough to be included in the function.

Examining the group centroids, this function appears to best discriminate the Technical A and Administrative family (high score) from the Military family (low score). The Technical A family ranks highest on the function (centroid=.27) followed closely by the Administrative family (centroid=.26). These two groups are clearly separated, in terms of decreasing rank from the Operator (centroid=.06), and Technical B (centroid=-.04) groups which in turn are separated from the Military group (centroid=-.47).

The discriminant function correctly classified 36% of the individual occupations (119 out of 330 cases) compared to 24% by chance based on the job family group sizes. Only two families, Military and Administrative had more correct classifications than could be expected by chance based on group size (39.2% vs. 22.4%, and 68.0% vs. 30.3% respectively); no cases were classified into the Operator or Technical A families, and classification into the Technical B family was lower than expected by chance (23.9% vs. 27.8%). The Military, Operator, Technical A and Technical B families each had a large percentage of cases misclassified into the Administrative family, despite the fact that the Technical A family is most associated with the Dependability factor and the Military family is least associated with the Dependability factor. The classification results are presented in Table 20.

Table 20:
Classification Results for Discriminant Analysis for Military sample using MPA (Derivation Sample)

	Predicted Group				
Actual Group	***Military***	***Operator***	***Admin***	***Tech A***	***Tech B***
Military	**29** **39.2%**	0 0%	31 41.9%	0 0%	14 18.9%
Operator	5 18.5%	**0** **0%**	15 55.6%	0 0%	7 25.9%
Admin	15 15.0%	0 0%	**68** **68.0%**	0 0%	17 17.0%
Tech A	5 13.5%	0 0%	24 64.9%	**0** **0%**	8 21.6%
Tech B	20 21.7%	0 0%	50 54.3%	0 0%	**22** **23.9%**

Similar classification results were obtained with the replication sample. Overall, the discriminant function correctly classified 38.4% of individual occupations (51 out of 133 cases) compared to 24.89% expected by chance. Again, correct classifications were obtained in only the Military and Administrative families (52.8% vs. 27.1% by chance and 71.8% vs. 29.3% by chance, respectively); no cases were classified into the Operator and Technical A families, and classification into the Technical B family was lower than expected by chance (11.1% vs. 27.1% by chance).The classification results are presented in Table 21.

Student Sample

To assess the generalizability of the discriminant analysis results of the CF data, the discriminant analysis was replicated on the student sample. Overall classification results were similar to that of the CF data, but there was one significant difference with the individual group classification. Overall, the

discriminant function correctly classified 32.43% of individual occupations (84 out of 259 cases) compared to 22.18% by chance. As in the analysis using CF data, correct classifications were obtained in the Military and Administrative families (30.6% vs. 18.9% by chance, and 58.9% vs. 28.2 by chance); no cases were classified into the Technical A family, and classification into the Technical B family was lower than expected by chance (6.3% vs. 12.4% by chance). However, unlike the results using CF data, where no cases were classified into the Operator family, correct classification were obtained using the student data (34.3% vs. 27.1% by chance). Table 22 presents the classification results for the student sample. Notwithstanding the difference in the classification into the Operator family, the proportion of correct classifications in the student sample is very similar to that of the military sample.

Table 21:
Classification Results for Discriminant Analysis for Military sample using MPA (Replication Sample)

	Predicted Group				
Actual Group	***Military***	***Operator***	***Admin***	***Tech A***	***Tech B***
Military	**19** **52.8%**	0 0%	15 41.7%	0 0%	2 5.6%
Operator	5 25.0%	**0** **0%**	9 56.3%	0 0%	3 18.8%
Admin	9 23.1%	0 0%	**28** **71.8%**	0 0%	2 5.1%
Tech A	0 0%	0 0%	6 100%	**0** **0%**	0 0%
Tech B	12 33.3%	0 0%	20 55.6%	0 0%	**4** **11.1%**

Table 22:
Classification Results for Discriminant Analysis for Student sample using MPA

	Predicted Group				
Actual Group	***Military***	***Operator***	***Admin***	***Tech A***	***Tech B***
Military	**15** **30.6%**	10 20.4%	22 44.9%	0 0%	2 4.1%
Operator	12 17.1%	**24** **34.3%**	34 48.6%	0 0%	0 0%
Admin	8 11.0%	22 30.1%	**43** **58.9%**	0 0%	0 0%
Tech A	3 8.6%	5 14.3%	27 77.1%	**0** **0%**	0 %
Tech B	11 34.4%	4 12.5%	15 46.9%	0 0%	**2** **6.3%**

Cluster Analysis of CF entry-level occupations using the MPA scales

To explore the predictive utility of the MPA, new job families were created using the MPA scores as the basis for grouping the entry-level occupations into families. The procedures used by Catano (1995) for the ability-based families were followed; the only difference was that the standardized MPA scores were the units of analysis. Appendix H presents the sample size, mean and standard deviation for the seven MPA scales for all 60 entry-level occupations used in the study. However, only those occupations (N=22) with greater than 5 cases were used in the cluster analysis.

Appendix I presents the results of the Cluster analysis. Initial inspection of the HCA dendogram suggested a three cluster solution. However, as the distance at which other clusters were joined was relatively close, a four cluster solution was also reviewed. The three cluster solution had one relatively large cluster (10 occupations), and two smaller clusters (5 and 7 occupations). The four cluster solution had the same smaller clusters as the three cluster solution,

but parceled the larger cluster of occupations into two clusters of 5 occupations. The four cluster solution appears to satisfy the requirements for parsimony and distinctiveness.

An examination of the outliers in the three and four cluster solutions indicated that, generally speaking, the same outliers emerged in each of the three potential solutions. In an effort to reduce the number of outliers, some occupations were reassigned to different groups. However, the number of outliers either remained the same or increased compared to the original cluster solution. As a result, none of the occupations in the original clusters were reassigned to another group.

Table 23 presents the occupations comprising the four cluster solution. For the most part, there appears to be little similarity in the work performed in each MPA cluster. Table 24 presents the descriptive statistics for MPA scales for each of the four job clusters. The clusters can be described in terms of their most distinctive MPA factors. Cluster 1 scored highest on the Dependability, Adjustment, Cooperativeness, and Internal Control scales and lowest on the Physical Condition scale. Cluster 2 scored highest on the Achievement and Dominance scales, and relatively high on the Physical Condition scale. Cluster 3 scored lowest on the Dominance and Adjustment scales, and relatively low on the Physical Condition scale. Cluster 4 scored highest on the Physical Condition scale, and lowest on the Dependability, Cooperativeness and Internal Control scales. These distinguishing characteristics are summarized in Table 25.

Table 23:
Four occupational families based on HCA of Standardized MPA Scale

Occupational Family	CF Occupations
Cluster 1	212 Teletype Operator 291 Communicator Research 521 Integral System Technician 524 Communication/Radar System Technician 831 Administrative Clerk
Cluster 2	411 Vehicle Technician 551 Instrument Electrical Technician 711 Medical Assistant 811 Military Police 911 Supply Technician
Cluster 3	511 Aero Engine Technician 531 Safety Systems Technician 541 Photographic Technician 841 Finance Clerk 512 Airframe Technician 933 Traffic Technician 935 Mobile Support Equipment Operator
Cluster 4	021 Artilleryman 031 Infanteer 181 Boatswain 211 Radio Operator 572 Air Weapons Systems Technician

Table 24:
Descriptive statistics (Mean and SD) for the four MPA clusters on MPA scales

	Cluster 1 (N=86)	Cluster 2 (N=108)	Cluster 3 (N=90)	Cluster 4 (N=83
MPA				
Achievement	39.35 (5.19)	40.20 (4.55)	38.04 (5.03)	37.60 (5.70)
Dominance	30.01 (4.72)	30.81 (4.29)	28.18 (5.21)	30.53 (4.75)
Dependability	31.50 (3.49)	29.67 (3.72)	30.66 (4.08)	27.53 (3.99)
Adjustment	32.17 (4.18)	31.44 (4.04)	29.67 (5.34)	31.18 (4.85)
Cooperativeness	23.21 (2.57)	23.01 (2.80)	22.58 (3.03)	22.05 (3.21)
Internal Control	27.33 (4.06)	27.01 (4.35)	26.01 (4.75)	25.52 (4.68)
Physical Condition	13.44 (3.39)	15.12 (3.04)	13.91 (3.37)	16.69 (3.05)

Table 25:
Distinguishing Factors of the Four MPA Clusters

Job Cluster	High Score	Low Score
Cluster 1	Dependability Adjustment Cooperativeness Internal Control	Physical Condition
Cluster 2	Achievement Dominance Physical Condition	
Cluster 3		Dominance Adjustment Physical Condition
Cluster 4	Physical Condition	Dependability Cooperativeness Internal Control

Discriminant Analysis of MPA Job Clusters

Military Sample

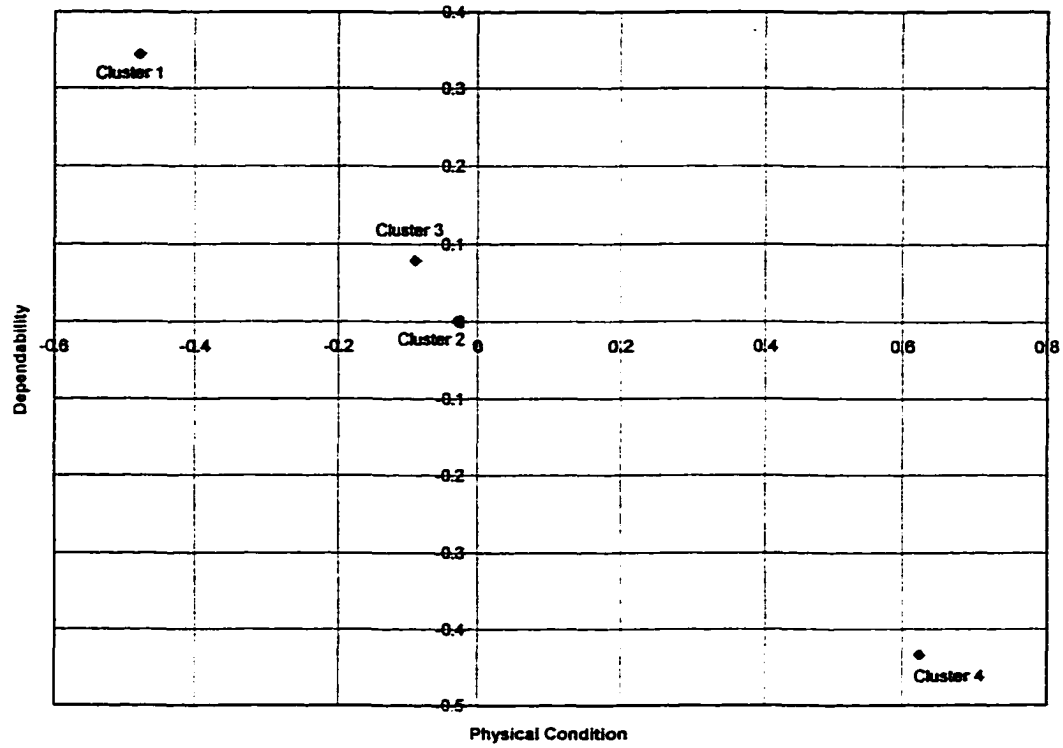
Appendix J presents the results of the stepwise discriminant analysis. The analysis produced three significant functions confirming that the composite variables differed across the four clusters. As indicated by Wilk's Lambda, Physical Condition produced the largest effect, and Internal Control produced the smallest, with the remaining five MPA subscales ranging from small to moderate. However, only three of the seven MPA subscales met the tolerance level for inclusion in the analysis. These included; Physical Condition, Dependability, and Dominance, and in that order.

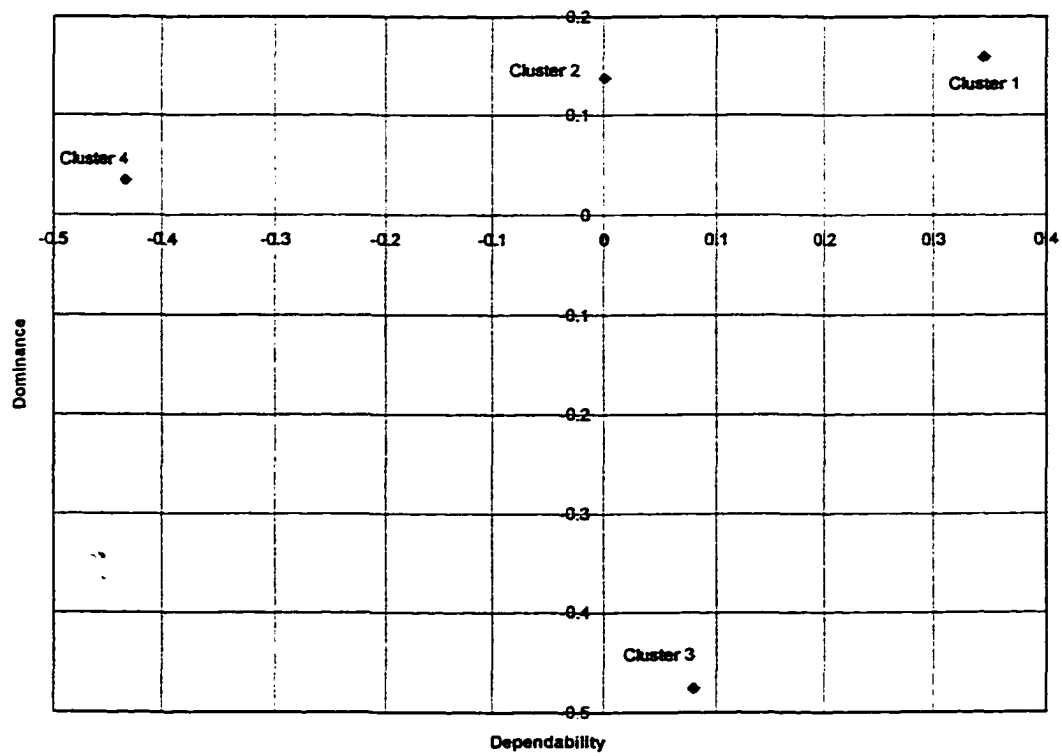
The resulting solution produced three discriminant functions accounting for 24% of the variance. Separately, the three functions accounted for 80.22%, 19,75% and .03% of the overall variance between clusters. Rotating the structure

matrix resulted in three new discriminant functions which accounted for 53.4%, 26.7% and 19.8% of the variance. As shown in the rotated structure matrix, the first function was strongly associated with Physical Condition (r=.97), the second function was associated with Dependability (r=.98) and the third function was associated with Dominance (r=99).

Figure 1 presents the plot of the centroids for each cluster on the first function contrasted with the second function, and on the second function contrasted with the third function. The first function, Physical Condition, clearly separates Clusters 4 and 1 from Clusters 2 and 3 which have no clear distinction between each other. Cluster 4 scored significantly higher on this function followed then by, in descending order, Cluster 2, Cluster 3 and then Cluster 1 which scored significantly lower than the other three clusters. There was no clear distinction between Cluster 2 and 3 on the Physical Condition function. The second function, Dependability, separates Clusters 1 and 4 from Clusters 2 and 3 which have no clear distinction between each other. Cluster 1 scored significantly higher on this function followed, in descending order, by Cluster 3, Cluster 2, and Cluster 4 which was significantly lower than the other three clusters. The third function, Dominance, separates Cluster 3 from the other three clusters. Cluster 3 scored lowest followed then by, in ascending order, Cluster 4, Cluster 2 and Cluster 1 with no clear distinction between these three on the third function.

Figure 1: Plot of Group Centroids for Discriminant Function for Military sample





The three discriminant functions correctly classified 48.39% of the individual occupations (129 out of 248) compared to 25.75% expected by chance based on cluster sizes. The rank order of classification by cluster was Cluster 1 (52.4% vs. 25% by chance), Cluster 2 (52.6% vs. 31% by chance) Cluster 3 (27.1% vs. 19% by chance) and Cluster 4 (55.9% vs. 23% by chance). Table 26 presents the classification results for the discriminant analysis.

Similar classification results followed when the three discriminant functions were used to classify individual occupations of the holdout sample, verifying the stability of the classification procedure. Overall, the three functions correctly classified 47.06% of individual occupations (48 out of 102 cases) compared to 25% expected by chance. The rank order of classification by cluster was Cluster 1 (47.8% vs. 22% by chance), Cluster 2 (56.7% vs. 29% by chance), Cluster 3 32.0% vs. 24% by chance) and Cluster 4 (50.0% vs. 23% by chance). The classification results for the holdout sample is presented in Table 27.

Table 26:
Classification Results for Discriminant Analysis of Occupations Clusters developed using MPA scales (Derivation Sample)

	Predicted Group			
Actual Group	***Cluster 1***	***Cluster 2***	***Cluster 3***	***Cluster 4***
Cluster 1	**33** **52.4%**	19 30.2%	4 6.3%	7 11.1%
Cluster 2	15 19.2%	**41** **52.6%**	8 10.3%	14 17.9%
Cluster 3	12 25.0%	13 27.1%	**13** **27.1%**	10 20.8%
Cluster 4	6 10.2%	17 28.8%	3 5.1%	**33** **55.9%**

Table 27:
Classification Results for Discriminant Analysis of Occupations Clusters developed using MPA scales (Replication Sample)

	Predicted Group			
Actual Group	***Cluster 1***	***Cluster 2***	***Cluster 3***	***Cluster 4***
Cluster 1	**11** **47.8%**	6 26.1%	4 17.4%	2 8.7%
Cluster 2	4 13.3%	**17** **56.7%**	2 6.7%	7 23.3%
Cluster 3	8 32.0%	6 24.0%	**8** **32.0%**	3 12.0%
Cluster 4	1 4.2%	10 41.7%	1 4.2%	**12** **50.0%**

The HCA raised the possibility that a three-cluster solution was viable. Therefore, discriminant analyses were repeated using the groups suggested by these solutions as the grouping variable. While the overall classification results were greater than the four-cluster solution, only cluster 1 had correct classifications, and a very large percentage of individual occupations in Clusters 2 and 3 (74.4% and 53.% respectively) were misclassified into Cluster 1, confirming the superiority of the four-cluster solution.

Student Sample

To assess the generalizability of the discriminant analysis results using CF data, the discriminant analysis was replicated on the student sample. The respondents were identified as preferring one of the four MPA developed clusters using the same procedure used to code into the ability-based job families. Descriptive statistics for the MPA scales for the four clusters are presented in Table 28.

Table 28:
Descriptive statistics (Mean and SD) for the four MPA clusters on MPA scales (Student sample)

	Cluster 1 (N=48)	Cluster 2 (N=91)	Cluster 3 (N=44)	Cluster 4 (N=55)
MPA				
Achievement	36.46 (5.66)	36.69 (5.62)	36.50 (5.75)	35.67 (6.59)
Dominance	29.48 (4.15)	29.27 (5.16)	29.89 (4.60)	30.25 (5.31)
Dependability	30.19 (3.45)	29.57 (3.82)	29.70 (4.06)	28.98 (3.77)
Adjustment	27.73 (4.97)	28.46 (4.81)	28.80 (4.98)	30.78 (5.36)
Cooperativeness	23.19 (2.75)	22.70 (3.28)	22.59 (3.19)	22.33 (3.27)
Internal Control	28.04 (3.16)	28.41 (3.41)	28.30 (3.84)	28.38 (3.20)
Physical Condition	14.40 (3.76	14.05 (3.53)	14.16 (3.23)	15.55 (3.26)

Classification results obtained with the student sample, were significantly different from those using the CF data. Overall, the discriminant functions correctly classified 36.97% of the individual occupations (88 out of 238 cases) which was slightly better than chance (27.44%). As well, only Cluster 2 had correct classifications (85.7% vs. 38% by chance); classification into Cluster 4 was lower than expected by chance (18.2% vs. 23% by chance) and no cases were correctly classified into Clusters 1 and 3. In fact, the majority of cases from Clusters 1, 3 and 4 were misclassified into Cluster 2. Table 29 reports the classification results for the discriminant analysis.

Table 29:
Classification Results for Discriminant Analysis of Occupation Clusters developed using MPA scales (Student Sample)

	Predicted Group			
Actual Group	***Cluster 1***	***Cluster 2***	***Cluster 3***	***Cluster 4***
Cluster 1	**0** **0.0%**	42 87.5%	0 0.0%	6 12.5%
Cluster 2	0 0%	**78** **85.7%**	0 0%	13 14.3%
Cluster 3	0 0%	39 88.6%	**0** **0%**	5 11.4%
Cluster 4	0 0%	45 81.8%	0 0%	**10** **18.2%**

Relationship between ability-based job families and MPA job clusters

Table 30 presents a matrix of the MPA developed job clusters and primary predictor variables versus ability-based job families and primary predictors. As indicated in the matrix, there appears to be some relationship between ability-based families and the personality-based families (Table 30). In the Military job family, coupled with Strength and Movement, Controlled Reaction and Vision as primary predictors, the MPA dimensions Dominance and Physical Condition may help predict membership in that family. There are no ability-based primary predictors for the Administrative job family, but the MPA dimensions Dependability, and Dominance may serve as predictor variables for that family. In the Technical A job family, in addition to Fine Motor Control, Analytical Ability, Cognition and Vision, membership may also be predicted using Dependability and Dominance. Membership in the Technical B job family is predicted by Strength and Movement, Controlled Reaction, Fine Motor Control, Analytical

Ability and Cognition. This may be enhanced by using the MPA dimensions Dominance and Physical Condition.

Table 30:
Matrix of MPA job clusters and primary predictors versus ability-based families and primary predictors

	Cluster 1 **Dependability** **Dominance**	**Cluster 2** **Dominance**	**Cluster 3**	**Cluster 4** **Physical** **Condition**
Military **Strength & Movement** **Controlled Reaction** **Vision**		811	935	031 021 181
Operator **Audition** **Information processing** **Vision**	291			211
Administrative	212 831	911	841 933	
Technical A **Fine Motor Control** **Analytical Ability** **Cognition** **Vision**	524 521	551	541	
Technical B **Strength & Movement** **Controlled Reaction** **Fine Motor Control** **Analytical Ability** **Cognition**		411 711	511 512 531	572

DISCUSSION

Correlation and regression analysis suggest that personality measures can be used to predict job performance across and within ability-based occupational families, but the proportion of variance in performance accounted for by personality measures was low. The MPA was not successful in predicting academic success.

Discriminant analysis suggest that personality measures may be used to predict membership in ability-based families. A comparison of personality-based job families to ability-based families suggest that personality constructs may enhance selection into ability-based families.

Test of Hypotheses

Hypothesis 1:

Hypothesis 1 states that performance will be significantly and positively related to all seven MPA personality scales across level and occupation. Four of the seven personality scales (Achievement, Dominance, Internal Control and Physical Condition) were significantly and positively related to the performance score for CF members regardless of rank or occupation. However, Internal Control and Physical Condition had a relatively low correlation with performance and accounted for virtually no variance in the performance score in the regression analysis. Additionally, the proportion of variance accounted for by all three dependent variables, while significant, was relatively low (R^2 = .09).

The results of the CF sample in terms of the Achievement are consistent with the findings of Barrick and Mount (1991) who reported that the Big Five personality factor Conscientiousness is related to performance. As reported by White and Moss (1995) the Big Five construct Conscientiousness (the degree of organization, persistence, and motivation in goal-directed behavior) is very similar to the MPA construct Achievement (the tendency to strive for excellence in the completion of work-related tasks).

It is not surprising that Dominance (the tendency to seek out and enjoy being in leadership positions) is positively related to performance within the military environment. CF members are encouraged and rewarded for being decisive and directing the activities of others. It is surprising however, that the MPA constructs Adjustment and Cooperativeness were not related to performance. Both constructs are specifically assessed on annual personnel evaluation reports. Adjustment (the tendency to maintain a positive affect and self-control even when faced with stressful circumstances) is assessed on a PER as 'Performance Under Stress'. Cooperativeness (the tendency to get along and work well with others) is assessed as 'Teamwork'.

A more accurate measure of the personality/performance relationship may be assessed by investigating the correlation between personality constructs and ratings for each area assessed by the PER. In other words, correlational analyses could be carried out between MPA constructs and PER factors such as Performance under Stress, Teamwork, Physical Fitness, Conduct, Loyalty and Dedication.

Hypothesis 2:

Hypothesis 2 states that the performance ***within*** job families will be significantly and positively correlated to all seven MPA constructs. This hypothesis was partially supported. Despite the fact that the job families are ability-based, in four job families (except Operator) MPA constructs were significantly related to performance.

In the Military job family, performance was predicted by Dominance. This finding should not be surprising. This family mainly consists of combat arms occupations which places great emphasis on a soldier's ability to lead others (Dominance). In the Administrative job family, Achievement and Dominance predicted performance with Achievement accounting for a large percent of the variance. This is consistent with the types of occupations found in this job family. Personnel in this job family generally work independently and in a supportive role. To this end, it is important for these personnel to strive for excellence in the completion of work-related tasks (Achievement), and to seek out and enjoy being in leadership positions (Dominance).

In the Technical A job family, Physical Condition predicted performance. Occupations in this family are more sedentary in nature compared to other families, and it is surprising that Physical Condition predicted performance in this family and not in the more physically active job families. In the Technical B job family, largely Achievement and to a lesser degree, Dominance predicted performance.

The insignificant results for the Operator may very well be a function of sample size. This group along with the Technical A family had relatively small numbers in comparison to the other three families. While insignificant, Dominance and Internal Control appear to be positively related to performance in the Operator family. Achievement appears to be positively related to performance in the Technical A family. However, these results must be used with caution; further studies, with greater representation from all job families must be

completed before these results should be applied to selection or classification in the CF.

These results support Tett, Jackson & Rothstein's (1991) argument that personality traits selected for use in research with performance have to be chosen on the basis of conceptual linkages with performance. In other words, it is not enough to predict performance across a variety of occupations without first conducting a job analysis to determine which personality traits are related to success in each occupation or occupation family. With this qualification, personality constructs may predict performance within certain ability-based job families.

Hypothesis 3:

Hypothesis 3 states that personality measures can be used to predict membership in the five CF entry-level job families. This hypothesis was partially supported. Dependability was the only MPA construct able to significantly differentiate the five CF job families. Approximately 12% more cases were correctly classified by this discriminant function than expected by chance, and the function accounted for 7% of the variance. The classification results were replicated with the holdout sample, confirming the stability of the predictive ability of the discriminant function.

Hypothesis 4:

Hypothesis 4 states that Personality/CF occupation linkages found in the military sample will be generalized to potential CF recruits (student sample). This hypothesis was partially supported.

Prediction of performance across job families. The results of the correlation and regression analysis using CF data were not replicated using the student sample. Surprisingly, none of the MPA personality scales were significantly related with student QPA. One would expect that, at the very least, Achievement would be related to academic performance. However, as indicated in the literature review, there is some evidence to suggest that self-report ratings of personality may have lower correlations with measures of academic achievement than personality ratings from other sources.

Prediction of performance within job families. There was no theoretical rationale for coding the student sample into CF job families to assess the relationship between personality and academic performance. Notwithstanding, due to the exploratory nature of the study, all analogues assessed with the military were replicated with the student sample.

The results of the correlation and regression analysis using CF data were not replicated using student data. While performance was predicted in three of the five families, the MPA predictors were different from those identified in the military sample. In the Military family, performance was predicted by Physical Condition such that a low score in Physical Condition resulted in high score in achievement performance, as indicated by QPA. In the Technical A and

Technical B family, performance was predicted by Internal Control and Achievement, respectively, with a high score on these scales resulting in a high QPA.

Assuming that university students represent potential CF applicants, and QPA and PER are similar performance criteria, the results of the correlation and regression analysis raise concern over the practical application of these results. Using the results of selection tests, recruiters assign NCM applicants to occupations with the goal of maximizing success in basic occupation training. Based on the results of the correlation and regression analysis, it would be difficult to predict the success in training using MPA constructs.

A limitation in using undergraduate university students to generalize results from military personnel is the difference in demographics; namely gender. Of the 330 student participants, 230 were female representing 70% of the sample. In the military sample, 236 females participated in the study accounting for 30% of the sample. While there was little practical difference between males and females on the MPA constructs, it is difficult to generalize from a population with such a difference in gender representation.

Another limitation in using the student sample is the issue of choice of occupations. Students were asked to rate the 20 CF occupations on the basis of preference. While students were coded into job families based solely on preference, military members were assigned occupations based on preference and availability at the time of enrollment. In other words, military members may be employed in occupations which may not have been their first choice, but

rather a matter of occupation availability, and therefore adversely affecting the results. This limitation may be addressed in future research by asking military members what their occupation preference was at the time of enrollment.

Prediction of membership in ability-based job families using personality measures. The classification results of the discriminant analysis using CF data were replicated with the student sample, confirming the stability of the predictive ability of the discriminant function. One discriminant function, Dependability, significantly differentiated the five CF job families. Approximately 10% more cases were correctly classified by this discriminant function than expected by chance, and the function accounted for 8% of the variance.

The method in which students were coded into families has some limitations. In several cases, students rated two families the same, suggesting that they preferred both families equally. In these cases, the students were not coded into either family, thereby not being included in the analysis. In other cases, the rating for two or more families was very similar indicating that there was no clear preference for one family. However, in these cases the students were still coded into the family with the highest preference value. This coding method omitted several cases from the analysis and may have coded students into the wrong family, thereby adversely affect the results.

Psychometric Properties of the MPA

The revised (89 item) model of the MPA is a psychometrically adequate instrument for measuring personality. The original (125 item) instrument had high

internal consistency reliability for each of the seven scales, but had several items which loaded quite low (less than .400) on their associated scales, resulting in a poor fit as indicated by the confirmatory factor analysis (LISREL). An examination of the 36 items removed from the original model suggest that they may not have been assessing their intended MPA construct. The 12 items removed from the Achievement scale dealt mostly with one's propensity to be organized. While being organized may be associated with Achievement, it does not necessarily have to be the case. The 6 items removed from the Dominance scale dealt more with one's chance for success rather than the tendency to seek out and enjoy leadership positions. The 9 items removed from the Dependability scale focused more on one's commitment to obey laws and rules. While it may be argued that Dependability is a necessary attribute to obey laws and rules, it does not follow that obedience and dependability are the same construct . The items removed from the remaining four MPA scales asked questions which didn't appear to be associated with the intended construct, and didn't seem to fit any apparent pattern.

While there were several significant statistical differences between different groups on the MPA, there were very few practical differences. In the military sample, Males and Females differed on the Dependability scale indicating that females have a greater tendency to respect and obey those in authority. French and English respondents differed on the Social Desirability scale suggesting that Francophones tend to respond in a way that will make them look good. In the student sample, Males and Females differed practically

on Adjustment and Physical Condition suggesting that males tend to have a more positive outlook on life, and seek out and enjoy physically demanding activities. The military and student sample differed practically on the Social Desirability scale with military personnel tending to response in a way that will make them look good.

While the MPA is a psychometrically adequate instrument for measuring personality, inventories based on the Big Five personality model may be as good or better in predicting performance. Confirmatory Factor Analysis of the NEO-PI using bipolar scales developed by Goldberg (1990) reported that the five factor model was a good fit for a data set of 423 flight attendant trainees (GFI=.91, RMSR=.05) (Cellar, Doverspike, Miller & Klawsky, 1996).

Discriminant Analysis

The MPA can be used to meaningfully describe military occupations. The discriminant analysis of the five CF job families using the MPA scales suggested that one MPA construct, Dependability, discriminated among the families, accounting for 7% of the variance. The classification results were fairly impressive when considering their consistency with both the replication and student sample.

The results from the student sample was especially impressive in that they provide a good estimate of the expected classification success in any new sample. However, compared to the military sample which were represented by 60 entry-level occupations, the student sample was asked to rate only 20

occupations which were then coded into job families. A more thorough method would have been to ask students to rate each of the 71 entry-level occupations in order of preference which then would be coded into families.

While family membership prediction was better than chance (36% vs. 24% expected by chance), the results suggest that the MPA would not be a useful tool as a primary predictor of ability-based family membership. Notwithstanding, if used for practical application for classification of personnel into the five CF job families, it could serve as a triadic choice, with assignment to either high (Technical A and Administrative family), medium (Operator and Technical B) and low (Military) Dependability score occupations.

While there was one significant discriminant function in this analysis, a more appropriate analysis may be to investigate the relationship between rank level and MPA constructs. As indicated in the descriptive statistics analyses, there were some differences between junior officers and junior NCMs on MPA scales. A discriminant analysis using rank level as the grouping variable could be carried out to assess the predictive usefulness of personality constructs at various rank levels.

A limitation of this discriminant analysis was the relatively small and disproportionate numbers represented in some job families. In the military sample two job families had relatively low numbers (Operator = 43, & Technical A = 43), compared to three larger families (Military=110, Administrative=139 and Technical B=128). The unequal group sizes could probably contribute to unstable results.

Cluster Analysis

The HCA of the mean standardized MPA profiles produced a four-cluster solution that was both interpretable and meaningful. Discriminant analysis recovered group membership of individual occupations above what could be expected by chance. The four-cluster solution was more valid than the three-cluster solution.

The discriminant analysis suggested that three MPA constructs loading on three functions discriminated between the clusters, accounting for 24% of the variance in the data set. These functions presented in order of extraction were; 1) Physical Condition, and 2) Dependability and 3) Dominance.

The three discriminant functions correctly classified 48.39% of the individual occupations compared to 25.75% expected by chance, and suggested predictor variables for all three clusters. Cluster 1 scored low on the Physical Condition function and high on the Dependability function. Cluster 1 is comprised of occupations which are supportive in nature and, generally speaking, work in a relatively sedentary work environment. This may account for the low score on the Physical Condition function. Personnel is these occupations often work independently which may account for the high score in Dependability.

Cluster 2 scored high on the Dominance function. This cluster is comprised of a variety of types of occupations which include Vehicle Technician, Medical Assistant, Military Police and Instrument Electrical Technician. While there is no clear pattern of the types of jobs performed by occupations in this cluster, the high Dominance score may be accounted for by the requirement by

some of these occupations to be in positions of leadership and have influence over others.

Cluster 3 scored low on the Dominance function. There appears to be no apparent justification for the low score on this function for this cluster. Occupations in this cluster include, the more physically active aircraft technician such as Airframe Technician and Aero-Engine Technician, Mobile Support Equipment Driver, Finance Clerk and Photo Technician. It would seem that very few of these occupations would be less dominant than other CF occupations.

Cluster 4 scored high on Physical Condition and low on Dependability. This cluster is comprised of the more physically active occupations such as, Infantry, Artillery and Boatswain which explains the high score of the Physical Condition function. However, the low score on the Dependability is surprising in that the occupations, generally speaking, are the front line soldiers, who place great emphasis on discipline, obedience and respect for authority.

The discriminant analysis was least successful in classifying occupations in the student sample. Most occupations in Clusters 1, 3 and 4 were misclassified into Cluster 2. Cluster 2 had the largest number of cases (91) compared to the other clusters which may account for some of the misclassifications.

A limitation of the HCA was the small number of occupations used in the analysis and the small number of members represented in some occupations. Of the 60 occupations represented in the study, only 22 had more than 5 cases, and therefore could be used in the cluster analysis. Of the 22 occupations used

in the analysis, the number of cases per occupations ranged from 6 to 49 with the mean being approximately 20. Such low numbers could result in unstable results. The Catano & Ibel (1995) cluster analysis was based on a solid representative sample of occupation members, and results of that study can be interpreted with a good degree of confidence. In the case on this analysis, further studies comprising of a more representative sample of occupation members is needed before MPA job clusters can be used for practical purposes.

While it may be possible to use these functions in the classification of military personnel, further studies are required before any practical application can take place. More specifically, cluster and discriminant analyses using a more representative sample and equal group sizes are required before the results of this analysis may be put to practical use.

Relationship Between ability-based job families and MPA job clusters

An examination of the matrix of ability-based job families versus MPA occupation clusters suggest that there is a relationship between ability-based families and the personality-based families. In addition to the ability-based variables identified as primary predictors for the job families, there may be some added value in using MPA dimensions as well. Dominance and Physical Condition may help predict membership in the military job family. Dependability, and Dominance may serve as predictor variables for the Administrative and Technical A job families, and Dominance and Physical Condition may help predict membership in the Technical B job family.

While encouraging, these results are preliminary and extremely limited in any practical use. They are based on MPA job clusters using only 22 of the possible 71 entry-level occupations. Further studies with a more representative sample of occupations are required before these results can be put to any practical use.

Conclusion

The present study has found the revised, 89 item, MPA to be a psychometrically adequate instrument for the measurement of occupational personality constructs. Using this instrument has provided support for the argument that it is possible to use personality measures to predict work performance in military occupations, and also to predict aspects of personality types in occupational families based on abilities.

The results of the study suggest that personality measures may enhance the current CF personnel selection system. However, at present it may be difficult to legally defend personnel selection decisions based on results from occupation personality inventories. A more acceptable approach may be to use inventories designed to capture human attributes such as personality and interests to classify personnel into occupations once they meet minimum cognitive ability cut-off scores. This could be accomplished by providing a list of occupations for which applicants qualify based on cognitive ability test results. Personality and Interest inventory results can then be used as a career counseling tool in the assignment of the occupation.

Recommendations

While there may be some usefulness in incorporating personality measures in the classification of military personnel, more research is required before the practical application of personality measures in personnel selection is viable. As such, the following recommendations are made for future research:

1. Similar research studies using significantly larger numbers of participants are required in order to verify the stability of research findings;
2. Other personality measures such as the NEO-PI should be used in conjunction with the MPA in future studies to compare the validity of the personality instruments;
3. Actual performance data (most recent PER score), rather than self-report measures be used as performance criteria. Self-report measures tend to be skewed in favor of positive performance.
4. Incremental validity studies using several predictors of performance such as cognitive ability and aptitude tests, personality measures and interest inventories be carried out to determine the usefulness of using tests to measure human attributes over and above that already established by cognitive ability tests.

REFERENCES

Barrick, M. R. & Mount, M. K. (1991). The Big Five personality dimensions and job performance: A meta-analysis. Personnel Psychology, 44, 1-25.

Barrick, M. R. & Mount M. K. (1993). Autonomy as a predictor of the relationships between the Big Five personality dimensions and job performance. Journal of Applied Psychology. 78 (1), 111-118.

Batemn, T. S., & Crant, J.M., (1993). The proactive component or organizational behaviour: A measure and correlates. Journal of Organizational Behavior, 14, 103-118.

Blashfield, R.K. (1976) Mixture model tests of cluster analysis: Accuracy of four Agglomerative Hierarchical Methods. Psychological Bulletin 83 (3), 377-388.

Campbell, J.P. (1990) An Overview: The Army Selection and Classification Project (Project A). Personnel Psychology, 43, 231-241.

Canadian Forces Administrative Order 26-15 (1986). Performance Evaluation Reports - Other Ranks of the Regular Force and of the Reserve Force on Class "C" Service. : 1605-26-15 (DPCAOR).

Catano, V.M. (1995) Describing the primary abilities associated with five clusters of entry-level military occupations. Technical Supplement 95-4 Willowdale, Ontario: Canadian Forces Personnel Applied Research Unit.

Catano, V.M. & Ibel R.H. (1995) Clustering Canadian Forces military occupations using statistical analyses of ability profiles. Technical Note 6/95 Willowdale, Ontario: Canadian Forces Personnel Applied Research Unit.

Cellar, D.F., Doverspike, D.D., Miller, M.L. & Klawsky, J.D. (1996) Comparison of factor structures and criterion-related validity coefficients for two measures of personality based on the five factor model. Journal of Applied Psychology, 81(6), 694-704.

Colihan, J., & Burger, G.K. (1995) Constructing job families: An analysis of quantitative techniques used for grouping jobs. Personnel Psychology, 48, 563-586.

Costa. P. T. & McCrae, R. R. (1988). From catalog to classification: Murray's needs and the Five-Factor model. Journal of Personality and Social Psychology, 55 (2) 258-265.

Day, A.L, Methot, L.L., & Stinson, V. (1997) Linking ABLE/AIM to Theory. Technical Report 97/? Ottawa, Ontario: Canadian Forces Personnel Research Team.

Garwood, M.K., Anderson, L.E., & Greenhart, B.J. (1991) Determining job groups: Application of hierarchical agglomerative cluster analysis in different job analysis situations. Personnel Psychology, 44, 743-762.

Goldberg, L. R. (1993). The structure of phenotypic personality traits. American Psychologist, 48 (1), 26-34.

Guion, R. & Gottier, R. F. (1965). Validity of personality measures in personnel selection. Personnel Psychology, 18 (2), 135-164.

Halliwell, S.T & Spinner, B. (1991). Future directions for Non-Commissioned Members (NCM) selection and classification. Technical Note 14/91. Willowdale, Ontario, Canadian Forces Personnel Applied Research Unit.

Harvey, R.J. (1986) Quantitative Approaches to job classification: A review and critique. Personnel Psychology, 39, 267-289.

Hough, L. M. (1992). The "Big Five" personality variables - construct confusion: description versus prediction. Human Performance, 5, 139-155.

Hough, L.M., Dunnette, M.D., Eaton, N.K., Kamp, J.D., & McCloy, R.A., (1990). Criterion-related validities of Personality constructs and the effect of response distortion on those validities. Journal of Applied Psychology, 75 (5), 581-595.

Irving, P. G. (1993). On the use of personality measures in personnel selection. Canadian Psychology, 34 (2), 208-214.

Joreskog, K. & Sorbom, D. (1989) LISREL 7: A Guide to the Program and Application 2nd Edition. SPSS Inc.: Chicago, Illinois.

Lissitz, R.W., Mendoza, J.L., Huberty, C.J. & Markos, H.V. (1979) Some further ideas on a methodology for determining job similarities/differences. Personnel Psychology, 32, 517-527.

MacLennan, R.N. (1996) Discriminant analysis of military occupational families. Technical Note !!/96. Ottawa, Ontario: Canadian Forces Personnel Research Team.

McCormick, E.J., Jeanneret, P.R., & Mecham, R.C., (1972) A study of job characteristics and job dimensions as based on the position analysis questionnaire (PAQ), Journal of Applied Psychology, 56(4), 347-368.

McCrae, R. R. & Costa, P. T. (1987). Validation of the Five-Factor model of personality across instruments and observers. Journal of Personality and Social Psychology, 52 (1), 81-90.

Mobley, W. H. & Ramsay, R. S. (1973) Hierarchical clustering on the basis of inter-job similarity as a tool in validity generalization. Personnel Psychology, 26, 213-225.

Mount, M. K. Barrick, M. R. & Strauss, J. P. (1994). Validity of observer ratings of the Big Five personality factors. Journal of Applied Psychology, 79 (2), 272-280.

Ones, D. S. Mount, M. K. Barrick, M. R. , & Hunter, J. E. (1994). Personality and job performance: A critiques of the Tett, Jackson, and Rothstein (1991) meta-analysis. Personnel Psychology, 47, 147-156.

Pedhazur, E. & Pedhazur Schmelkin, L. (1991). Measurement, Design, and Analysis. Lawrence Erlbaum Associates: Hillsdale, New Jersey.

Reynolds, D.H., Laabs, G.J. & Harris, D.A. (1996) Occupational Genealogies: Using job family characteristics in Personnel Research. Military Psychology, 8(3), 195-217.

Schmit, M. J. & Ryan, A. M. (1993). The big five in personnel selection: Factor structure in applicant and non-applicant populations. Journal of Applied Psychology, 78 (6), 966-974.

Smith, G. (1967) Usefulness of peer ratings of personality in educational research. Educational and Psychological Measurement. 27, 967-984.

SPSS, Inc. (1994) SPSS Professional Statistics 6.1. Chicago, IL: SPSS inc.

Tabachnick, B.G. & Fidell, L.S. (1989). Using Multivariate Statistics. 2nd Edition. New York: HarperCollins Publishers.

Tett, R. P., Jackson, D. N. & Rothstein, N. (1991). Personality measures as predictors of job performance: A meta-analytic review. Personnel Psychology, 44, 703-742.

Tett, R. P., Jackson, D. N. Rothstein, M. & Reddon, J. R. (1994). Meta-analysis of personality-job performance relations: A reply to Ones, Mount, Barrick, and Hunter (1994). Personnel Psychology, 47, 157-172.

White, L. A., & Moss, M.C., (1995) Factors influencing concurrent versus predictive validities of personality constructs. Presentation at May 1995 meeting of the Society of Industrial and Organizational Psychology. Orlando Fl.

White, L. A., Nord, R.D., Mael, F.A., & Young, M.C. (1993) The Assessment of Background and Life Experiences (ABLE). Chapter 4: Adaptability Screening for the Armed Forces. Washington, DC: Office of Assistant Secretary of Defence (Force Management and Personnel).

Appendix A

Canadian Forces Occupational Families Based on Hierarchical Cluster Analysis of Standardized Occupation Ability Profiles (Catano & Ibel, 1995)

Group 1: Military	**Group 2: Operator**
Crewman 011 Artilleryman 021 Artilleryman Air Defence 022 Infantryman 031 Field Engineer 041 Lineman 052 Boatswain 181 Fire Fighter 651 Military Police 811 Mobile Support Equipment-Operator 935	Meteorological Technician (Tech) 121 Air Traffic Controller 161 Air Defence Tech 171 Oceanographic Operator 191 Radio Operator 211 Naval Signalman 262 Naval Acoustics Operator 273 Naval Radio Operator 274 Naval Combat Information Operator 275 Naval Electronic Sensor Operator 276 Naval Electronics Tech (Acoustics) 283 Naval Electronics Tech (Communications) 284 Naval Electronics Tech (Tactics) 285 Communication Research 291
Group 3: Administrative	**Group 4: Technical A**
Teletype Operator 212 Administrative Clerk 831 Finance Clerk 841 Steward 862 Postal Clerk 881 Supply Tech 911 Traffic Tech 933	Radio Tech 221 Terminal Equipment Tech 222 Teletype and Cipher Tech 223 Radar Tech 231 Integral Systems Tech 521 Communication and Radar Systems Tech 524 Photographic Tech 541 Instrument Electrical Tech 551 Construction Engineering Tech 611 Dental Clinic Assistant 722
Group 5:	**Technical B**
Naval Weapons Tech 065 Marine Engineering Mechanic 312 Hull Tech 321 Marine Electrician 332 Vehicle Tech 411 Weapons Tech (Land) 421 Electro-Mechanical Tech 431 Material Tech 441 Aero Engine Tech 511 Airframe Tech 512 Safety Systems Tech 531 Metals Tech 561 Machinist 562	Refinisher Tech 563 Air Weapons System Tech 572 Structures Tech 612 Plumber Gas Fitter 613 Electrician 614 Refrigeration and Mechanical Tech 621 Electrical Generating Systems Tech 622 Stationary Engineer 623 Water, Sanitation and POL Tech 624 Medical Assistant 711 Cook 861 Ammunition Tech 921

Appendix B

Personality and Performance Study

Dear Respondent

The purpose of this study is to examine the effects that personality has on performance. Your performance will be measured in terms of your QPA in December 97.

Your participation in this study is greatly appreciated. The session will take approximately 2 hours and you are free to leave at any time. In exchange for your participation in this study, you will receive credit towards your final grade in your respective Psychology course. Additionally, if you wish, you will receive the results of the personality measure.

Please write your student number where indicated. Your student number will be used solely to match your QPA with the results of your personality questionnaire in order to measure the relationship between personality and performance. **Your identification number will NOT be used for any other purpose.**

Furthermore, all completed questionnaires are confidential.

Please read all of the items carefully and follow all directions. Although completion of the questionnaires is voluntary, your responses are valuable to this study. Even though some questions may look repetitive, it is important to answer **all** questions so that there is a reliable assessment of your responses.

If you wish to participate in this study, please fill out the attached Consent Form. Also, please ensure that you put your student identification number where indicated. **Please do not write on the questionnaires themselves**.

This study has received ethics approval through the Department of Psychology Ethics Committee at Saint Mary's University. You may contact the chair of this committee, Dr. Methot, at 420-5860, or my Thesis Advisor, Dr. Catano at 420-5845 if you have any questions or concerns about this study.

Thank you very much for your assistance in this study.

Sincerely,

Damian O'Keefe

Personality and Performance Study Consent Form

Name:_____

Student Number:_____

I would like to receive the results of the personality questionnaire: **Yes / No**

Under the guidance of Dr. Catano, Chair of Psychology Department, I give Damian O'Keefe permission to obtain my QPA score for December 97.

_____

Signature

I expect my Christmas QPA score to be: (Please circle one)

A **B** **C** **D** **F**

Appendix C

Occupation Preference Questionnaire

On the following pages you will see a list of 20 Canadian Forces occupations. Please read the descriptions for each occupation and then rank each occupation according to the following ranking scale:

1. I would dislike this job very much
2. I would dislike this job somewhat
3. I would neither like nor dislike this job
4. I would like this job somewhat
5. I would like this job very much

Try to consider only the jobs as they are described. Try not to consider such things as your attitude toward military organizations or actual interest in, or qualifications for employment by the Canadian Forces.

Student Number:_____

Infanteer:
Duties:

- Use weapons such as rifle and pistol
- Use explosives and pyrotechnics
- Use mortars, machine guns, anti-tank weapons, missiles and grenades
- Use communication, navigation and riot control equipment
- Inspect and maintain weapon systems, vehicles and equipment
- Participate in airborne operations
- Operate with support elements such as fighter aircraft, helicopters and artillery
- Unarmed combat
- Fieldcraft and battle procedures including camouflage and concealment, internal security, patrol, escape and evasion tactics.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Field Engineer:
Duties:

- Construct accommodations in the field
- Construct runways
- Construct and maintain roads, airfields, heliports, bridges, causeways and rafts
- Construct and maintain buildings for the protection of personnel, equipment, aircraft and vehicles
- Construct field defenses and obstacles
- Provide drinking water by testing, purification, filtration and construction of local distribution systems
- Detect and dispose of land mines, booby traps and bulk explosives
- Deny enemy mobility on the battlefield by demolishing roads and bridges, and laying minefields and booby traps
- Demolish enemy roads, airfields and buildings
- Maintain engineering equipment, weapons, vehicles and supplies
- Provide engineer communications on the battlefield
- Fight if necessary to protect themselves, or in an infantry defensive role in land battles

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Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Lineman:
Duties:

- Operate construction vehicles and specialized plant equipment including backhoe, trencher, pole and cable trailers
- Operate commercial and military vehicles in operational and non-operational environments
- Construct, inspect and test overhead, underground and underwater communications wire and cable plants at both permanent and land operation locations
- Operate and perform user maintenance on tools of the trade such as power saws, jack hammers, compressors and cable pressurization equipment
- Supervise, install and connect terminal and field telephone equipment to telephone lines, radio relay and line transmission equipment
- Acquire and apply the knowledge and skills required to function as a combat soldier, including the use of personal weapons, reconnaissance and tactics.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Boatswain:
Duties:

- Operate and maintain shipboard equipment associated with cargo handling, and internship transfer of personnel, fuel and material at sea
- Operate and maintain ships' anchor and cable equipment including that used in towing, launch and recovery of ships' boats and rescue operations
- Operate and navigate small craft including ships' rigging ropework and life saving equipment
- Organize and conduct activities associated with storage, training and use of small arms, demolitions and ammunition
- Plan, organize, and conduct drill and ceremonies such as ceremonial salutes, honor guards and burials at sea
- Assist and supervise deck crews in cleaning, preserving and painting the ship and its equipment
- Operate a variety of the occupation-associated equipment such as outboard motors, sewing machines (to repair canvas) and fork lifts and cranes on replenishment ships
- Co-ordinate watchkeeping duties at sea and in harbour
- Organize internal security and boarding parties as required.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Meteorological Technician:
Duties:

- Observe, record and encode weather conditions including upperwind, sea surface and ice conditions
- Process, analyze and interpret meteorological information
- Plot meteorological charts and diagrams
- Operate and maintain specialized meteorological instruments and equipment
- Brief pilots, Ships' officers and commanders on weather conditions
- Assist a ship's navigator in navigational chart work
- Provide wind and weather data to artillery regiments
- Plot and present data concerning the physics and chemistry of sea water for marine operations.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Oceanographic Operator:
Duties:

- Start, stop and adjust oceanographic equipment in order to obtain the best displays of oceanographic data
- Operate data transmission systems
- Identify significant features of displayed oceanographic data
- Prepare and maintain visual displays of analyzed data using status boards, charts and watchkeeping records
- Convert analyzed data into comprehensive reports

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Radio Operator:
Duties:

- Send and receive voice, Morse code and teletype messages
- Use tactical and authentication codes and operate cryptographic equipment
- Operate mobile radio stations
- Site, erect and maintain portable antennae
- Operate power generators and battery charging equipment
- Perform preventive maintenance routines and serviceability checks on all equipment associated with the trade
- Drive communications vehicles
- Maintain message centre files and operating logs
- Use and update communications publications including classified material
- May perform as a combat soldier in land operations.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Communicator Research:
Duties:

- Collect, process, report and disseminate signals throughout the radio frequency spectrum
- Prepare, transmit, receive, relay and process teleprinter message traffic
- Operate receivers, computers, tape recorders, antennae switches, video display units, coding and direction finding equipment
- Analyze and report data on foreign communications systems
- Receive Morse code, voice teletype an data transmissions
- Apply knowledge of security and communications procedures
- Support national and international search and rescue agencies
- Use and maintain detailed records and publications.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Administrative Clerk:
Duties:

- Draft, type and proof-read correspondence, documentation and records
- Operate typewriters, calculators, photocopiers, word processors and office computers
- Maintain centralized filing systems
- Receive, distribute, dispatch and control correspondence and other mail
- Amend and control publications
- Maintain personnel records; organize, receive and dispatch service documents and prepare inputs for the computerized Personnel Management Information System
- Interpret military regulations and orders
- Advise personnel on administrative procedures and assist with the completion or required documentation.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Supply Technician:
Duties:

- Receive, handle and prepare items for shipment
- Operate military vehicles and material handling equipment such as forklifts
- Prepare invoices and shipping documents
- Order material from internal and external sources and purchase supplies (by cash or contract)
- Deliver supplies to operational units
- Perform stock record keeping, stocktaking and inventory control
- Maintain accounting and financial records.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Steward:
Duties:

- Manage military accommodations including room allocation, reception, furnishings, key control, cleaning and maintenance
- Operate military clubs (known as Messes), including allocation and control of facilities, mess fund accounting, bar management and supervision of staff
- Operate and manage military retail outlets such as Canadian Forces Exchanges, supermarkets, snack bars, gas service stations and vending operations
- Prepare light meals, snacks and hors-d'oeuvres
- Serve food and alcoholic and non-alcoholic beverages on formal and informal occasions at sea and ashore and on board military aircraft, including VIP flights
- Maintain records, financial accounts, and filing systems relating to public and non-public fund activities.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Traffic Technician:
Duties:

- Prepare, load, secure and off-load baggage, cargo and freight from road, rail, air or water transport vehicles
- Plan and arrange movements of personnel, furniture and effect, material and equipment, by military and commercial means
- Liaise with commercial moving, storage and transportation firms
- Prepare, process, record and account for all transportation documents and forms relating to personnel and material movements
- Process passengers for travel at a military air terminal and coordinate movement of passengers through commercial terminals
- Act as member of an Air Movements Team
- Operate military cargo and passenger vehicles and material handling equipment
- Maintain financial records.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Avionics Systems Technician:
Duties:

- Carry out performance tests, preventive/corrective maintenance and calibration of aircraft communication, acoustic sensing, intercom, search radar, fire control radar, infra-red radar, electronic warfare, navigation, compass and flight control systems and their components
- Set up and operate test equipment to maintain the above mentioned systems
- Operate and maintain computer controlled automatic test stations
- Serve as an instructor in field technical training units, training squadrons or basic training units
- Prepare and maintain aircraft forms and statistical data
- Operate aircraft support equipment
- Perform first line service tasks such as marshaling, parking, towing, starting, refueling, cleaning and de-icing aircraft.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Photographic Technician:
Duties:

- Operate photographic, video and other imaging equipment
- Print and process photographic material using manual and automated printing and processing equipment
- Monitor and maintain the processing of monochrome and color films and papers
- Perform preventative and corrective electrical, electronic and mechanical maintenance, modifications and repairs of photographic, video and other imaging equipment
- Test and evaluate photographic and video equipment, materials, techniques and processes.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Dental Clinical Assistant:
Duties:

- Produce intra-oral radiographs (X-rays)
- Prepare and apply rubber dams and carry out other chairside duties
- Perform dental laboratory procedures at the clinical levels
- Assist in or carry out preventive dentistry procedures
- Maintain, replenish and account for general and technical dental supplies
- Initiate, maintain, distribute and dispose of dental records, documents, reports and returns
- Carry out preventive maintenance on instrument and equipment used in dentistry
- Instruct Canadian Forces personnel, and in some instances their dependents, in preventive dentistry measures.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Radar Technician:
Duties:

- Perform preventive and corrective maintenance on all types of radars, data processors and computers
- Perform overhaul and support maintenance on all systems associated with the occupation
- Perform inspections and performance tests on the equipment used in Long Range Radar and Navigation Aids roles
- Perform installation and acceptance tests
- Maintain liaison with command, region and other on-base sections
- Maintain and advise other occupations on the maintenance of the electromechanical and refrigeration positions of radar systems.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Hull Technician:
Duties:

- Maintain air conditioning and ventilation systems
- Test, maintain and repair ships' structure and hull fittings
- Maintain, repair and install ships' boats and liferafts
- Perform arc and oxyacetylene welding
- Perform carpentry and painting to maintain and repair ship fittings
- Operate and maintain fire-fighting and damage repair equipment
- Read and interpret sketches, engineering and mechanical drawings
- Maintain and repair ships' piping systems, pumping and flooding systems, steam heating and de-icing equipment.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Weapons Technician (Land):
Duties:

- Inspect, repair and modify all army weapons and associated equipment
- Operate general and special tools and test equipment
- Test and fire weapons
- Operate military vehicles
- Locate, diagnose, analyze and repair faults on weapons
- Maintain specialized equipment such as potable field kitchens, mobile laundry and shower units, security cabinets and miscellaneous equipment

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Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Aviation Systems Technician:
Duties:

- Test aviation systems
- Inspect aviation systems for defects
- Fix defects in aviation systems
- Perform quality assurance checks
- Prepare and maintain aircraft forms and statistical data
- Perform aircraft handling task which include parking, towing, marshaling, starting, refueling, cleaning and de-icing
- Operate aircraft support equipment.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Medical Assistant:
Duties:

- Care for medical and surgical patients
- Provide first aid and initial treatment to injured patients
- Transport and shelter the sick and injured
- Assist with the rescue of personnel from disabled or crashed vehicles, tanks, ships, aircraft and demolished structures
- Advise on disease prevention
- Collect specimens and carry out some laboratory procedures
- Operate and perform maintenance on medical/health/life support equipment
- Maintain, replenish and account for general and medical supplies
- Initiate, maintain, distribute and dispose of medical records, documents, reports and returns.

Please choose the statement that best describes your feelings about this occupation; *(Please Circle only one number)*

1. **I would dislike this job very much**
2. **I would dislike this job somewhat**
3. **I would neither like nor dislike this job**
4. **I would like this job somewhat**
5. **I would like this job very much**

Appendix D

Results of Measures of Personal Attributes Questionnaire

The following page contains the results of the Personal Attributes questionnaire you recently completed as part of a study on Personality and Performance. A description of each scale is provided on page 3.

The results are presented using a Stanine scale. A Stanine score of '5' represents the mid-range of that specific temperament scale. Stanine scores below '5' represent scores below the mid-range score and scores above '5' represent scores above the mid-range.

Your scores are reported in comparison with the average scores obtained from a survey carried out in 1996, of Canadian Forces (CF) personnel. The mean score for the CF personnel is highlighted in black. Your score is indicated by an 'X'

Please note, that the questionnaire is a relatively new instrument and normative scores are still being established. In other words, your scores have been compared with Canadian Forces personnel and may not be indicative of the whole population.

If you have any questions or concerns, please come and see me at Rm MM309G. Thank you once again for your participation.

Damian O'Keefe

Measures of Personal Attributes Scales

	S	T	A	N	I	N	E	
MPA Scale	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Achievement					■				
Dominance					■				
Dependability					■				
Adjustment					■				
Cooperativeness				■					
Internal Control			■						
Physical Condition				■					

The following is a description of each Personal Attribute Scale:

Achievement: The tendency to strive for excellence in the completion of work-related tasks. Persons high on this construct enjoy challenging activities, and set high standards of performance for themselves. They consistently work very hard to meet these high standards.

Dominance: The tendency to seek out and enjoy being in leadership positions. Persons high on this construct are confident of their abilities, speak up when they have something to contribute, and succeed in persuading others. They feel comfortable directing the activities of other people, and are looked up to when decisions have to be made.

Dependability: The tendency to respect and obey rules, regulations, and authority figures. Persons high on this construct stay out of trouble, avoid physical violence, and like to plan ahead for their future.

Adjustment: The tendency to have a uniformly positive affect. Persons high on this construct maintain a positive outlook on life, are free of excessive fears and worries, and have a feeling of self-control. They maintain their positive affect and self-control even when faced with stressful circumstances.

Cooperativeness: The tendency to interact with others in a pleasant manner. Persons high on this construct get along and work well with others. They show kindness, while avoiding arguments and negative emotional outbursts directed at others.

Internal Control: The tendency to believe that positive life outcomes are under an individual's control; as opposed to simply happening by chance. Person's high on this construct believe that any person's success is largely a result of his/her initiative and effort. These individual's also have great respect for authority and discipline.

Physical Condition: The tendency to seek out and participate in physically demanding activities. Persons high on this construct routinely participate in vigorous sports or exercise and enjoy doing hard physical work.

Appendix E

MPA Confirmatory Factor Loadings for 125 item MPA

	ACH	DOM	DEP	ADJ	COOP	IC	PC	SD
R5	.443	.000	.000	.000	.000	.000	.000	.000
R9	.313	.000	.000	.000	.000	.000	.000	.000
R12	.290	.000	.000	.000	.000	.000	.000	.000
R21	.491	.000	.000	.000	.000	.000	.000	.000
R25	.584	.000	.000	.000	.000	.000	.000	.000
R26	.398	.000	.000	.000	.000	.000	.000	.000
R27	.290	.000	.000	.000	.000	.000	.000	.000
M39	.434	.000	.000	.000	.000	.000	.000	.000
R41	.454	.000	.000	.000	.000	.000	.000	.000
R42	.378	.000	.000	.000	.000	.000	.000	.000
R51	.643	.000	.000	.000	.000	.000	.000	.000
R63	.438	.000	.000	.000	.000	.000	.000	.000
R70	.374	.000	.000	.000	.000	.000	.000	.000
R72	.469	.000	.000	.000	.000	.000	.000	.000
R73	.585	.000	.000	.000	.000	.000	.000	.000
R78	.347	.000	.000	.000	.000	.000	.000	.000
R87	.377	.000	.000	.000	.000	.000	.000	.000
R89	.331	.000	.000	.000	.000	.000	.000	.000
R90	.450	.000	.000	.000	.000	.000	.000	.000
R97	.391	.000	.000	.000	.000	.000	.000	.000
R100	.307	.000	.000	.000	.000	.000	.000	.000
R101	.563	.000	.000	.000	.000	.000	.000	.000
R107	.542	.000	.000	.000	.000	.000	.000	.000
R109	.662	.000	.000	.000	.000	.000	.000	.000
R121	.458	.000	.000	.000	.000	.000	.000	.000
R123	.609	.000	.000	.000	.000	.000	.000	.000
R124	.446	.000	.000	.000	.000	.000	.000	.000
R133	.299	.000	.000	.000	.000	.000	.000	.000
R1	.000	.652	.000	.000	.000	.000	.000	.000
R2	.000	.452	.000	.000	.000	.000	.000	.000
R10	.000	.344	.000	.000	.000	.000	.000	.000
R18	.000	.527	.000	.000	.000	.000	.000	.000
R19	.000	.416	.000	.000	.000	.000	.000	.000
M22	.000	.483	.000	.000	.000	.000	.000	.000
R35	.000	.651	.000	.000	.000	.000	.000	.000
R37	.000	.597	.000	.000	.000	.000	.000	.000
R43	.000	.402	.000	.000	.000	.000	.000	.000
R50	.000	.623	.000	.000	.000	.000	.000	.000
R55	.000	.565	.000	.000	.000	.000	.000	.000

R60	.000	.295	.000	.000	.000	.000	.000	.000
M61	.000	.564	.000	.000	.000	.000	.000	.000
R75	.000	.530	.000	.000	.000	.000	.000	.000
R93	.000	.332	.000	.000	.000	.000	.000	.000
R96	.000	.368	.000	.000	.000	.000	.000	.000
R112	.000	.341	.000	.000	.000	.000	.000	.000
R113	.000	.371	.000	.000	.000	.000	.000	.000
R129	.000	.539	.000	.000	.000	.000	.000	.000
M7	.000	.000	.619	.000	.000	.000	.000	.000
M15	.000	.000	.381	.000	.000	.000	.000	.000
M36	.000	.000	.298	.000	.000	.000	.000	.000
M49	.000	.000	.604	.000	.000	.000	.000	.000
M53	.000	.000	.295	.000	.000	.000	.000	.000
M74	.000	.000	.567	.000	.000	.000	.000	.000
M77	.000	.000	.407	.000	.000	.000	.000	.000
M80	.000	.000	.404	.000	.000	.000	.000	.000
M98	.000	.000	.511	.000	.000	.000	.000	.000
R99	.000	.000	.455	.000	.000	.000	.000	.000
R104	.000	.000	.349	.000	.000	.000	.000	.000
M105	.000	.000	.411	.000	.000	.000	.000	.000
R110	.000	.000	.342	.000	.000	.000	.000	.000
M111	.000	.000	.149	.000	.000	.000	.000	.000
M114	.000	.000	.484	.000	.000	.000	.000	.000
M116	.000	.000	.514	.000	.000	.000	.000	.000
M119	.000	.000	.553	.000	.000	.000	.000	.000
M120	.000	.000	.344	.000	.000	.000	.000	.000
M127	.000	.000	.414	.000	.000	.000	.000	.000
M128	.000	.000	.388	.000	.000	.000	.000	.000
M130	.000	.000	.316	.000	.000	.000	.000	.000
M13	.000	.000	.000	.380	.000	.000	.000	.000
M14	.000	.000	.000	.515	.000	.000	.000	.000
M16	.000	.000	.000	.588	.000	.000	.000	.000
M20	.000	.000	.000	.400	.000	.000	.000	.000
M24	.000	.000	.000	.464	.000	.000	.000	.000
M28	.000	.000	.000	.447	.000	.000	.000	.000
M30	.000	.000	.000	.630	.000	.000	.000	.000
M34	.000	.000	.000	.503	.000	.000	.000	.000
M52	.000	.000	.000	.405	.000	.000	.000	.000
M54	.000	.000	.000	.433	.000	.000	.000	.000
M65	.000	.000	.000	.494	.000	.000	.000	.000
M94	.000	.000	.000	.605	.000	.000	.000	.000
M118	.000	.000	.000	.556	.000	.000	.000	.000
M122	.000	.000	.000	.449	.000	.000	.000	.000
R131	.000	.000	.000	.256	.000	.000	.000	.000
R4	.000	.000	.000	.000	.579	.000	.000	.000
M23	.000	.000	.000	.000	.425	.000	.000	.000

R31	.000	.000	.000	.000	.604	.000	.000	.000
R44	.000	.000	.000	.000	.605	.000	.000	.000
R46	.000	.000	.000	.000	.569	.000	.000	.000
R71	.000	.000	.000	.000	.526	.000	.000	.000
M79	.000	.000	.000	.000	.540	.000	.000	.000
M83	.000	.000	.000	.000	.219	.000	.000	.000
R85	.000	.000	.000	.000	.502	.000	.000	.000
M103	.000	.000	.000	.000	.462	.000	.000	.000
R8	.000	.000	.000	.000	.000	.214	.000	.000
R11	.000	.000	.000	.000	.000	.401	.000	.000
M38	.000	.000	.000	.000	.000	.550	.000	.000
R47	.000	.000	.000	.000	.000	.563	.000	.000
R48	.000	.000	.000	.000	.000	.609	.000	.000
R57	.000	.000	.000	.000	.000	.631	.000	.000
R62	.000	.000	.000	.000	.000	.439	.000	.000
M66	.000	.000	.000	.000	.000	.552	.000	.000
R81	.000	.000	.000	.000	.000	.163	.000	.000
R82	.000	.000	.000	.000	.000	.501	.000	.000
R95	.000	.000	.000	.000	.000	.647	.000	.000
R108	.000	.000	.000	.000	.000	.627	.000	.000
M126	.000	.000	.000	.000	.000	.579	.000	.000
R6	.000	.000	.000	.000	.000	.000	.687	.000
R17	.000	.000	.000	.000	.000	.000	.365	.000
R32	.000	.000	.000	.000	.000	.000	.439	.000
R56	.000	.000	.000	.000	.000	.000	.741	.000
R58	.000	.000	.000	.000	.000	.000	.509	.000
R84	.000	.000	.000	.000	.000	.000	.690	.000
R88	.000	.000	.000	.000	.000	.000	.667	.000
R102	.000	.000	.000	.000	.000	.000	.738	.000
M3	.000	.000	.000	.000	.000	.000	.000	.037
R33	.000	.000	.000	.000	.000	.000	.000	.465
M40	.000	.000	.000	.000	.000	.000	.000	.573
M59	.000	.000	.000	.000	.000	.000	.000	.415
M64	.000	.000	.000	.000	.000	.000	.000	.413
M68	.000	.000	.000	.000	.000	.000	.000	.597
R69	.000	.000	.000	.000	.000	.000	.000	.583
R91	.000	.000	.000	.000	.000	.000	.000	.340
R106	.000	.000	.000	.000	.000	.000	.000	.362
M117	.000	.000	.000	.000	.000	.000	.000	.448
M125	.000	.000	.000	.000	.000	.000	.000	.509

Appendix F

MPA Confirmatory Factor Loadings for 89 item MPA

	ACH	DOM	DEP	ADJ	COOP	IC	PC	SD
R5	.435	.000	.000	.000	.000	.000	.000	.000
R21	.500	.000	.000	.000	.000	.000	.000	.000
R25	.594	.000	.000	.000	.000	.000	.000	.000
M39	.448	.000	.000	.000	.000	.000	.000	.000
R41	.451	.000	.000	.000	.000	.000	.000	.000
R51	.664	.000	.000	.000	.000	.000	.000	.000
R63	.454	.000	.000	.000	.000	.000	.000	.000
R72	.459	.000	.000	.000	.000	.000	.000	.000
R73	.578	.000	.000	.000	.000	.000	.000	.000
R90	.451	.000	.000	.000	.000	.000	.000	.000
R101	.550	.000	.000	.000	.000	.000	.000	.000
R107	.559	.000	.000	.000	.000	.000	.000	.000
R109	.671	.000	.000	.000	.000	.000	.000	.000
R121	.459	.000	.000	.000	.000	.000	.000	.000
R123	.603	.000	.000	.000	.000	.000	.000	.000
R124	.405	.000	.000	.000	.000	.000	.000	.000
R1	.000	.656	.000	.000	.000	.000	.000	.000
R2	.000	.437	.000	.000	.000	.000	.000	.000
R18	.000	.520	.000	.000	.000	.000	.000	.000
R19	.000	.385	.000	.000	.000	.000	.000	.000
M22	.000	.508	.000	.000	.000	.000	.000	.000
R35	.000	.674	.000	.000	.000	.000	.000	.000
R37	.000	.591	.000	.000	.000	.000	.000	.000
R43	.000	.382	.000	.000	.000	.000	.000	.000
R50	.000	.640	.000	.000	.000	.000	.000	.000
R55	.000	.560	.000	.000	.000	.000	.000	.000
M61	.000	.588	.000	.000	.000	.000	.000	.000
R75	.000	.512	.000	.000	.000	.000	.000	.000
R129	.000	.536	.000	.000	.000	.000	.000	.000
M7	.000	.000	.653	.000	.000	.000	.000	.000
M49	.000	.000	.659	.000	.000	.000	.000	.000
M74	.000	.000	.569	.000	.000	.000	.000	.000
M77	.000	.000	.367	.000	.000	.000	.000	.000
M80	.000	.000	.387	.000	.000	.000	.000	.000
M98	.000	.000	.542	.000	.000	.000	.000	.000
R99	.000	.000	.441	.000	.000	.000	.000	.000
M105	.000	.000	.384	.000	.000	.000	.000	.000
M114	.000	.000	.493	.000	.000	.000	.000	.000
M116	.000	.000	.526	.000	.000	.000	.000	.000
M119	.000	.000	.508	.000	.000	.000	.000	.000
M127	.000	.000	.399	.000	.000	.000	.000	.000
M14	.000	.000	.000	.521	.000	.000	.000	.000
M16	.000	.000	.000	.597	.000	.000	.000	.000

M20	.000	.000	.000	.395	.000	.000	.000	.000
M24	.000	.000	.000	.446	.000	.000	.000	.000
M28	.000	.000	.000	.441	.000	.000	.000	.000
M30	.000	.000	.000	.642	.000	.000	.000	.000
M34	.000	.000	.000	.501	.000	.000	.000	.000
M52	.000	.000	.000	.411	.000	.000	.000	.000
M54	.000	.000	.000	.422	.000	.000	.000	.000
M65	.000	.000	.000	.481	.000	.000	.000	.000
M94	.000	.000	.000	.603	.000	.000	.000	.000
M118	.000	.000	.000	.545	.000	.000	.000	.000
M122	.000	.000	.000	.451	.000	.000	.000	.000
R4	.000	.000	.000	.000	.593	.000	.000	.000
M23	.000	.000	.000	.000	.413	.000	.000	.000
R31	.000	.000	.000	.000	.621	.000	.000	.000
R44	.000	.000	.000	.000	.613	.000	.000	.000
R46	.000	.000	.000	.000	.574	.000	.000	.000
R71	.000	.000	.000	.000	.526	.000	.000	.000
M79	.000	.000	.000	.000	.511	.000	.000	.000
R85	.000	.000	.000	.000	.514	.000	.000	.000
M103	.000	.000	.000	.000	.443	.000	.000	.000
R11	.000	.000	.000	.000	.000	.396	.000	.000
M38	.000	.000	.000	.000	.000	.547	.000	.000
R47	.000	.000	.000	.000	.000	.571	.000	.000
R48	.000	.000	.000	.000	.000	.609	.000	.000
R57	.000	.000	.000	.000	.000	.629	.000	.000
R62	.000	.000	.000	.000	.000	.409	.000	.000
M66	.000	.000	.000	.000	.000	.552	.000	.000
R82	.000	.000	.000	.000	.000	.503	.000	.000
R95	.000	.000	.000	.000	.000	.646	.000	.000
R108	.000	.000	.000	.000	.000	.635	.000	.000
M126	.000	.000	.000	.000	.000	.576	.000	.000
R6	.000	.000	.000	.000	.000	.000	.687	.000
R32	.000	.000	.000	.000	.000	.000	.435	.000
R56	.000	.000	.000	.000	.000	.000	.739	.000
R58	.000	.000	.000	.000	.000	.000	.508	.000
R84	.000	.000	.000	.000	.000	.000	.701	.000
R88	.000	.000	.000	.000	.000	.000	.669	.000
R102	.000	.000	.000	.000	.000	.000	.741	.000
R33	.000	.000	.000	.000	.000	.000	.000	.427
M40	.000	.000	.000	.000	.000	.000	.000	.578
M59	.000	.000	.000	.000	.000	.000	.000	.440
M64	.000	.000	.000	.000	.000	.000	.000	.398
M68	.000	.000	.000	.000	.000	.000	.000	.629
R69	.000	.000	.000	.000	.000	.000	.000	.554
M117	.000	.000	.000	.000	.000	.000	.000	.467
M125	.000	.000	.000	.000	.000	.000	.000	.525

Appendix G

Stepwise Discriminant Analysis using Military Data
(Classification Sample)

-------- DISCRIMINANT ANALYSIS --------

On groups defined by FAMILY Job Family

330 (Unweighted) cases were processed.
0 of these were excluded from the analysis.
330 (Unweighted) cases will be used in the analysis.

NOTE: 133 of these cases were intentionally excluded for later use in the cross-validation sample that was used to replicate the classification results. The discriminant functions were built on approximately a third of the sample to provide conservative estimates.

Number of cases by group

	Number of cases		
FAMILY	Unweighted	Weighted	Label
1	74	74.0	Military
2	27	27.0	Operator
3	100	100.0	Administrative
4	37	37.0	Technical A
5	92	92.0	Technical B
Total	330	330.0	

-------- DISCRIMINANT ANALYSIS --------

On groups defined by FAMILY Job Family

Analysis number 1

Stepwise variable selection
Selection rule: minimize Wilks' Lambda
Maximum number of steps.....14
Minimum tolerance level..... . .00100
Minimum F to enter..... 3.84000
Maximum F to remove..... 2.71000

Canonical Discriminant Functions

Maximum number of functions..... 4
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probabilities

Group	Prior	Label
1	.22424	Military
2	.08182	Operator
3	.30303	Administrative
4	.11212	Technical A
5	.27879	Technical B
Total	1.00000	

---------- Variables not in the Analysis after Step 0 ----------

Variable	Tolerance	Minimum Tolerance	F to Enter	Wilks' Lambda
ZACH	1.0000000	1.0000000	1.8742176	.9774528
ZDOM	1.0000000	1.0000000	.3075697	.9962288
ZDEP	1.0000000	1.0000000	6.5292349	.9256175
ZADJ	1.0000000	1.0000000	.3281673	.9959773
ZCOOP	1.0000000	1.0000000	.3962798	.9951464
ZIC	1.0000000	1.0000000	1.9115639	.9770139
ZPC	1.0000000	1.0000000	3.8736128	.9544943

****

At step 1, ZDEP was included in the analysis.

		Degrees of Freedom		Signif.	Between Groups
Wilks' Lambda	.92562	1	4 325.0		
Equivalent F	6.52923		4 325.0	.0000	

---------- Variables in the Analysis after Step 1 ----------

Variable	Tolerance	F to Remove	Wilks' Lambda
ZDEP	1.0000000	6.5292	

---------- Variables not in the Analysis after Step 1 ----------

Variable	Minimum Tolerance	Tolerance	F to Enter	Wilks' Lambda
ZACH	.9882678	.9882678	1.4608759	.9092193
ZDOM	.9956330	.9956330	.2967821	.9222385
ZADJ	.9822527	.9822527	.2646150	.9226035
ZCOOP	.9309513	.9309513	.2656064	.9225923
ZIC	.9780708	.9780708	2.0497136	.9027728
ZPC	.9888681	.9888681	2.8664211	.8939814

F level or tolerance or VIN insufficient for further computation.

Summary Table

Step	Action Entered	Removed	Vars in	Wilks' Lambda	Sig.	Label
1	ZDEP		1	.92562	.0000	Zscore(DEP)

Classification function coefficients
(Fisher's linear discriminant functions)

FAMILY =	1 Military	2 Operator	3 Administrative	4 Tech A	5 Tech B
ZDEP	-.4906642	.0492294	.2566731	.2638025	-.0593362
(Constant)	-1.6102210	-2.5044154	-1.2254448	-2.2214726	-1.2789887

Classification function coefficients
(Fisher's linear discriminant functions)

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr	After Fcn	Wilks' Lambda	Chi-square	df	Sig
				:	0	.925618	25.198	4	.0000
1*	.0804	100.00	100.00	.2727 :					

* Marks the 1 canonical discriminant functions remaining in the analysis.

Standardized canonical discriminant function coefficients

	Func 1
ZDEP	1.00000

Structure matrix:

Pooled within-groups correlations between discriminating variables and canonical discriminant functions

(Variables ordered by size of correlation within function)

	Func 1
ZDEP	1.00000
ZCOOP	.26277
ZIC	.14809
ZADJ	.13322
ZACH	.10832
ZPC	-.10551
ZDOM	-.06608

Canonical discriminant functions evaluated at group means (group centroids)

Group	Func 1
1	-.46513
2	.06301
3	.26594
4	.27292
5	-.04319

Test of Equality of Group Covariance Matrices Using Box's M

The ranks and natural logarithms of determinants printed are those of the group covariance matrices.

Group	Label	Rank	Log Determinant
1	Military	1	.246501
2	Operator	1	-.212521
3	Administrative	1	-.251776
4	Technical A	1	-.224119
5	Technical B	1	-.001719
Pooled within-groups covariance matrix		1	-.044004

Box's M	Approximate F	Degrees of freedom		Significance
6.38009	1.58215	4,	90052.5	.1764

Classification results -

Actual Group	No. of Cases	Predicted Group Membership 1	2	3	4	5
Group 1 Military	74	29	0	31	0	14
		39.2%	.0%	41.9%	.0%	18.9%
Group 2 Operator	27	5	0	15	0	7
		18.5%	.0%	55.6%	.0%	25.9%
Group 3 Administrative	100	15	0	68	0	17
		15.0%	.0%	68.0%	.0%	17.0%
Group 4 Technical A	37	5	0	24	0	8
		13.5%	.0%	64.9%	.0%	21.6%
Group 5 Technical B	92	20	0	50	0	22
		21.7%	.0%	54.3%	.0%	23.9%

Percent of "grouped" cases correctly classified: 36.06%

Classification processing summary

330 (Unweighted) cases were processed.
0 cases were excluded for missing or out-of-range group codes.
0 cases had at least one missing discriminating variable.
330 (Unweighted) cases were used for printed output.

Appendix H

Sample Size, and Mean for the 7 MPA scales for the 60 entry-level MOCs used in the Cluster Analysis

MOC	N	ACH (48)	DOM (39)	DEP (12)	ADJ (39)	COOP (27)	IC (33)	PC (21)
011	5	40.20	32.80	32.00	35.80	22.60	29.60	16.80
021	15	35.27	29.63	26.00	31.33	22.00	24.67	15.67
022	3	33.33	27.33	23.00	32.00	23.00	25.67	15.33
031	41	38.49	30.29	27.27	31.41	22.51	26.61	17.76
041	5	37.80	29.20	27.60	28.60	22.80	23.60	14.80
052	2	40.50	32.50	27.00	32.00	21.50	26.00	19.50
065	4	42.50	30.25	32.50	29.50	22.75	26.50	14.75
161	2	45.50	35.50	34.00	31.50	25.00	25.50	12.00
171	1	40.00	32.00	34.00	34.00	20.00	25.00	11.00
181	6	35.33	30.17	27.50	29.83	20.83	25.00	15.00
191	2	38.00	29.00	30.00	31.00	21.50	25.50	13.50
211	9	37.22	30.33	29.11	29.89	21.44	24.89	17.67
212	21	39.95	29.57	31.86	32.38	22.86	27.71	12.86
225	4	36.25	27.75	28.00	26.75	18.00	21.25	15.25
226	3	39.00	27.33	34.00	32.00	21.67	25.00	11.00
227	5	39.00	30.40	31.20	30.40	21.80	20.60	15.60
262	3	41.00	30.67	29.67	32.33	22.33	28.67	15.67
273	3	34.67	29.00	26.67	30.33	21.00	26.00	15.00
274	3	42.00	26.00	32.00	30.67	25.67	29.00	15.00
275	2	39.50	27.50	29.00	30.00	24.00	25.50	13.00
276	4	40.25	30.00	27.00	30.25	21.25	28.00	18.25
283	2	45.00	32.50	32.50	31.50	22.00	27.50	16.50
284	1	48.00	35.00	31.00	30.00	22.00	30.00	12.00
285	2	37.50	31.50	29.00	29.50	24.50	25.50	16.50
291	9	39.67	29.67	31.78	31.89	23.89	26.78	14.00
312	2	35.50	28.00	31.50	27.00	20.50	26.50	13.00
321	4	39.50	27.25	31.00	32.25	23.75	29.50	15.00
332	2	31.50	27.50	25.50	30.50	22.00	26.00	12.50
411	26	39.73	30.12	28.58	31.73	22.46	26.35	15.27
421	2	36.50	32.00	24.00	27.00	21.00	19.50	19.00
441	2	38.50	29.50	26.00	27.50	21.00	24.50	17.00
511	8	36.50	28.00	30.37	30.62	22.75	27.12	15.38
512	17	38.88	28.53	30.88	30.76	21.94	26.41	12.53
514	1	39.00	32.00	33.00	38.00	24.00	31.00	20.00
521	6	37.00	30.67	31.33	32.00	22.83	26.00	13.67
524	7	39.43	28.71	31.71	31.71	23.14	26.14	13.43
526	1	39.00	32.00	25.00	32.00	24.00	23.00	14.00

MOC	N	ACH (84)	DOM (57)	DEP (63)	ADJ (45)	COOP (30)	IC (39)	PC (24)
531	9	38.11	28.67	29.56	30.67	23.44	27.00	14.56
541	6	38.17	27.83	32.00	29.50	24.00	26.00	15.17
551	8	42.63	31.25	30.75	30.25	23.88	27.75	14.13
561	5	41.60	30.80	33.00	29.60	22.00	22.80	15.20
563	1	40.00	30.00	27.00	33.00	19.00	29.00	16.00
572	12	38.92	32.42	29.17	31.18	21.58	23.58	14.42
611	1	26.00	24.00	32.00	25.00	22.00	22.00	17.00
612	3	39.00	32.00	30.33	34.67	22.67	27.00	14.00
613	1	33.00	26.00	29.00	32.00	27.00	24.00	16.00
621	1	45.00	30.00	34.00	36.00	27.00	33.00	19.00
622	3	33.33	25.67	31.33	28.33	20.67	23.00	14.00
651	1	30.00	31.00	22.00	26.00	21.00	22.00	17.00
711	19	41.26	31.95	29.42	32.37	22.84	27.95	15.84
722	2	40.00	30.00	33.50	32.50	22.00	30.00	13.50
811	6	40.50	32.67	31.17	31.33	24.00	26.17	15.83
831	43	39.30	30.42	31.26	32.23	23.30	27.63	13.58
841	16	39.81	29.69	31.94	29.31	23.25	24.19	14.13
861	5	41.20	31.40	26.60	34.00	24.60	28.80	13.60
881	2	35.50	29.00	26.00	34.50	25.00	26.00	13.00
911	49	39.61	30.43	29.98	31.12	23.10	26.98	14.84
921	1	44.00	34.00	34.00	28.00	20.00	30.00	10.00
933	8	36.38	26.25	31.25	28.63	22.13	26.00	14.88
935	26	37.35	27.58	29.69	28.88	22.04	26.19	13.42

Appendix I

Hierarchical Cluster Analysis of the 60 entry-level occupations used in the MPA

**********PROXIMITIES**********

Data Information

22 unweighted cases accepted.
0 cases rejected because of missing value.

Squared Euclidean measure used.

******HIERARCHICAL CLUSTER ANALYSIS******

Agglomeration Schedule using Ward Method

Stage	Clusters Combined Cluster 1	Cluster 2	Coefficient	Stage Cluster 1st Appears Cluster 1	Cluster 2	Next Stage
1	5	18	.206353	0	0	5
2	6	11	.475816	0	0	5
3	7	20	.766814	0	0	13
4	8	12	1.115245	0	0	10
5	5	6	1.645263	1	2	8
6	9	22	2.311262	0	0	15
7	1	3	2.989975	0	0	16
8	5	10	3.794382	5	0	19
9	16	17	4.646318	0	0	12
10	8	13	5.533463	4	0	14
11	2	4	6.447553	0	0	18
12	14	16	7.608491	0	9	13
13	7	14	9.124925	3	12	19
14	8	19	10.897472	10	0	17
15	9	21	12.869585	6	0	17
16	1	15	15.159662	7	0	18
17	8	9	17.716452	14	15	20
18	1	2	20.427092	16	11	21
19	5	7	24.631474	8	13	20
20	5	8	34.727352	19	17	21
21	1	5	48.273724	18	20	0

* * * * * * H I E R A R C H I C A L C L U S T E R A N A L Y S I S * *

Dendrogram using Ward Method

Rescaled Distance Cluster Combine

C A S E Label	Num	0	5	10	15	20	25
212	5						
831	18						
291	6						
524	11						
521	10						
411	7						
911	20						
711	16						
811	17						
551	14						
511	8						
531	12						
541	13						
841	19						
512	9						
935	22						
933	21						
031	2						
211	4						
021	1						
181	3						
572	15						

Appendix J

Stepwise Discriminant Analysis using clusters developed in the Cluster Analysis using the MPA (Classification Sample)

-------- DISCRIMINANT ANALYSIS --------

On groups defined by FOURFAM

330 (Unweighted) cases were processed.
82 of these were excluded from the analysis.
82 had missing or out-of-range group codes.
248 (Unweighted) cases will be used in the analysis.

NOTE: 119 cases were intentionally excluded for later use in the cross-validation sample that was used to replicate the classification results. The discriminant functions were built on approximately a third of the sample to provide conservative estimates.

Number of cases by group

	Number of cases		
FOURFAM	Unweighted	Weighted	Label
1	63	63.0	
2	78	78.0	
3	48	48.0	
4	59	59.0	
Total	248	248.0	

-------- D I S C R I M I N A N T A N A L Y S I S --------

On groups defined by FOURFAM

Analysis number 1

Stepwise variable selection
Selection rule: minimize Wilks' Lambda
Maximum number of steps.....14
Minimum tolerance level..... .00100
Minimum F to enter..... 3.84000
Maximum F to remove..... 2.71000

Canonical Discriminant Functions

Maximum number of functions..... 3
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probabilities

Group	Prior	Label
1	.25403	
2	.31452	
3	.19355	
4	.23790	
Total	1.00000	

---------- Variables not in the Analysis after Step 0 ----------

Variable	Tolerance	Minimum Tolerance	F to Enter	Wilks' Lambda
ZACH	1.0000000	1.0000000	2.5094839	.9700692
ZDOM	1.0000000	1.0000000	4.6317064	.9461210
ZDEP	1.0000000	1.0000000	9.5490619	.8949295
ZADJ	1.0000000	1.0000000	3.2616835	.9614436
ZCOOP	1.0000000	1.0000000	2.8097131	.9666079
ZIC	1.0000000	1.0000000	.9331048	.9886575
ZPC	1.0000000	1.0000000	11.1600817	.8793419

* *

At step 1, ZPC was included in the analysis.

		Degrees of Freedom		Signif.	Between Groups
Wilks' Lambda	.87934	1	3 244.0		
Equivalent F	11.16008		3 244.0	.0000	

---------- Variables in the Analysis after Step 1 ----------

Variable	Tolerance	F to Remove	Wilks' Lambda
ZPC	1.0000000	11.1601	

---------- Variables not in the Analysis after Step 1 ----------

Variable	Tolerance	Minimum Tolerance	F to Enter	Wilks' Lambda
ZACH	.9342382	.9342382	4.1892964	.8360991
ZDOM	.9350334	.9350334	5.0842804	.8274065
ZDEP	.9819960	.9819960	6.2368729	.8164746
ZADJ	.9189030	.9189030	5.4611887	.8237996
ZCOOP	.9656883	.9656883	4.5800267	.8322817
ZIC	.9932713	.9932713	1.3248935	.8651902

* *

At step 2, ZDEP was included in the analysis.

		Degrees of Freedom		Signif.	Between Groups
Wilks' Lambda	.81647	2	3	244.0	
Equivalent F	8.64244		6	486.0	.0000

---------- Variables in the Analysis after Step 2 ----------

Variable	Tolerance	F to Remove	Wilks' Lambda
ZDEP	.9819960	6.2369	.8793419
ZPC	.9819960	7.7833	.8949295

---------- Variables not in the Analysis after Step 2 ----------

Variable	Tolerance	Minimum Tolerance	F to Enter	Wilks' Lambda
ZACH	.9035167	.9035167	3.1309410	.7859686
ZDOM	.9340901	.9211209	5.1412895	.7675545
ZADJ	.9012939	.8928371	4.3607360	.7746007
ZCOOP	.8668744	.8668744	2.2053819	.7947467
ZIC	.9665589	.9555868	.5957920	.8104885

* *

At step 3, ZDOM was included in the analysis.

		Degrees of Freedom		Signif.	Between Groups
Wilks' Lambda	.76755	3	3	244.0	
Approximate F	7.51627		9	589.1	.0000

---------- Variables in the Analysis after Step 3 ----------

Variable	Tolerance	F to Remove	Wilks' Lambda
ZDOM	.9340901	5.1413	.8164746
ZDEP	.9810054	6.2902	.8274065
ZPC	.9211209	8.3355	.8468681

---------- Variables not in the Analysis after Step 3 ----------

Variable	Tolerance	Minimum Tolerance	F to Enter	Wilks' Lambda
ZACH	.6247605	.6247605	1.2698073	.7556108
ZADJ	.8164927	.8164927	2.3112389	.7460891
ZCOOP	.8409161	.8409161	1.6000652	.7525651
ZIC	.9629864	.9142478	.4618397	.7631671

F level or tolerance or VIN insufficient for further computation.

Summary Table

Step	Action Entered	Removed	Vars in	Wilks' Lambda	Sig.	Label
1	ZPC		1	.87934	.0000	Zscore(PC)
2	ZDEP		2	.81647	.0000	Zscore(DEP)
3	ZDOM		3	.76755	.0000	Zscore(DOM)

Classification function coefficients
(Fisher's linear discriminant functions)

FOURFAM =	1	2	3	4
ZDOM	.3258739	.2086941	-.3921707	-.0332910
ZDEP	.3377386	-.0385755	.0438600	-.5193510
ZPC	-.4482851	-.0292346	-.0390427	.6001739
(Constant)	-1.5464102	-1.1790618	-1.7278494	-1.7619000

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr	After Fcn	Wilks' Lambda	Chi-square	df	Sig
				:	0	.767555	64.417	9	.0000
1*	.2323	80.22	80.22	.4342 :	1	.945832	13.561	4	.0088
2*	.0572	19.75	99.97	.2326 :	2	.999911	.022	1	.8830
3*	.0001	.03	100.00	.0094 :					

* Marks the 3 canonical discriminant functions remaining in the analysis.

Standardized canonical discriminant function coefficients

	Func 1	Func 2	Func 3
ZDOM	.22036	1.00835	-.07238
ZDEP	.62473	-.04679	.79176
ZPC	-.73374	-.05288	.73788

Structure matrix:

Pooled within-groups correlations between discriminating variables and canonical discriminant functions
(Variables ordered by size of correlation within function)

	Func 1	Func 2	Func 3
ZPC	-.76139*	.21041	.61320
ZDEP	.70893*	-.10487	.69743
ZDOM	-.00703	.99789*	.06452
ZACH	.02452	.55494*	.25823
ZADJ	-.07355	.33345*	.25866
ZCOOP	.08576	.17168	.34965*
ZIC	.05035	.06287	.17472*

* denotes largest absolute correlation between each variable and any discriminant function.

Varimax rotation transformation matrix

	Func 1	Func 2	Func 3
% Variance	53.43	26.72	19.85
Func 1	-.81596	.57648	.04336
Func 2	.01967	-.04727	.99869
Func 3	.57777	.81574	.02723

Rotated correlations between discriminating variables
and canonical discriminant functions
(Variables ordered by size of correlation within function)

	Func 1	Func 2	Func 3
ZPC	.97969*	.05134	.19382
ZDEP	-.17757	.98257*	-.05501
ZCOOP	.13542	.32655*	.18469
ZIC	.06110	.16858*	.06973
ZDOM	.06265	.00141	.99803*
ZACH	.14011	.19855	.56230*
ZADJ	.21602	.15284	.33687*

* denotes largest absolute correlation between each variable and any discriminant function.

Rotated standardized discriminant function coefficients
Based on rotation of structure matrix

	Func 1	Func 2	Func 3
ZDOM	-.20179	.02033	1.01461
ZDEP	-.05321	1.00823	.00191
ZPC	1.02399	.18144	-.06453

Canonical discriminant functions evaluated at group means (group centroids)

Group	Func 1	Func 2	Func 3
1	-.47724	.34459	.15908
2	-.02978	.00093	.13795
3	-.09143	.07930	-.47588
4	.62336	-.43369	.03492

Test of Equality of Group Covariance Matrices Using Box's M

The ranks and natural logarithms of determinants printed are those of the group covariance matrices.

Group Label	Rank	Log Determinant
1	3	-.388835
2	3	-.693940
3	3	.558206
4	3	-.208459
Pooled within-groups covariance matrix	3	-.199303

Box's M	Approximate F	Degrees of freedom	Significance
14.76606	.80143	18, 167872.6	.7009

Symbols used in territorial map

Symbol	Group	Label
1	1	
2	2	
3	3	
4	4	
*		Group centroids

Classification results -

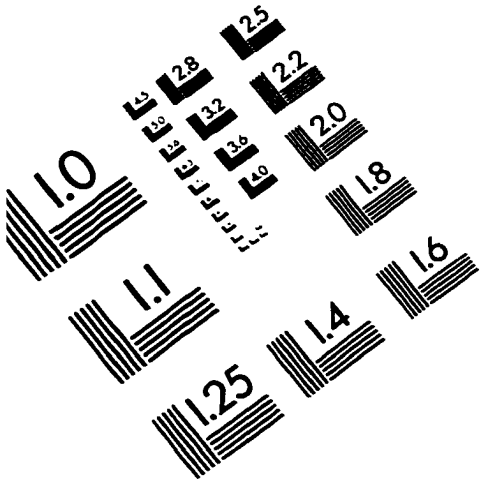
Actual Group	No. of Cases	Predicted Group Membership 1	2	3	4
Group 1	63	33 52.4%	19 30.2%	4 6.3%	7 11.1%
Group 2	78	15 19.2%	41 52.6%	8 10.3%	14 17.9%
Group 3	48	12 25.0%	13 27.1%	13 27.1%	10 20.8%
Group 4	59	6 10.2%	17 28.8%	3 5.1%	33 55.9%
Ungrouped cases	82	24 29.3%	32 39.0%	10 12.2%	16 19.5%

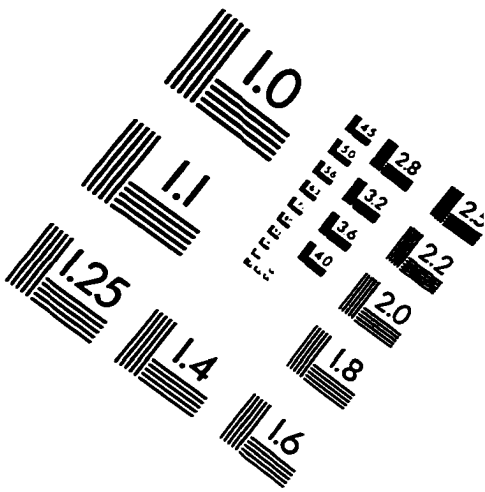
Percent of "grouped" cases correctly classified: 48.39%

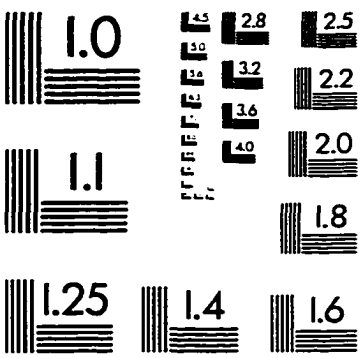
Classification processing summary

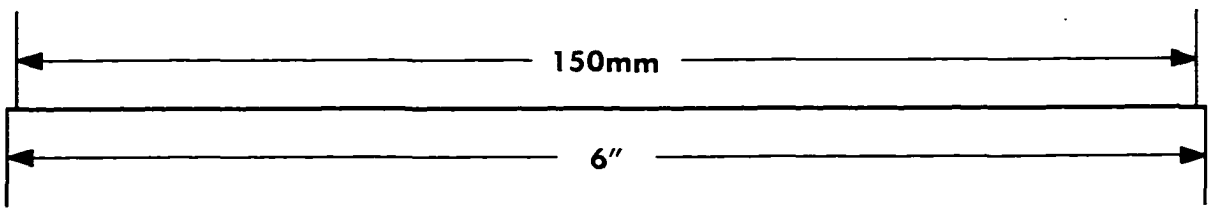
330 (Unweighted) cases were processed.
0 cases were excluded for missing or out-of-range group codes.
0 cases had at least one missing discriminating variable.
330 (Unweighted) cases were used for printed output.

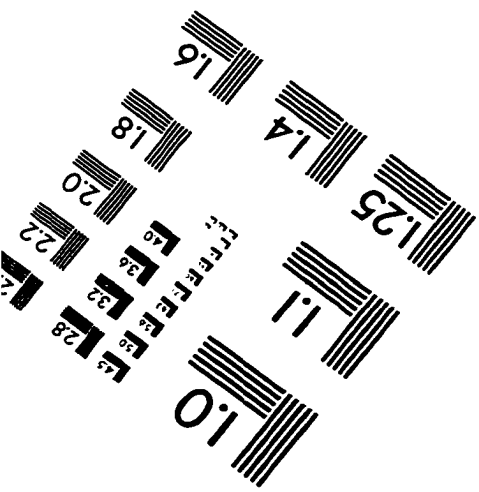
IMAGE EVALUATION
TEST TARGET (QA-3)

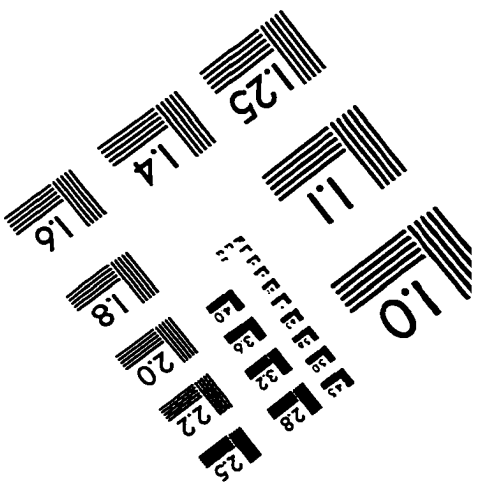












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