PREDICTION OF POLICE PERFORMANCE:

A REGRESSION MODEL

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The purpose of this study is to develop regression models to predict the performance of police officers using standardized psychological tests. It has not been clearly established that the various police occupations form a homogeneous whole; therefore, an effective predictor of performance for police officers of a particular city may be of little value in a somewhat different police environment. Previous research in this area has contributed little that might serve as a basis for the development of a comprehensive theory of police performance.

One-hundred nine police officers were randomly divided into a research group (N=55) and a cross-validation group (N=54). Two hundred predictor variables were taken from seven standardized tests to develop regression models to predict the performance of police officers based on performance evaluations. Five criteria were pulled from the performance evaluations and were used in this study. The criteria included task, initiative, quality, judgment, and cooperation.

Personality and interest inventory's combined with aptitude tests were em-

ployed in this research to isolate effective predictors of police performance. Cross-validation was performed on the criterion cooperation. The results of this study indicate significance ($p < .01$) on all five criteria and also with the cross-validation sample. The results indicate it is possible to develop regression models to predict police performance and will provide a basis for further research.

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CHAPTER 1

INTRODUCTION

Vocational success is a concept which has caught the attention of researchers for four decades and which has produced numerous studies to help explain both general and specific success concepts. The investigation of successful vocational choices has resulted in data (see, Krumboltz, 1965; Super, 1957; Tiedman & O'Hara, 1963) reporting that over two-thirds of the vocational choices made by college freshman are not stable. For example, two to three years after graduation only one-third of these freshman were found in their chosen career field (see, Super, 1957).

Therefore, one of the most critical concerns of any organization is to develop accurate and fair procedures to select the best qualified candidates for employment and promotional purposes. In an organization, such as the police department, which is charged with enforcing the laws of a community, the need to select employees that can protect citizens rights and enforce the law without abuse of the position is critical.

The traditional methods of police selection; personal interviews, reference checks, review of training, and job experience, have not proven completely satisfactory. Often the aforementioned selection elements are based on the subjective perceptions of others and do little to help predict actual job performance. Additionally, the traditional demographic data of age, sex, race, religion, handicaps, and marital status, which have long been a questionable part of the selection process, are no longer legally available to prospective employers because

of the federal regulations imposed by the Equal Employment Opportunity Commission (EEOC, 1978).

Psychological tests are often used to supplement the interview for the assessment of employee variables that relate to performance and job survival. A number of major corporations, for example, Sears, Roebuck and Company (see, Byham, 1969), are using psychological tests to supplement information about basic skills, interpersonal relationship styles, responses to stress and interests patterns. This standardization of gathering information from a prospective employee meets EEOC guidelines (1978) only when such testing is proven to be job related.

Since World War I a key element of personnel selection and evaluation has been job performance (see, Walter, 1979). Bingham and Freyd (1926) wrote:

> From a management's point of view the successful employee does more work, does it better, with less supervision, with less interruption and absenteeism, makes fewer mistakes and has fewer accidents. He offers more acceptable original suggestions, learns more quickly, is promoted more rapidly and stays with the company (p. 29).

Many studies have focused specifically on breaking down job performance into smaller parts. Crites (1969) explained that vocational success is how well a worker can perform his duties, is rewarded by pay raises, bonuses, promotions and special recognition. Other criteria for job performance have been earnings, or output as well as job stability (see, Super, 1951).

Over the years many researchers have attempted to use several psychological instruments and combinations of tests in order to predict performance of police applicants. A study in 1978 (Lester) revealed that demographic variables such as educational level, sex, and race can prove to be significant factors associated with the completion of a police training program. This study suggested that individuals who failed the training program or resigned often had

a higher educational level, were usually caucasian, and male. However, due to increased pressure by the EEOC, demographic variables are often not recommended. Other methods used to predict performance include bio-data variables (see, Baehr, Furcon, & Froemel, Note 1; Cohen & Chaiken, Note 2; Levy, 1967), and peer assessment methods (Azen, Snibbe, Montgomery, Fabricatorie, & Earle, 1974). Two recent developments concerning job-related examinations for police applicants include job-related written examinations and simulations. Job-related written exams include such elements as portrait identification, license plate identification, recall of detail, and altered portrait identification (see, Schrachter, 1979). The second development, simulations, usually involve the applicant performing actual police duties and decision making processes in a test situation. Simulations often cover a wide range of generic skills. Simulations and job-related written exams are face-valid and in some instances have proven to be related to actual job performance. However, the start-up costs and costs of training personnel to administer and judge these exercises are usually prohibitive. Barnabas (1976) developed a test battery consisting of aptitude tests, personality, adjustment and interest inventories. This research showed that several of the test instruments used had predictive validity and were useful in predicting the performance of police applicants. However, Dunnett and Bownas (Note 3) in a technical review of Barnabas' (1976) research, suggested several potential methodological shortcomings. More specifically, Barnabas (1976) failed to perform a cross-validation with a seperate sample and in fact removed thirteen officers from the sample group because prime supervisors of the officers, "did not want any more recruits of that type" (page 2). Because of this error, Barnabas (1976) failed to show a significant difference between those who were judged successful and those who were judged to be failures in a police officer position. This research however, did

correlate .34 with police training course grades for a sample of 117 officers.

The following studies are grouped to support the instruments which were used in the present study to assess factors relevant to job performance. General areas covered by these instruments are basic skills (aptitude tests), interpersonal relationship styles, stress-coping behavior, and interests patterns.

Test Instruments

Data from both World Wars (Yerkes, 1921; Stewert, 1947) was produced and indicated that intelligence had a positive relationship regarding placement on the "Occupational Ladder". Thus, it was tentatively concluded that such tests would be excellent and valuable assets for prediction of job performance. However, not all tests of intelligence have been good predictors. For example, Matarazzo and Wiens (1977) showed that the Wechsler Adult Intelligence Scale (WAIS) had little correlation with the Black Intelligence Test of Cultural Homogeneity (BITCH), and that both were poor predictors of police performance.

Other mental ability tests, such as the Army General Classification Test (AGCT), have been researched to find if they have value as a predictive instrument. Clopton (1971) used the AGCT to predict final academy grades but found only a .16 correlation. Mullineaux (1965) used 322 police recruits to study the interaction of the AGCT and a personal interview with a police officer's spelling scores, report writing, and final scores in a training program. He found a .56 correlation between the AGCT and spelling; a .60 correlation between the AGCT and report writing; and a .66 between the AGCT and the final scores received from the training program.

One of the most comprehensive use of mental tests for the prediction of police performance was developed by Baehr, Furcon, and Froemel (1968) for the Chicago Police Department. An extensive battery of written tests were administered to two seperate groups of police officers who had at least one

year of job experience. The tests measure abilities of nonverbal reasoning, closure flexibility and speed, perceptual speed and verbal comprehension. Performance criteria were divided into eight catagories: paired comparison supervisor ratings, departmental graphic ratings, tenure, awards, complaints, arrests, disciplinary actions, and absenteeism A regression analysis was performed on all the test scores against each performance variable and the results indicated that multiple correlations above .60 could be obtained for the paired comparison rating and the police department's performance rating. Multiple correlation coefficients were obtained for prediction of absenteeism, disciplinary problems, and awards, but they were generally lower, being in the range of .50 to .55. A cross-validation resulted in multiple correlations from .30 to .40. The results of this study indicated that there were significant and high relationships between the test scores and all eight of the performance criteria.

Psychological instruments such as personality inventories, have also been researched to ascertain their predictiveness of the performance of police applicants (see, Poland, 1978). Snibbe and Grenicik (Note 4) found that more than half of the police departments investigated acknowledged the use of psychological instruments in the hiring process. These instruments appear to have typically been used to test for pathology. Hence, one can view them in the role of "screen out" instruments. The use of the Sixteen Personality Factor Inventory (16PF) is representative of such screening. Fabricatoe, , Azen, Schoentgen, and Snibbe (1978) reported that the 16PF showed a significant ($p < .05$) positive relationship between the E scale (aggressiveness) and the criteria "ranked comparisons to peers". A negative relationship between the O scale (self assurance) and the criteria "least official reprimands" was also found. This study used two police departments and a total of 495 subjects.

The Minnesota Multiphasic Personality Inventory (MMPI) has been used extensively in the selection process of police departments. Grenik (Note 5) found that the most common tests for police applicants were the MMPI and the Rorschach. The MMPI revealed differences between "typical" applicants and applicants who were nondisabled veterans (Gottesman, 1969). The typical group was found to generally be positively adjusted but somewhat more defensive than the veteran group. Goldstein (1971) compared 500 applicants who had passed a Civil Service examination with 600 applicants who had failed the examination. Goldstein's (1971) results showed that those who had passed the exam were less likely to avoid dangerous situations, were more prone to believe in the honesty of others, and were more apt to listen to others and offer assistance to the public. Those who failed usually showed a greater interest in situations which harmed others and typically had an unrealistic appraisel of themselves.

Although vocational interest inventories are usually thought to be unrelated to predicting performance, these psychological instruments have been used successfully to aid in the selection of police officers. Holland's Self-Directed Search has been shown to have a significant relationship with job performance (see, Hogar & Johnston, 1981). This study is unusual because the two variables which were found to be significant came from Holland's occupational themes. Holland's theory is based on the assumption that, in our culture, most people can be categorized in terms of six types or themes - realistic, investigative, artistic, social, enterprising, or conventional - such that each person is characterized by one, or some combination, of these types (see, Campbell, 1977). Hogar and Johnston (1981) found Holland's Artistic and Conventional themes to be significantly related to a number of criteria. The Artistic scale was negatively related ($\underline{r} = -.29$, $\underline{p} < .05$) with final grades at a training aca-

demy, but positively related (r = .34, p< .05) to the number of complaint letters that were received regarding the officer. The Conventional theme score was related to both grades at the training academy (r = .21, p< .10), and with the supervisory ratings (r = .23, p < .10). Most police applicants will traditionally score high on the Realistic and Social themes. The author suggests that because most police applicants do score high on those scales, the variance is restricted thus making these two variables poor predictors.

Spaulding (1948) administered the Kuder Preference Inventory to 40 police applicants in Delaware. The results of this study suggested that police applicants appear to have strong vocational interests in the helping professions. The Strong-Vocational Interest Blank was given to 113 police applicants (see, Matarazzo, 1964). As with the Spaulding (1938) study, these results also indicated a significant interest in the social services. However, Kates (1950) found little difference for police applicants between any of the scales when using the Strong Vocational Interest Blank. However, several studies do suggest the possible use of vocational interest inventories in the selection process. White and Thornton (1979) administered the Strong-Campbell Interest Inventory to police evidence technicians in order to determine if this instrument could successfully determine performance. They concluded that interest in crime scene work could be detected and that there was an indication of a positive correlation between scores on the crime scene technician scales and performance.

Although there has been much research conducted with psychological instruments in order to predict police performance, very little research has employed the multiple regression technique. Kim and Kohout (1975) define multiple regression as a general statistical technique which allows analysis of the relationship between the criterion variable and a set of predictor variables. Multiple regression may be viewed either as a descriptive tool by which the

linear dependence of one variable on others is summarized and decomposed, or as an inferential tool by which relationships in the population are evaluated from the examination of the sample data. The lack of use of multiple regression in this area may be traced to Thorndike (1949) who reported negligible correlations in his multiple regression studies on predicting job performance. These results would appear to be attributable to an inability to chose predictor variables and clearly define the dependent variables. However, E. L. Thorndike and later his son R. L. Thorndike recognized the complexity of the variables of vocational success and the characteristics of workers that became successful (see, Walter, 1979). Although their largely negative results may have slowed down the multivariate statistical analysis of these complex and interacting variables, some researchers continued their work.

Multiple Regression Studies

The above studies point out the possibility of accounting for additional variance by assessing the combination of basic skills, interpersonal relationship styles, stress-coping behavior and interest patterns. E. L. Thorndike (1934) involved prediction of vocational success by multivariate statistics. This study is recognized as an early classic and is one of the most frequently cited studies in this area. Unfortunately, his study did yield negative results and was severely criticized (see, Patterson, 1934; Viteles, 1936) for the criteria of vocational success (earnings, job level, and interest in work) that were employed. Other criticisms included misclassification of subjects by using very broad terms for groupings, e.g., the term "mechanical" that included prize fighters as well as tool and die makers. Most critics recognized a few aptitude tests such as bead stringing, assembling a clothes pin, and making a rosette could not be expected to predict success with any degree of accuracy in such broad groupings of occupations.

R. L. Thorndike and Hagen (1959) followed up the 1936 study with a multiple discriminant analysis of "10,000 careers." This study was aided by the use of high speed data-processing machines to analyze the data. Thorndike and Hagen (1959) used the Aviation Cadet Classification Test Battery (ACCT) and a 100-item-plus Biographical Data Blank. The ACCT was factored into the following areas; general intelligence, numerical, perceptual-spatial, mechanical and psychomotor components. These factors were similar to those found in the earlier testing of E. L. Thorndike (1934). The Biographical Data Blank covered areas such as; general family and personal background, major subject in college, activities done a number of times, and work experience. Approximately 70% of 17,000 questionnaires were returned. There were seven criteria for vocational success: (1) monthly income; (2) number supervised; (3) self-rated success; (4) self-rated job satisfaction; (5) vertical mobility; (6) lateral mobility; and (7) length of time in occupation.

The results of this study did show some characteristic differences between some of the occupations. For example, treasurer's generally showed greater numerical fluency. One of the most important findings in this study was the extent of the overlap of the aptitudes between the occupations. While there were differences between occupations, there were only a few low correlations between the aptitude tests and the various criteria of vocational success. A lack of job-related variables and poorly defined criteria for success could easily explain such low-order correlations.

Thorndike and Hagen (1959) drew two general conclusions from their study. The first was that while differences between groups were real, sizable and sensible, with a good amount of variance within each group it could be easy to overemphasize the between-group differences: and (2) aptitude tests and biographical data were poor predictors of the criteria selected for vocational success.

To rectify this situation, Thorndike (1963) suggested several possible weaknesses. For example, "success" as defined by earnings could be a meaningless concept because of union contracts, wage scales and other means of fixing or setting wage levels.

Unfortunately, many of the multivariate studies following Thorndike (1963) have yielded largely negative results. This may be due to the lack of correlation between important characteristics needed for job success (performance, job survival, etc.) and the instruments used to test predictor variables. However, recent studies have expanded on the earlier research with more refined instrumentation.

Plag and Goffman (1966) used biographical items plus the Armed Forces Qualifications Test (AFQT) to predict successful completion of the first four-year enlistment in the Navy. These tests indicated adjustment problems, such as level of schooling (high school graduate or dropout), number of arrests, and the number of suspensions or expulsions. The combination of actual social performance plus the test variables supplied enough job-related scores to build a regression equation to predict completion of the four year enlistment at the .05 level of confidence.

Haire, Ghiselli, and Gordon (1967) found earlier salaries of managers to be good predictors of future salaries. Scores on a variety of personality variables, as well as interest-patterns scores, were obtained from the employees of three different companies. The scores from these tests in turn were used to form a regression equation to predict future earnings. The personality traits that received larger Beta-weights were social extroversion, accendence or social boldness, and general activity or energy. This combination of actual performance, job-related personality variables, attitudes about the occupation of manager, with overlapping scores from the interest pattern instrument ac-

counted for enough variance to predict at the .05 level of confidence. McKay (1958) explains Beta weights as the weights which give us the relative improtance of the independent variable in determining the value of the dependent variable.

Weinstein and Srinivasan (1974) used a multiple regression to predict salaries of masters graduates from the school of industrial administration at Carnegie-Melon University. The sample of 366 graduates who averaged six years of experience in their respective occupations were divided into staff and line positions. The earnings were adjusted for the years of experience. A zero-order correlation for graduate grade point average (GPA) and earnings was .49 for line managers and .24 for staff managers. Because of the length of time between graduation and the survey, combined with personality and test scores, enough variance was accounted for to predict at the .05 level of confidence.

In a more recent article LaRocco, Ryman, Biersner (1977) studied 1,292 Navy recruits shortly after basic training. A Mood Questionnaire and a Life History Questionnaire (LHQ) supplied scores which showed differential relationships to success and failure in recruit training. Three unique contributors to the regression model, which was developed to predict effectiveness in recruit training, proved to be one Mood (self-reported depression) and two LHQ factors (social participation and anti-social behavior). The reported moods of happiness, depression, and the social participation factor were found to differ significantly between discharged and nondischarged recruits who were matched for anti-social behavior. The results of this study can be applied to help recruits who can potentially benefit from counseling and remediation programs. The multiple R from the validation to the cross-validation samples (R = .24 vs. R = .18, .01 level of significance) showed shrinkage

from the lessened significance of Depression in the cross-validation sample.

In a similar fashion, Harrell, Harrell, McIntyre and Weinburg (1977) developed a regression model to predict earnings five and ten years after students had graduated with the Master of Business Administration (MBA) degree. The criterion variables were self-reported five and ten year earnings. Their earnings were, in turn, scaled and normalized within classes to become comparable between years. The sample of 266 was assessed and validation was checked against another set of 70 MBAs. The instruments used in this study were the Strong-Vocational Interest Blank (SVIB), Guilford-Zimmerman Temperment Survey, Individual Background Survey, Ghiselli's Self-Description Inventory, Leadership Opinion Questionnaire, Test of Imagination, Minnesota Multiphasic Personality Inventory, Personnel Problems Test, and the Public Opinion Questionnaire (a revision of the California F Scale). Thirty-one predictor variables showed significant relationships to the criterion variables. A High Earner's Scale was developed by item analysis of the SVIB, Guilford-Zimmerman Temperament Survey, Individual Background Survey and Self-Description Inventory. Second year GPA, boss-peer ratings, and friend-peer ratings accounted for additional variables in the study. Five and ten year earnings regression models predicted with a multiple $R = .46$ at five years and $R = .65$ at ten years with five-year earnings added as a predictor variable. These results suggest that the selection of MBAs should include the personality and interest variables, as well as scholastic-aptitude predictors, to establish minimum levels of completion of the program. The High Earner's Scale could be used to evaluate application materials for white males.

Additional research also indicates that better results can be obtained from homogenous groups that are used in split-group studies for retest validation of the regression model for prediction of vocational success criteria. For ex-

ample, Leitner and Sedlacek (1976) used seven personality and attitude measures; Personal Mastery Index, California Personality Inventory, The Press Test, Test for Social Insight, Situational Attitude Scale (Form B), The Dogmatism scale, and the California F Scale. Demographic variables including educational level, sex, race, and age to predict tenure, most commendations, most reprimands, most absenteeism, rating by top supervisors, paired comparisons peer ratings, and a self and immediate-supervisor rating on the same checklist form for 52 police officers were also used. The equations were double cross-validated using split samples and all the data were analyzed with zero-order Pearson Correlation and regression models. Multiple correlations from the first group ranged from .60 to .94 with a median of .79. The cross-validated correlations ranged from .16 to .90 with a median of .54 indicating reasonable stability in the prediction. All the multiple R's were significant at the .05 level except for highest peer rating in sample two. There seemed to be some conflicting findings in this study regarding individuals who differed in terms of authoritarianism. This research indicated that those who had high peer ratings tended to be authoritarian while those with the most commendations were not authoritarian. The authors suggested;

> We must decide on the performance characteristics of the campus force we want. Only then can we properly select people to succeed on those criteria. It would be inappropriate to select those predictors we feel are good without relating them to a standard of performance (p. 307).

Poland (1978) indicated that there was a need for a predictive validation design in which prediction scores are related to performance measures after some period of time has elapsed. It does appear, in summary, that a study of homogeneous groups within the success criteria that is not limited by outside constraints is possible. The studies seem to suggest that a combination of predictor variables to cover basic skills, intelligence, personality variables,

stress-coping behavior, and interests pattern might be a suitable method to predict job-performance. The purpose of the present study, therefore, was to attempt to predict the job-performance of police applicants from psychological instruments when the criteria are performance ratings by supervisory personnel.

CHAPTER 2

METHOD

Subjects

A total of 109 individuals who had made application to become police officers served as subjects. These individuals were chosen on the basis of two criteria: (1) the subjects must have taken the APT police test battery, including the Strong-Campbell Interest Inventory, and (2) each subject must have received at least one performance evaluation as a police officer. Each subject was administered the APT police test battery at a centralized location by a professional testing firm prior to becoming a police officer. This testing was done at the completion of recruiting, interviews, reference checks, and a polygraph examination. Further, all subjects were required to successfully complete a sixteen week training program administered by the police department under study.

The 109 subjects included 14 females and 95 males. There were 102 caucasions and 7 blacks in the study. The ages ranged from 20 to 33 with a mean age of 24.1. The educational level of the subjects ranged from grade 10 to five years of college with a mean educational level of 13.6 years.

Test Instruments

Tests. Each subject was given a battery of nine tests which included aptitude tests, and personality and interests inventories. The following instruments were used to test applicants that were eventually hired to police officer positions in the order of their administration:

1) Strong Campbell Interest Inventory, Consulting Psychological Press, Stanford, California.

2) The Personality Inventory, Consulting Psychological Press, Stanford, California.

3) Language Comprehension, Test Systems International, Wichita, Kansas.

4) Mathematical Thinking, Test Systems International, Wichita, Kansas.

5) The Oral Directions Test, The Psychological Corporation, New York City, New York.

6) Minnesota Clerical Test, The Psychological Corporation, New York City, New York.

7) The Atwell-Wells Wide Range Vocabulary Test, The Psychological Corporation, New York City, New York.

8) The Minnesota Multiphasic Personality Inventory, The Psychological Corporation, New York City, New York.

9) The Wonderlic Personnel Test, E. F. Wonderlic and Associates, Inc., Northfield, Illinois.

Although nine tests were administered to all police applicants, only seven tests were used in the current study. This is due to the fact that the original timed math and language tests (Qa & Va, Associated Personnel Technicians, Wichita, Kansas) were replaced midway through the study with an alternate test-publisher's tests (Language Comprehension & Mathematical Thinking, Test Systems International, Wichita, Kansas).

A standard set of instructions was read to each applicant by a qualified test administrator. See appendix A.

Performance Evaluations. The criteria which were used in this research came from a performance evaluation which is administered to all departmental members twice a year by the police department. This instrument was not specifically designed for police work but was adopted for the city wide employee evaluation by the community in which the police department operates.

The performance evaluation contains five variables which are rated on a five point scale by a single supervisor in the officer's division. Each of the points on the scale contains a short descriptor which differs for each variable

measured. The five variables include; task, initiative, quality of work, judgment and cooperation. The evaluation form also contains an overall rating and a section concerning remedial action. These later variables were not included in the present research as each was determined unmeasurable without introducing unacceptable error into the study.

The variable task differed from the other variables in that each supervisor was required to break down the variable task into seven seperate job duties. Each supervisor then rated the performance of the officers on each of the seven elements on a one to five Likert scale. The seven ratings were then averaged to produce a single rating for the task variable. See appendix B.

Procedure

Each subject completed an application with the police department under study. Each was then interviewed, asked to complete an obstacle course, received a background check and a polygraph test. At this point, if all the prerequisites had been met, the applicant was required to take a police test battery. The tests were given by a professional firm at a location external to the police department. The testing procedure consisted of an individual explanation concerning the purpose of the test and administration of the test battery by a staff member according to a standardized set of instructions. Once the tests were completed they were computer scored.

The applicants then completed a final interview and were placed in a sixteen-week-training program. At the conclusion of the training program the recruits then became officers and were assigned to various divisions within the department. After six months each officer receives a performance evaluation by the division supervisor. The results of each evaluation are entered into the officer's permanent file. This permanent file was used to determine the criteria and ratings which were used for this study. The ratings from

each of the five performance criteria on this evaluation were assigned numerical values according to a one to five Likert scale and were then converted to T-scores. The conversion of the performance ratings to T-scores was done to make statistical computation more meaningful and easier since the test data was already represented by T-scores. If more than one evaluation was found for a subject then the scores for each criterion were averaged and then converted to a T-score. More than one performance evaluation was possible because performance evaluations are given each six months and the subjects were chosen over a two year range. Each variable was then entered seperately into the computer to be run against the test scores in a multiple stepwise regression equation.

The average length of time for the test battery to be completed by each applicant was four hours. The applicants normally completed the tests in three to five hours, depending upon how quickly they could read.

CHAPTER 3

RESULTS

The files of the police department under study yielded 109 subjects that had been recruited, interviewed, tested, and hired to be police officers. Approximately half of the 109 subjects were assigned to a research group, designated RG (N=55). See Table 1 for range of scores, means, and standard deviations of 200 predictor variables on the RG group.

The remaining 54 subjects comprised the cross-validation group (CVG). Because of computer time constraints, cross-validation was performed only on the variable Cooperation. For clarity of presentation the results will be presented in five seperate sections: Analysis of Task variable, analysis of Initiative variable, analysis of Quality variable, analysis of Judgment variable, and analysis of Cooperation variable.

Analysis of Task Variable

A multiple step-wise regression was performed on Group RG with the criterion variable Task and 200 predictor variables taken from the standardized test instruments administered in this study. A series of 21 weights were calculated, plus a constant, in the 21st step. A multiple R of .976 and a multiple R^2 of .952 were obtained. An analysis of variance was performed at the 21st step and yielded significant results, $F(21,55) = 2.23$, $p < .01$ (see Table 2).

Table 3 shows the variables selected by the regression equation. All but one of the twenty-one variables come from the Strong-Campbell II. The scale, Dental Hygenist (F), shows the strongest B-coefficient (-.9178). These 21

variables predicted performance ratings (T-scores) on the criterion Task with the largest residual at 3.88 for the research group (see, Table 4).

Analysis of Initiative Variable

Multiple Pearson-Product Moment correlations were calculated to determine the relationship between the criterion Initiative and the 200 predictor variables taken from the standardized tests. As can be seen in Table 5, with corrected correlations for restriction of range, five variables yielded significant ($p < .05$) correlations.

A multiple step-wise regression was performed on Group RG with the criterion variable Initiative and the 200 predictor variables taken from the standardized tests. A series of 15 weights were calculated, plus a constant, in the 15th step. A multiple R of .932 and a multiple R^2 of .868 were obtained. An analysis of variance was performed at the 15th step and yielded significnace, F (15,39) = 2.49, $p < .01$ (see, Table 2).

The variables selected for the regression model are shown in Table 6. All regression model variables are from the Strong-Campbell II. The scale, Flight Attendant, shows the highest B-coefficient (1.083). The fifteen variables in the regression model predicted the performance ratings (T-scores) on the criterion Initiative. The residual range on this criterion was +/- 2.580 (see, Table 7).

Analysis of Quality Variable

Multiple Pearson-Product Moment Correlations were calculated to determine the relationship between the criterion Quality and the 200 predictor variables from the test instruments. The correlations were corrected for restriction of range and produced nine variables which are significant ($p < .05$). Five additional variables proved significant at the .01 level of confidence (see, Table 8).

A multiple step-wise regression was performed on Group RG with the criterion variable Quality and 200 predictor variables from standardized test instruments. A series of 24 weights were calculated at the 24th step. A multiple R of .964 and a multiple R^2 of .928 were obtained. An analysis of variance was performed at the 24th step and yielded significant results, F (24,30) = 2.15, $p < .01$ (see, Table 2).

The variables selected for the regression model are shown in Table 9. Twenty-one of these variables were taken from the Strong-Campbell II (SCII). The other three variables include the Verbal Language Test (LV), Clerical Numbers from the Minnesota Clerical test, and the Oral Directions Test (ODT). The Teaching scale from the SCII pulled the strongest B-coefficient from the regression model with a .9406. The 24 variables in the regression model predicted the performance ratings on the RG group (in T-scores) on the criterion Quality. The residual range on this criterion is +/- 1.947 (see, Table 10).

Analysis of Judgment Variable

Multiple Pearson-Product Moment correlations were calculated to determine the relationship between the criterion Judgment and the 200 predictor variables taken from the standardized tests. With corrected correlations for restriction of range, six variables yielded significant correlations at the .05 level of confidence (see, Table 11).

A multiple step-wise regression was performed on Group RG with the criterion variable Judgment and the 200 predictor variables taken from the standardized tests. A series of 24 weights and a constant were calculated in the 24th step. A multiple R of .966 and a multiple R^2 of .934 were obtained. An analysis of variance performed at the 24th step yielded significance, F (24,30) = 2.15, $p < .01$ (see, Table 2).

The variables selected for the regression model are shown in Table 12. Twenty-one of the 24 variables in the regression model come from the SCII. The other three include Mental Level (ML) which is an average of scores on the untimed math and language test; The Oral Directions Test (ODT), and from the Minnesota Multiphasic Personality Inventory (MMPI) the Hypomania scale (MA). The Flight Attendant (F) scale from the SCII pulled the strongest B-coefficient from the regression model with a (-.9126). The twenty-Four variables from the regression model predicted performance ratings (T-scores) on the RG group on the criterion Judgement. The average residual on this criterion at the 24th step is +/- 1.957 (see, Table 13).

Analysis of Cooperation Variable

Multiple Pearson-Product Moment correlations were calculated to determine the relationship between the criterion variable Cooperation and the 200 predictor variables taken from the standardized tests. The correlations were corrected for restriction of range and produced three variables which are significant at the .01 level of confidence (see, Table 14).

A multiple step-wise regression was performed on Group RG with the criterion variable Cooperation and the 200 predictor variables from the standardized tests. A series of 24 weights and a constant were calculated at the 24th step. A multiple R of .967 and a multiple R^2 of .935 were obtained at this step. An analysis of variance was performed at the 24th step and yielded significance, F (24,30) = 2.15, $p < .01$ (see,Table 2).

The variables selected for the regression model are shown in Table 15. All but four of the twenty-four variables in the regression model are taken from the SCII. The four variables are B4D (assertiveness) from the Bernreuter Personality Inventory, and the Lie (L) scale, Masculine-Feminine (MF) scale, and the Social Introversion (SI) scale from the MMPI. The Business

Management scale from the SCII exhibited the highest B-coefficient a 1.4304. The 24 variables plus the constant were used to predict performance ratings (T-scores) of police officers on the criterion Cooperation. The average residual on this criterion is +/- 1.783 (see, Table 16).

The regression model for cooperation was then used to calculate predicted performance ratings on the cross-validation group (N=54, see Table 17). A Pearson-Product Moment correlation was calculated to determine the relationship between the actual performance ratings and the predicted performance ratings. The correlation showed a definite relationship, r (53) = .344, $p < .01$. This result indicates the regression model on the criterion Cooperation can accurately predict performance ratings on a different sample.

CHAPTER 4

DISCUSSION

Obviously, there are many statistical questions which could be explored when using the multiple step-wise regression technique to predict the performance of police officers from the use of standardized psychological test instruments. However, the primary purpose of the present study was to investigate the possibility of utilizing actuarial methods to supplement police personnel procedures in the selection of police officers by predicting job performance based on the criteria of performance ratings.

The study of career choices by Holland (1963) showing interaction effects of environmental and personality variables for career roles suggested the use of standardized instruments to assess these variables. Within the constructs of vocational success, Crites (1969) suggested the need for careful selection of factors of job performance when using complex statistical procedures. Moreover, Guion (1965) suggested the use of multiple test batteries for the selection of personnel.

To capitalize on the experience of the past studies in this area, standardized psychological test instruments were employed by the present study to assess four basic areas (basic skills, interpersonal relationship styles, stress-coping behavior, and vocational interests). Also, multiple step-wise regression was chosen as the statistical tool by which to evaluate the resulting data.

Both Yerkes (1921) and Stewart (1947) have shown, with data from both World Wars, that intelligence measured by basic skills tests correlates posi-

tively with "success" on the "occupational ladder". This type of research and its results provided the basis for the present use of the quantitative and verbal-logical problem-solving tests as well as the vocabulary and oral direction tests for measures of basic skills in this research.

As can be seen from the data already considered, only one basic skills test (vocabulary) correlated highly with a criterion variable. However, several basic skills variables did prove valuable in the multiple regression prediction formulas. The Verbal-logic and clerical numbers, in addition to the Oral Directions Test (ODT), were among the first fifteen steps on the criterion Quality. Mental level and the ODT were included in the prediction formula for the criterion Judgment . These results suggest that a police officer's ability to understand the written language (reports), his ability to perceive numbers quickly and accurately (license plate recall) and his ability to follow oral directions (radio transmissions, briefings, etc.) are job-related elements which are judged important when rating the quality of job performance. Additionally, an officer's mental level and ability to follow oral directions are important variables when rating an officer's judgment. This study indicates that basic skills tests can be a valuable part of a selection process for police applicants.

Personality inventories such as the 16PF and the Bernreuter Personality Inventory have been shown to successfully predict job performance (Fabricatore, Azen, Schoentgen, & Snibbe, 1978; Walter, 1979). The Bernreuter Personality Inventory was used in the test battery to assess dominance, self-sufficiency, self-confidence, and desire for social contact. The first scale score from this instrument (self-sufficiency) was near the general population mean. During interviews it may be important to look for indicators that suggest the applicant is neither too independent or overly dependent, but rather a team-orientated individual. The Dominance scale score was one standard deviation above the

general population mean. This variable also was chosen by the multiple regression to be in the regression models on the criteria Cooperation and Task. In the background investigation evidence of leadership and perserverance might prove to be important selection criteria. The Social Self-Confidence scale also is one standard deviation above the general population mean. This variable was also significant in the Multiple Pearson-Product Moment correlation with the criterion variables Quality and Initiative. This behavioral characteristic might tend to show a person that is quite verbal and at ease in first time conversation or contacts with others. The Desire for Social Contact score was about three-fourths of a standard deviation above the mean of the general population, which indicates a good level of socialibility for the average police officer.

The Minnesota Multiphasic Personality Inventory (MMPI) was also used in the present test battery. This instrument was included because of its wide spread use among police departments in the selection procedure of police officers. Dalstrom (1975) also notes that the MMPI has been employed in a number of investigations to assess the attributes of successful applicants in such diverse occupations as salesmen, clerks, teachers, policemen, firemen, and forest rangers. These studies indicate a variety of interactions between the requirements of the job and personality characteristics. The MMPI was specifically included in the present battery to determine the relative importance that stress-coping behavior has when interacting with variables from basic skills, personality characteristics and vocational interest patterns in a multiple regression formula. Interestingly enough, a number of scales proved to be significant with the criterion variables in the study. Multiple Pearson-Product Moment correlations indicate significant MMPI scales on three of the five criteria. These MMPI scales include the L scale, the F scale, and Hysteria scale (HY). When rating the judgement of police officers the Hypomania scale (MA) was included

in the regression model. The L scale, Masculinity-Femininity scale (MF), and Social Introversion scale (SI), were included in the prediction equation on the criterion Cooperation. The adjustment pattern also showed a psychopathic deviance (PD) and MA elevations for the 55 research subjects. The PD score is one standard deviation above the general population mean. Interviewers may want to look for some indication of mild tendencies to ignore social codes and rules, which may be exhibited through school or personnel records. The high MA behavior is exhibited through excess energy directed to many outside activities, in addition to working a eight hour day. The results of this research project suggest that the MMPI is a useful instrument in the selection of police officers.

Based on the results of this research, the instrument which provided the majority of variables with the most significance came from the Strong-Campbell Interest Inventory (SCII). The variables from this instrument accounted for approximately three quarters of the total variables selected for each regression model. The predictive scales from the SCII which were included in three or more prediction equations across the criterion variables are as follows: Home Economic Teacher (F), Characteristics (Indifferent Preference), Public Speaking, Business Management, Sales, Office Practices, Dentist (F), Flight Attendent (F), and Buyer (F). It may be important to review background information such as past employment, hobbies, and to listen carefully in the interview of police applicants to find evidence of interests in these areas. It must be noted that high scores on the above scales indicate that the testee has responded in a similar manner to the items on the SCII as successful individuals in the field which the given scale represents. Therefore, a high score on a scale does not necessarily suggest a high interest in that specific field as much as it indicates similar interests with individuals within the represented field. This fact complicates the interpretation of results using multiple regression and caution

must be exercised when interpreting the data from the present study. The results of this research, however, do clearly indicate that the SCII is accounting for a large amount of the variance in the regression models and should remain in the police test battery.

Although the present investigation has yielded clearly significant results, there are a few methodological concerns which require attention. This study investigated a limited number of police applicants. It is recommended that a wider sampling of police personnel be taken in this particular police department. It may also be interesting to sample additional police departments to find if there are any significant differences between departments.

The instrumentation, although adequate to supply the variables needed in the regression models to accurately predict performance, may need to be expanded to replace the weaker predictor variables to increase the accuracy of the results. Instruments such as the 16PF, the California Assessment Questionnaire, the Motivational Analysis Test, and additional mental ability tests may help to further define the differences between successful and unsuccessful police applicants.

One of the most important concerns of this research regards the selection of the criteria. The subjects in this study were rated on a performance-evaluation form which is administered to several different departments within the city. Hence, the criteria are generalized and somewhat subjective. Although several visits with police department personnel indicated the criteria did measure aspects required on the job description, it is still arguable as the whether the chosen criteria are actually job-related. To avoid this problem in future studies it is suggested that a thorough job-analysis first be conducted. Also, the development of a better performance evaluation system, such as behaviorally anchored rating scales, might be employed to evaluate police officers.

One other related concern deals with the number of supervisors who rate the officers. Only one supervisor from each division was used to evaluate an officer in this study. To insure greater reliability in future investigations it is recommended that a minimum of three supervisors rate each officer. The above suggestions should help to provide more reliable and valid results in future studies.

One final suggestion would be to cross-validate with seperate samples to insure that the test instruments can appropriately be used for selecting police officers. Although the results of the cross-validation on the criterion variable Cooperation in this study proved to have a definite relationship between the two samples, cross-validation on the other four criteria would help to show whether the multiple regression models were capitalizing upon error. Ideally, a double cross-validation would be the method which would provide the most acceptable statistics.

Can the job-performance of police applicants be predicted from psychological instruments when the criteria are from supervisory performance ratings? The results from the present study seem to indicate that the answer to this question is 'yes'. All five of the criteria ratings were able to be predicted from the multiple regression models developed from the 200 predictor variables.

The implications of this study are many. Police departments may be able to generalize the results of this research and apply the battery to their own selection process. The use of a validated test battery in the selection process can aid interviewer's by making them aware of what personality characteristics and basic skills are important in police applicants. Interviewers could then gear other selection elements (interviews, background checks, polygraph tests, etc.) to help screen for these variables. Instead of using general impressions of an individual's personality, the personnel department could focus

on specific characteristics such as assertiveness and self-confidence. When conducting a background check, investigators can now search for evidence of the variables which have proved significant. Using the validated test battery to give direction to the other selection elements may also make the job of validating the entire selection process easier. Another possiblity is to aid in the training of borderline applicants. Through testing one could determine weaknesses and focus remedial efforts in the weak areas during the training program. Finally, the positive results obtained by the use of multiple regression in this research should increase the possibility of further use of multiple regression in other areas of the selection process.

However, it is apparent that many facets of using multiple step-wise regression to predict job-performance need further exploration. Such investigations are needed in the areas of refined instrumentation and experimental design. However, one must remember that the use of multiple step-wise regression bas been limited in the past due to inadequate data processing equipment and has only recently become practical for many researchers. Also, early studies such as Thorndike (1949) and E.L. Thorndike (1934) reported largely negative results, which in turn, deterred investigators from using this statistical tool. Hopefully the positive results from Leitner and Sedlacek (1976) and the present study will encourage others to conduct further research in this area.

In a broader sense, it is hoped that the results of this study will help to further elaborate the importance of conducting research to improve the selection process of police officers, given the importance of their role in society. It would appear that if we can make police department personnel aware of objective and predictive methods of selection, through continued research, then we may be able to reduce bias in the selection process while increasing the quality of the police department.

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APPENDIX A

Test Battery Instructions

I

THE PERSONALITY INVENTORY

Now pass out the test folder and answer sheet for the PERSONALITY INVENTORY and read the following instructions:

Please print your name, date, and the name of the company for whom you are being tested on the answer sheet.

The questions on this blank are intended to indicate your interests and attitudes. It is not an intelligence test nor are there any right or wrong answers.

Please turn over the answer sheet.

On the answer sheet there is a "YES", "NO", and a QUESTION MARK for each question number. If your answer to the question is "YES", darken the space under the word "YES" for that question number. If your answer is "NO", darken the space under the word "NO", for that answer. If you cannot say "YES" or "NO", darken the space under the question mark. We ask that you work rapidly since you will have only 18 minutes to answer the 125 questions. Do not study over them but put down your first frank reaction. Be sure you are looking at question number 1 in the test booklet.

READY . . . . . GO

Allow 18 minutes for this test. Most applicants will complete the test in 12 to 15 minutes. As soon as the applicant has finished, pick up the answer sheet and in the upper left hand corner record the number of minutes required to finish the test. For example, 12' 45".

READY . . . . . STOP

Collect Personality answer sheets.

LANGUAGE COMPREHENSION

Now hand out the LANGUAGE COMPREHENSION TEST and read the following instructions:

Please write your name and the date on the top of the test blank.

This is a test to see how well you can solve problems involving words and ideas. We want you to work as fast as you can, because your score will be the number you get correct in the time allowed. You probably will not finish the test, but work as rapidly and as accurately as you can.

To show you how to work the test, look at the example given. Which word has the opposite meaning of happy? The correct answer is sad. Circle the correct letter at the right of the page.

If one of the questions stumps you, go on to the next. As soon as you finish the front, go on to the back. There are 40 questions.

If you have no questions, you will be told when to start. This is a timed test. You are expected to complete as many questions as you can in 10 minutes.

READY . . . . . GO

Allow 10 minutes for completion of the test.

READY . . . . . STOP

Pick up the Language Comprehension test.

MATHEMATICAL THINKING

Distribute the MATHEMATICAL THINKING test and read the following instructions:

> Please write your name, the date and circle the last year of your completed formal education in the spaces provided at the top of the test blank.
>
> This is a test to see how well you solve arithmetic problems. To show you how to answer the questions, look at the sample question. "One dozen is equal to?" The answer is 12, so you circle b to the right of the page.
>
> If one question stumps you, go on to the next. You probably will not finish in the 10 minutes we will give you, but work as rapidly and as accurately as you can. You may do figuring in the margins. As soon as you finish the front, go on to the back. There are 40 questions.
>
> READY . . . . . GO

Allow 10 minutes for completion of the test.

> READY . . . . . STOP

Pick up the Mathematical Thinking test.

ORAL DIRECTIONS TEST (ODT)

Fill in the blanks at the top of the answer sheet:

1. Print your last name, then your first name and middle initial.
2. Check the appropriate box, male or female.
3. Write today's date.
4. Circle the highest grade you completed in school.

SAY: "This is a test to see how well you follow oral directions. All of the instructions are given from a tape recording. The gentleman on the tape will tell you exactly what to do. Put all of your answers on the answer sheet after the correct number. If you need to change an answer, simply erase it and put in the correct one. Listen carefully, and do just as you are directed."

START TAPE. Takes approximately 14-15 minutes.

5

MINNESOTA CLERICAL EFFICIENCY TEST

Pass out the MINNESOTA CLERICAL EFFICIENCY TEST and read the following instructions:

Please write your name in the space provided at the top of the page.

About a fourth of the way down the page you will notice the word "Instructions". Please read the paragraph under that carefully to yourself.

Allow time for applicant to read paragraph.

Below the paragraph you have just read, you will find four examples that have been worked according to the instructions in the paragraph. Would you look at those please.

Allow a few seconds.

At the bottom of the page there are four examples for you to work according to these instructions. Will you do that please, but do not open the booklet until I give you the signal to do so.

Be certain that they have checked the second pair of numbers and the first pair of names.

Test One consists of two pages. There are 100 items on each page. As soon as you finish the first page, go on to the second. Check if the pairs are the same, leave the space blank if they disagree.

You probably will not finish in the eight minutes we will give you, but work as rapidly and as accurately as you can. Would you open your booklet please so that both pages are showing.

Check if the pairs are the same, leave the space blank if they disagree. Be sure you are looking at number 1.

READY . . . . . GO

After 8 minutes exactly, say;

READY . . . . . STOP. Draw a line please under the last pair you were looking at.

Now will you close your booklet so that it says, "Ready for Test 2."

MINNESOTA CLERICAL TEST - 2

Test 2 is paired names instead of numbers. Again work as rapidly and as accurately as you can. You will have 7 minutes.

Would you open your booklet please to Test 2. Be sure you are looking at question number 1.

READY . . . . . GO

After exactly 7 minutes, say:

READY. . . . . STOP. Draw a line please under the last pair you were looking at.

Sometimes applicants have a tendency to start at question 101, rather than number 1 and during the first few seconds you may wish to observe their performance to be certain that they have started in the right place.

Collect the Minnesota Clerical Efficiency test.

WIDE RANGE VOCABULARY TEST

Now pass out the WIDE RANGE VOCABULARY TEST. Then say:

Please write your name in the space provided at the top of the page.

Notice the sample question "A". "A street is a . . . field . . . hill . . . road . . . stream . . . path." Road is the best answer, so draw a circle around the word "road".

You will notice the word "street is in bold type. For each word in bold type, there are five (5) words to the right. You are to select the answer that best illustrates or defines the key word or words in bold type and circle it. There are 45 items on the front and 55 on the back, so be sure to work both sides of the test. The last 10 to 15 are rather difficult, but do not let that worry you, they are supposed to be.

Answer <u>every</u> question by circling one of the 5 words at the right. Even if you are unsure about the answer, make a guess. There is no penalty for guessing wrong, so answer all the questions. There is no time limit, but it shouldn't take you over 12 or 15 minutes.

As this measurement is collected, be certain that all items have been answered. If a question has been omitted, please return it to the applicant with instructions to guess, rather than omit the item.

7

VOCATIONAL INTEREST BLANK

ow pass out the test folder and answer sheet for the VOCATIONAL INTEREST LANK. Then say:

Put your name in the space provided on the answer sheet. Turn to the next measurement in the test folder, THE STRONG-CAMPBELL VOCATIONAL INTEREST BLANK.

This is an interest test. We want you to indicate your likes and dislikes. Will you open the booklet please.

Part I deals with occupations. For each occupation listed below, you are to indicate whether you would like to do that type of work, dislike it, or be indifferent to it. If you think you would like to do the kind of work involved in the occupation listed, blacken the space on the answer sheet under the letter "L". If you think you would dislike it, blacken the space on the answer sheet under "D".

If you cannot say whether you would like it or dislike it, blacken the space under "I" indicating your indifference to it. However, you should only mark the "I" to indicate indifference when you really have no choice. If you feel you would slightly like the occupation or slightly dislike it, make that choice. Do not be too quick to mark the "I" for indifference.

In thinking of each of these occupations, disregard any consideration for salary, social prestige, or any special training or ability that may be necessary to perform the duties. We are only interested in knowing if you would like the kind of activity involved in the occupation listed, or dislike it, either for a very short period of time or indefinitely.

Before you start, read the instructions that precede Part I and as you come to each new part, read those instructions carefully. Work rapidly, answer every question, and put down your first frank reaction. Be sure you are looking at question number I. You may begin.

his test does not require close supervision, so you can leave the applicant lone, returning in about forty minutes to see if he has finished. When he s through, glance through the test to make sure all questions have been nswered.

MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Now pass out the answer sheet for the MINNESOTA MULTIPHASIC PERSONALITY INVENTORY. Then say:

Put your name in the space provided. Then turn to the next section of your test folder.

This is a personality inventory. It has no right or wrong answers. It is very in-depth as there are 502 questions. It will probably take you about an hour to complete this test. It is best if you go with your first reaction to each question, but there is no hurry as this test is untimed.

Some of the questions on this inventory are personal. Nevertheless, research has shown that the inventory has a definite relationships to certain types of work situations. More important, the scores that come from the inventory, when interpreted by persons with knowledge of the research, permit employers to use the findings to improve performance and accelerate the training of the individual.

To preserve the confidentiality of your answers, this test is first computer scored and then it is destroyed. The computer will print out statistical patterns which relate to the job research. No one will ever see the way you answer individual questions.

On the other hand, in taking inventories of this type, most people quite naturally want to "put their best foot forward". They tend to answer the questions in the way they think people should behave rather than in the way they actually do behave. We are aware of this tendency and even allow for it. What we ask of you is not to get carried away with it. If you do, you will end up looking like a saint; and since the odds are against any one of us being a saint, we would have to request that you take this test again.

Now look at question No. 45. It reads, "I do not always tell the truth". We do not mean to imply that you would not tell the truth in an important situation. What we are pointing out is that it is almost humanly impossible to always tell the truth. For example, someone may tell their mother-in-law that her hat looks good when it does not, or parents may tell their children there is a Santa Claus. Most people would answer question No. 25 True.

You may leave questions blank if they do not apply to you. We ask that you leave no more than five questions blank to maintain the validity of the test. Usually there are no more than one or two questions which will not apply to an individual.

Start with question No. 1 and answer the questions through No. 502. Go ahead and start.

Occasionally applicants will have difficulty answering some of the questions true or false. Should they question you as to whether they should answer true or false, we suggest that you tell them to answer the question in a way that is "most" generally true of them. After the subject has completed about

PERSONNEL TEST

Pass out the WONDERLIC PERSONNEL TEST and say:

Put your name in the place provided at the top of the page.

This is a test of problem-solving ability. It contains various types of questions. Look at the first sample. "Reap is the opposite of 1. obtain . . . 2. cheer . . . 3. continue . . . 4. exist . . . 5. sow." "Sow" is the best answer, it is numbered "5", so all you have to do is put the number "5" between the brackets at the end of the line. It is not necessary to underline.

Look at number two. "paper sells for 23¢ per pad. What will 4 pads cost?" The answer is 92¢, so all you have to do is put 92¢ between the brackets at the end of the line.

Look at the next example, "MINER (M-I-N-E-R spell out), MINOR (M-I-N-O-R). Do these words have 1. similar meaning, 2. contradictory, 3. mean neither the same nor the opposite." They mean neither the same nor the opposite which is number 3, so all you have to do is put the number 3 between the brackets at the end of the line.

When the answer to a question is a letter or number, put the letter or number between the brackets at the end of the line. All letters should be printed.

Open your booklet to question 1. Accuracy is of more importance than speed and we would like for you to attempt all 50 of the questions. There is no time limit, but do not spend too much time on any one problem. Go ahead.

Scratch paper may be needed, or the applicant can use the back page of the test.

APPENDIX B

Performance Evaluation

SECTION I

CITY OF WICHITA

Performance Appraisal Ranges 620 and Above

(to be completed by the supervisor prior to meeting with the employee)

_____ Employee Number: _____ Probationary Period Ends: _____ (if applicable)

nt: _____ Division: _____ Position _____

is to be completed and returned to Personnel no later than _____ , 19 ____ . Merit Consideration Date _____

major duties and responsibilities performed by the employee. (If applicable, E.E.O. compliance efforts should be included as one of the employee's duties and responsibilities.)

the employee's performance of each duty and responsibility using the following scale:

Outstanding	Exemplary performance far exceeding performance criteria.
Exceeds Expectations	Performance exceeds the level supervisor expects.
Meets Expectations	Generally meets supervisor's expectation on performance criteria.
Below Expectations	Erratic performance on criteria, falling short of that normally expected requires remedial attention.
Unsatisfactory	Unacceptable performance that must receive immediate attention.

	B Rating

ction only. Support your rating regarding EEO compliance efforts with comments about EEO goals attained and/or goals that have not been met.

sider each of the following factors separately when arriving at rating decisions. Give specific examples to support each rating

ITIVE

es employee resourcefulness in handling assignments without detailed instructions; measures valuable suggestions. Consider whether employee is a self-starter on the job eks additional tasks and/or looks for ways to improve on job assignments.

☐	☐	☐	☐	☐
ent; seeks additional often makes valuable ions.	Occasionally offers suggestions and seeks additional tasks.	Goes ahead on regular work willingly, but offers suggestions only when asked	Slow to start, usually waits for directions.	Always waits for directions, never offers suggestions.

ples/Comments:

LITY OF WORK

es accuracy, thoroughness, effectiveness, and neatness of work. Consider not how much work is done or how fast, but how well the work is done

☐	☐	☐	☐	☐
istently does exceptional rely makes mistakes.	Usually does good job; very seldom makes mistakes	Usually does satisfactory job with few mistakes	Work is often low quality; careless, makes more mistakes than normal.	Work is usually poor or quality is not acceptable; constantly makes mistakes.

ples/Comments

NT

mployee's ability to think clearly and make logical decisions based on sound analysis and application of knowledge.

☐	☐	☐	☐	☐
clear and concise; ilent judgment in king.	Judgment and logic in decision-making; exceeds expectations.	Demonstrates expected judgment and logic in decision-making.	Frequently has difficulty analyzing facts, seldom makes logical decisions.	Judgment cannot be relied upon; thinking is usually confused.

/Comments:

ATIVENESS

employee's willingness and ability to establish effective working relationships with other city employees and the public

☐	☐	☐	☐	☐
l skill in human promotes harmony; dy to help.	Gets along well with others; helps solve conflicts.	Works with others with few problems, occasionally has conflicts with others	Conflicts with others occur more often than they should.	Frequently ceuses friction with others

s/Comments:

al overall rating should reflect the majority of ratings given for the major job duties and the four performance factors. Rate employee's overall performance using the scale d in 8.

LL RATING _____

cate below specific examples of performance strengths. Include additional responsibilities the employee has assumed since the last evaluation or will rtake within the next rating period.

cate below specific examples of performance weaknesses.

SECTION II

(to be completed by the supervisor and employee together during the performance appraisal discussion)

EDIAL ACTIVITIES: Actions which supervisor and employee have agreed upon to correct performance weaknesses.

ELOPMENTAL ACTIVITIES: Actions which supervisor and employee have agreed upon to further develop employee capabilities and to prepare for er responsibility.

MENTS/REACTIONS OF EMPLOYEE: _____
be completed by employee if desired.)

ot sign this form until all sections are completed and Section II has been discussed with the employee.

oyee's Signature _____ Date _____ Supervisor's Signature _____ Date _____

ort Director _____ Date _____ Department Director _____ Date _____

APPENDIX C

Tables

TABLE 1

Range, Means, and Standard Deviations (SD) of Standard Test Instrument Predictor Variables and Criterion Variables for the Reasearch Group (N=55)

	Variable	Low	High	Mean	SD
1	ML	47	71	58.45	06.87
2	LQ	36	70	51.05	10.29
3	LV	49	77	65.13	05.71
4	VOC	43	75	57.84	06.23
5	CLNO	00	83	59.29	12.36
6	CLNA	40	79	59.45	08.90
7	ODT	20	72	65.82	09.69
8	B2S	33	65	51.55	06.93
9	B4D	37	70	59.40	07.26
10	F1C	37	68	59.47	06.49
11	F2S	43	76	57.78	06.81
12	L	37	56	45.35	04.55
13	F	43	62	50.82	04.61
14	K	36	75	56.03	10.06
15	HS	35	63	46.96	05.92
16	D	32	70	46.36	06.95
17	HY	34	69	52.02	07.91
18	PD	45	79	60.92	08.07
19	PA	32	78	54.60	10.67
20	PT	40	72	52.62	06.49
21	SC	00	75	53.44	11.21
22	MA	40	80	62.87	09.74
23	MF	38	72	56.22	07.87
24	SI	09	43	20.51	08.06
25	REALISTIC	43	75	59.87	09.35
26	INVESTIGATIVE	35	69	53.71	09.14
27	ARTISTIC	26		45.33	11.51
28	SOCIAL	32	73	54.87	11.65
29	ENTERPRISING	35	77	53.87	11.81
30	CONVENTIONAL	38	79	54.96	10.28
31	A.O.	05	71	42.09	14.82
32	I-E	23	73	43.67	11.04
33	OC. LP	70	95	41.67	21.82
34	OC. IP	00	64	17.22	18.06
35	OC. DP	05	79	41.22	19.57
36	SS. LP	08	99	52.31	22.63
37	SS. IP	00	69	20.40	21.38
38	SS. DP	00	75	27.29	19.45

TABLE I - Continued

	Variable	Low	High	Mean	SD
39	Act. LP	16	96	53.45	20.38
40	Act IP	00	75	21.05	19.41
41	Act DP	20	55	25.58	15.29
42	Amuse LP	13	95	48.87	21.06
43	Amuse IP	00	75	21.55	19.44
44	Amuse DP	00	64	29.69	18.22
45	TP-LP	08	99	52.60	22.31
46	TP-IP	00	79	30.67	23.71
47	TP-DP	00	79	16.75	16.25
48	Pref. LP	10	63	38.04	10.78
49	Pref. IP	00	70	17.69	14.18
50	Pref. DP	20	67	44.25	10.02
51	Char. LP	21	93	67.23	17.51
52	Char. IP	00	79	15.36	14.96
53	Char. DP	00	50	17.16	12.50
54	Agriculture	36	68	55.07	08.73
55	Nature	26	67	48.45	11.19
56	Adventure	53	71	62.13	48.50
57	Military Act.	45	76	67.95	09.32
58	Mechanical	33	72	56.56	10.01
59	Science	34	69	54.31	09.12
60	Mathematics	31	67	49.69	10.99
61	Medical Science	29	68	53.64	10.64
62	Medical Service	33	76	55.60	11.20
63	Music/Dramatics	26	73	44.15	10.94
64	Art	26	68	43.78	11.57
65	Writing	26	66	45.44	11.93
66	Teaching	28	67	47.35	10.96
67	Social Service	35	69	53.29	09.84
68	Athletics	38	70	59.49	07.83
69	Domestic Arts	27	75	45.49	11.99
70	Religious Activities	31	68	55.05	11.78
71	Public Speaking	33	71	55.22	10.43
72	Law/Politics	38	69	56.55	08.47
73	Merchandising	31	72	50.05	11.59
74	Sales	37	72	51.95	11.18
75	Business Mgt.	32	72	53.31	11.64
76	Office Practices	36	75	49.60	10.03
77	Farmer (M)	02	54	26.02	11.77
78	Instrum. Assem (F)	09	54	33.22	10.13
79	Voc. Ag. Teach. (M)	06	53	26.24	11.27
80	Dietitician (F)	20	71	40.40	10.98
81	Police Officer (M)	28	69	50.09	10.60
82	Highway Patrol (M)	23	68	43.55	10.76
83	Army Officer (F)	31	74	49.18	09.00
84	Phys. Ed. Teach. (F)	07	61	42.96	10.01

TABLE 1 - Continued

Variable	Low	High	Mean	SD
85 Skilled Crafts (M)	-5	59	29.47	12.63
86 Forester (M)	14	62	38.15	11.73
87 Rad. Tech. (F)	16	69	40.96	11.67
88 Merchant Marine (M)	18	56	40.67	76.01
89 Navy Officer (M)	10	66	38.64	13.72
90 Registered Nurse (M)	15	64	42.35	11.98
91 Veterinarian (M)	-1	53	23.53	11.85
92 Cartographer (M)	11	67	43.82	11.00
93 Army Officer (M)	20	62	42.16	10.85
94 Air Force Officer (M)	15	64	37.80	13.28
95 Occ. Therapist (F)	08	68	36.31	15.00
96 Engineer (F)	11	59	36.72	12.25
97 Engineer (M)	17	64	39.67	12.55
98 Chemist (F)	-6	61	25.29	13.08
99 Reporter (F)	10	49	27.82	09.93
100 Reporter (M)	11	52	29.44	11.05
101 English Teacher (F)	-2	50	22.47	14.56
102 English Teacher (M)	14	62	32.64	12.48
103 Nurse, Reg. (F)	14	64	35.55	13.63
104 Physical Ther. (M)	15	72	42.53	14.03
105 Nurse, Lic. Pract(M)	19	57	36.24	08.71
106 Social Worker (F)	-3	61	34.75	16.14
107 Social Worker (M)	02	60	30.95	15.41
108 Priest (M)	09	61	33.65	14.64
109 Dir. Christian Ed. (F)	-7	59	24.13	17.59
110 YMCA Staff (F)	05	67	40.33	14.13
111 Minister (M)	01	62	31.35	15.79
112 Physical Science (M)	-9	44	18.13	10.28
113 Medical Tech. (F)	17	67	38.73	11.37
114 Pharmacist (F)	18	64	37.15	11.34
115 Dentist (F)	14	61	34.47	10.28
116 Dentist (M)	18	60	36.13	10.90
117 Dental Hygienist (F)	12	53	34.78	10.13
118 Physical Ther. (F)	17	70	44.24	13.09
119 Physician (M)	02	61	31.56	13.61
120 Math/Sci. Teach. (M)	16	61	36.38	12.06
121 Math/Sci. Teach. (F)	25	60	40.42	07.31
122 Dietitian (F)	08	66	32.85	15.34
123 Medical Tech. (M)	08	60	34.20	14.46
124 Optometrist (M)	03	58	32.71	13.43
125 Computer Prog. (F)	13	61	34.56	10.96
126 Computer Prog. (M)	10	63	37.31	13.57
127 Mathematician (F)	-5	46	22.44	10.00
128 Mathematician (M)	-9	39	16.25	09.56
129 Physicist (F)	-9	58	22.53	11.87
130 Biologist (M)	06	47	23.96	09.51
131 Veterinarian (F)	16	61	32.82	09.09

TABLE 1 - Continued

Variable	Low	High	Mean	SD
132 Optometrist (F)	21	57	39.38	08.94
133 Physician (F)	11	62	34.72	10.16
134 Social Scientist (M)	06	46	26.04	09.85
135 College Prof. (F)	23	58	38.11	07.57
136 College Prof. (M)	17	49	31.87	07.60
137 Speech Path. (F)	11	52	30.25	10.44
138 Speech Path. (M)	09	63	33.71	12.94
139 Psychologist (F)	-1	48	24.25	11.34
140 Psychologist (M)	-2	47	24.67	12.52
141 Language Int. (F)	07	41	22.16	08.82
142 Architect (M)	-9	48	16.02	12.16
143 Ad. Exec. (F)	20	53	33.93	07.44
144 Artist (F)	05	48	22.93	10.82
145 Artist (M)	03	41	20.38	09.15
146 Art Teacher (F)	-9	57	10.65	17.84
147 Photographer (M)	01	42	20.11	09.31
148 Musician (F)	-1	55	22.13	11.26
149 Musician (M)	08	49	25.75	09.78
150 Enterrainer (F)	03	37	21.55	08.36
151 Interior Decorator(F)	-9	31	33.82	11.21
152 Interior Decorator(M)	06	35	20.65	06.63
153 Ad. Exec. (M)	07	57	31.09	11.84
154 Language Teacher(F)	-9	42	15.91	13.35
155 Librarian (F)	07	51	25.89	13.12
156 Librarian (M)	-9	42	19.73	10.76
157 Elem. Teacher (M)	03	72	39.65	16.64
158 Elem. Teacher (F)	07	63	29.60	13.92
159 School Super. (M)	08	63	38.25	14.05
160 Public Admin. (M)	17	67	42.73	13.21
161 Guidance Coun (M)	10	63	37.93	13.65
162 Rec. Leader (F)	09	66	40.69	13.39
163 Rec. Leader (M)	06	65	38.89	14.51
164 Guidance Coun (F)	02	61	33.09	15.70
165 Soc. Science (F)	16	56	35.98	12.57
166 Soc. Science (M)	16	59	38.71	10.31
167 Personnel Dir. (M)	08	65	40.24	13.36
168 Dept. Store Mgr.(M)	11	59	36.49	13.24
169 Home Econ. (F)	-9	55	12.85	17.19
170 Flight Attn. (F)	07	61	31.44	11.77
171 Ch. Of Comm. (M)	12	61	38.09	12.45
172 Sales Manager (M)	-4	49	27.64	12.31
173 Life Ins. Agent (M)	08	57	32.16	11.66
174 Life Ins. Agent (F)	02	57	33.45	12.19
175 Lawyer (F)	21	58	37.62	09.43
176 Lawyer (M)	13	52	32.05	10.92
177 Computer Sales (M)	-9	60	27.05	15.23

TABLE 1 - Continued

Variable	Low	High	Mean	SD
178 Inv. Fund Mgr. (M)	07	48	24.85	09.34
179 Pharmacist	04	61	34.71	13.70
180 Buyer (F)	17	58	32.89	09.47
181 Buyer (M)	01	57	27.09	15.88
182 Credit Manager (M)	08	66	36.16	14.89
183 Funeral Dir. (M)	09	58	35.36	11.60
184 Realtor (M)	11	51	32.82	08.92
185 Agribusiness Mgr.	03	56	25.29	10.78
186 Purchasing Agent(M)	16	64	38.73	13.91
187 Chiropractor (M)	07	70	41.51	13.31
188 Accountant (M)	-3	45	21.38	13.25
189 Banker (F)	20	52	33.65	08.20
190 Banker (M)	10	52	29.95	08.64
191 Credit Manager (F)	14	61	35.69	10.94
192 Dept. Store Sales (F)	07	53	27.27	10.83
194 Business Ed. (F)	-6	44	21.82	10.43
194 Business Ed. (M)	04	66	33.82	14.87
195 Exec. Housekeep (F)	06	65	32.89	12.72
196 Accountant (F)	10	52	30.31	12.18
197 Secretary (F)	09	49	26.69	09.53
198 Dental Assist. (F)	07	56	32.91	10.75
199 Nurse, Lic. Pract.	09	61	32.78	12.92
200 Beautician (F)	12	51	30.51	09.86
201 Cooperation	28	70	49.95	09.28
202 Judgment	28	56	47.64	08.07
203 Quality	28	58	48.69	08.47
204 Initiative	28	58	48.53	08.59

TABLE 2

Summation of Regression Models, Multiple Correlation Coeficients F-Values, and Significance Levels

Regression Model	Mult. R	Mult R^2	F	Degrees of Freedom	Sign. Level
TASK	.9758	.9522	31.32	21,55	.01
QUALITY	.9635	.9284	16.21	24,55	.01
COOPERATION	.9671	.9354	18.11	24,55	.01
JUDGMENT	.9662	.9336	17.60	24,55	.01
INITIATIVE	.9318	.8682	17.14	15,55	.01

TABLE 3

Multiple Regression Model Variables and B - Coefficients on the Criterion Task

	Variable	B - Coefficient
B4D	Dominance	0.1583
37	School Subjects (IP)	- 0.2549
44	Amusements (DP)	0.2581
48	Preferences (LP)	- 0.4803
49	Preferences (IP)	- 0.3232
53	Characteristics (DP)	- 0.0828
77	Farmer (M)	- 0.1768
79	Voc. Ag. Teacher (M)	- 0.4455
90	Reg. Nurse (M)	0.6026
99	Reporter (F)	- 1.5934
100	Reporter (M)	- 0.3812
115	Dentist (F)	0.5512
117	Dental Hygenist (F)	- 0.9178
121	Math/Science Teacher (F)	- 0.6686
127	Mathematician (F)	- 0.4867
131	Veterinarian (F)	0.2564
132	Optometrist (F)	0.1208
171	Chamber of Commerce (M)	0.3203
190	Banker (M)	- 0.1068
195	Exec. Housekeeper (F)	- 0.7184
198	Dental Assistant (F)	- 0.7306

TABLE 4

Predicted Values from Multiple Regression Model on the Variable Task

Case	Actual	Predicted	Residual
1	50.00	47.91	2.087
2	49.00	47.76	1.231
3	49.00	47.99	1.003
4	50.00	51.02	- 1.020
5	48.00	49.66	- 1.660
6	50.00	50.70	- 0.702
7	52.00	53.99	- 1.997
8	51.00	48.90	2.091
9	52.00	52.73	- 0.731
10	50.00	46.11	3.880
11	51.00	52.28	- 1.286
12	46.00	47.79	- 1.793
13	49.00	48.92	0.074
14	50.00	46.74	3.256
15	49.00	48.22	0.771
16	28.00	25.92	2.073
17	28.00	29.77	- 1.772
18	50.00	50,37	- 0.370
19	51.00	50.37	0.634
20	51.00	51.70	- 0.707
21	50.00	48.39	1.606
22	50.00	48.68	1.313
23	52.00	51.63	0.365
24	53.00	52.04	0.951
25	50.00	49.22	0.776
26	50.00	49.27	0.726
27	52.00	55.07	- 3.070
28	47.00	49.27	- 2.278
29	50.00	48.66	1.313
30	51.00	51,47	- 0.470
31	51.00	50.49	0.510
32	53.00	54.14	- 1.147
33	28.00	28.24	- 0.240
34	51.00	50.42	0.572
35	50.00	52.74	- 2.747
36	48.00	47.29	0.707
37	50.00	51.65	- 1.658
38	28.00	29.33	- 1.330
40	50.00	52.05	- 2.052

TABLE 4 - Continued

Case	Actual	Predicted	Residual
41	50.00	52.24	- 2.242
42	53.00	51.79	1.208
43	50.00	50.60	- 0.609
44	51.00	49.40	1.600
45	52.00	53.57	- 1.576
46	28.00	31.15	- 3.157
47	28.00	29.45	- 1.459
48	50.00	46.40	3.596
49	50.00	49.57	0.428
50	50.00	48.22	1.777
51	28.00	28.50	- 0.503
52	50.00	50.26	- 0.265
53	50.00	48.74	1.251
54	51.00	50.49	0.505
55	49.00	50.30	- 1.308

TABLE 5

Multiple Pearson-Product Moment Correlations Between the Criterion Variable Initiative and Significant Predictor Variables from the Research Group (N=55)

Name	Raw	Corrected r's
08 B2S	.2368	.3319*
13 F	.1344	.2824*
131 Veterinarian (F)	.2754*	.3006*
132 Optometrist (F)	.2532	.2808*
169 Home Ec. Teach (F)	.3203*	.1930
170 Flight Attendant (F)	.3160*	.2723*
195 Exec. Housekeeper (F)	.2670*	.2131
d.f. = N-2 = 53	* $p < .05 = .265$	** $p < .01 = .344$

TABLE 6

Multiple Regression Model Variables and B - Coefficients on the Criterion Initiative

Variable	B - Coefficient
46 Types of People IP	- 0.3595
71 Public Speaking	0.3710
74 Sales	0.6009
75 Business Management	1.0414
76 Office Practices	0.7138
120 Math/Science Teacher (M)	- 0.2713
129 Physicist (F)	0.4125
133 Physician (F)	- 0.5418
151 Interior Decorator (F)	- 0.3372
169 Home Ec. Teacher (F)	0.1862
170 Flight Attendant (F)	- 1.0833
180 Buyer (F)	- 0.5577
193 Business Ed. Teacher (F)	- 0.6167
195 Exec. Housekeeper (F)	- 0.4365
200 Beautician (F)	0.3011

TABLE 7

Predicted Values from Multiple Regression Model on the Variable Initiative

Case	Actual	Predicted	Residual
1	53.00	52.48	0.515
2	50.00	50.69	- 0.697
3	50.00	53.30	- 3.301
4	50.00	49.87	0.121
5	50.00	52.55	- 2.552
6	50.00	48.93	1.063
7	50.00	50.53	- 0.537
8	56.00	57.96	- 1.966
9	51.00	47.98	3.019
10	56.00	53.77	2.226
11	56.00	60.34	- 4.347
12	43.00	38.77	4.227
13	50.00	47.76	2.239
14	50.00	51.15	- 1.156
15	47.00	40.83	6.163
16	28.00	26.96	1.032
17	28.00	34.78	- 6.788
18	53.00	52.22	0.775
19	56.00	58.54	- 2.542
20	53.00	51.12	1.870
21	50.00	50.04	- 0.047
22	50.00	48.68	1.317
23	58.00	56.60	1.399
24	56.00	54.36	1.638
25	50.00	49.05	0.941
26	51.00	50.74	0.256
27	53.00	52.27	0.726
28	47.00	50.58	- 3.580
29	50.00	50.25	- 0.259
30	50.00	47.26	2.734
31	56.00	54.10	1.894
32	53.00	52.13	0.867
33	28.00	31.18	- 3.185
34	56.00	51.61	4.389
35	56.00	60.09	- 4.096
36	43.00	47.79	- 4.797
37	50.00	48.82	1.179
38	28.00	34.06	- 6.062
39	56.00	63.63	- 7.639
40	43.00	43.06	- 0.061

Table 7 - Continued

Case	Actual	Predicted	Residual
41	56.00	49.88	6.114
42	50.00	49.67	0.325
43	53.00	56.84	- 3.845
44	50.00	50.81	- 0.818
45	56.00	50.43	5.569
46	28.00	31.23	- 3.238
47	28.00	32.52	- 4.523
48	50.00	46.26	3.735
49	50.00	48.01	1.982
50	50.00	47.48	2.513
51	28.00	27.55	0.447
52	50.00	49.01	0.986
53	50.00	47.72	2.277
54	56.00	53.89	2.100
55	50.00	50.60	- 0.601

TABLE 8

Multiple Pearson-Product Moment Correlations Between the Criterion Variable Quality and Significant Predictor Variables from the Research Group (N=55)

Name	Raw r's	Corrected r's
04 Vocabulary	.1696	.2663*
08 B2S	.2055	.2901*
12 L	.1366	.2902*
13 F	.1679	.3466**
17 HY	.2118	.2641*
48 Preferences LP	.2889*	.2705*
49 Preferences IP	.2976*	.2147
66 Teacher	.3381*	.3117*
69 Domestic Arts	.3157*	.2674*
80 Dietitian (M)	.2596*	.2712*
127 Mathematician (F)	.3457**	.3460**
131 Veterinarian (F)	.3430*	.3728**
132 Optometrist (F)	.3188*	.3520**
135 College Prof. (F)	.2746*	.3530**
158 Ele. Sch. Teach (F)	.2730*	.1998
161 Guidance Counselor (M)	.3133*	.2342
162 Rec. Leader (F)	.2766*	.2033
169 Home Ec. Teach (F)	.4027**	.2479
170 Flight Attendant (F)	.4002**	.3479**
193 Bus. Ed. Teach (F)	.3451**	.3325*
195 Exec. Housekeep (F)	.3062*	.2452

d.f. = N-2 = 53 * $p < .05 = .265$ ** $p < .01 = .344$

TABLE 9

Multiple Regression Model Variables and B - Coefficients on the Criterion Quality

	Variable	B - Coefficients
LV	Logical - Verbal	- 0.6889
CLNO	Clerical Numbers	0.2855
ODT	Oral Directions Test	0.2485
36	School Subjects (LP)	0.5289
48	Preferences (LP)	- 0.1207
52	Characteristics (IP)	0.0702
54	Agriculture	- 0.2987
56	Adventure	0.2989
57	Military Activities	0.2773
66	Teaching	- 0.4173
67	Social Service	0.9406
71	Public Speaking	0.4031
75	Business Management	0.2840
89	Navy Officer (M)	- 0.3754
95	Occupational Therapist (F)	- 0.3668
108	Priest (M)	- 0.3024
114	Pharmacist (F)	- 0.3735
115	Dentist (F)	0.2047
131	Veterinarian (F)	0.4554
149	Musician (M)	0.2853
169	Home Ec. Teacher (F)	- 0.4987
175	Lawyer (F)	- 0.2367
180	Buyer (F)	- 0.7768
189	Banker (F)	0.6514

TABLE 10

Predicted Values from Multiple Regression Model on the Variable Quality

Case	Actual	Predicted	Residual
1	50.00	49.34	0.654
2	50.00	45.18	4.813
3	50.00	48.74	1.259
4	50.00	50.86	- 0.868
5	43.00	44.88	- 1.888
6	50.00	50.66	- 0.661
7	56.00	56.96	- 0.970
8	56.00	54.53	1.461
9	58.00	56.35	1.643
10	54.00	57.10	- 3.101
11	50.00	50.06	- 0.063
12	50.00	51.69	- 1.696
13	50.00	48.54	1.452
14	53.00	51.91	1.085
15	47.00	50.37	- 3.376
16	28.00	26.68	1.319
17	28.00	35.39	- 7.395
18	53.00	53.60	- 0.600
19	54.00	53.54	4.580
20	50.00	50.38	- 0.385
21	50.00	48.91	1.087
22	50.00	51.55	- 1.559
23	58.00	57.19	0.807
24	50.00	53.41	- 3.415
25	50.00	48.95	1.049
26	54.00	50.02	3.975
27	53.00	54.98	- 1.980
28	50.00	48.03	1.969
29	50.00	49.01	0.982
30	50.00	46.59	3.402
31	53.00	54.02	- 1.023
32	53.00	52.71	0.286
33	28.00	27.38	0.612
34	56.00	54.41	1.583
35	53.00	53.89	- 0.894
36	50.00	51.15	- 1.154
37	50.00	47.96	2.032
38	28.00	30.93	- 2.930
39	56.00	56.75	- 0.751
40	50.00	48.34	1.653

Table 10 - Continued

Case	Actual	Predicted	Residual
41	50.00	49.29	0.707
42	56.00	59.15	- 3.154
43	56.00	58.60	- 2.602
44	50.00	48.12	1.874
45	56.00	56.60	- 0.604
46	28.00	29.68	- 1.689
47	28.00	29.64	- 1.640
48	50.00	44.87	5.127
49	50.00	53.61	- 3.617
50	48.00	47.09	0.902
51	28.00	28.09	- 0.098
52	50.00	50.61	- 0.615
53	56.00	54.27	1.728
54	50.00	47.87	2.121
55	50.00	47.31	2.689

TABLE 11

Multiple Pearson-Product Moment Correlations Between the Criterion Variable Judgment and Significant Predictor Variables from the Research Group (N=55)

Name	Raw r's	Corrected r's
13 F	.1390	.2914*
66 Teacher	.3039**	.2797*
103 Reg. Nurse (F)	.2295	.2706*
117 Dental Hygienist (F)	.2737*	.2279
131 Veterinarian (F)	.2448	.2680*
132 Optometrist (F)	.2806*	.3107*
143 Ad. Executive (F)	.2066	.2730*

d.f. = N-2 = 53 * $p < .05 = .265$ ** $p < .01 = .344$

TABLE 12

Multiple Regression Model Variables and B - Coefficients on the Criterion Judgment

	Variable	B - Coefficients
ML	Mental Level	- 0.4735
ODT	Oral Directions Test	0.1778
MA	Hypomania	0.2039
28	Social	0.8368
41	Activities (DP)	0.4113
42	Amusements (LP)	0.2992
44	Amusements (DP)	0.2512
51	Characteristics (LP)	- 0.2529
60	Mathematics	0.2055
69	Domestic Arts	0.3620
74	Sales	0.4159
75	Business Management	0.3678
76	Office Practices	0.4154
81	Police Officer (M)	0.4021
88	Merchant Marine Officer (M)	- 0.5962
128	Mathematician (M)	- 0.4592
149	Musician (M)	0.2578
166	Social Science Teacher (M)	- 0.6593
169	Home Ec. Teacher (F)	- 0.5770
170	Flight Attendant (F)	- 0.9126
173	Life Insurance Agent (M)	- 0.7659
174	Life Insurance Agent (F)	0.7578
178	Investment Fund Manager (M)	0.2779
180	Buyer (F)	- 0.2920

TABLE 13

Predicted Values from Multiple Regression Model on the Variable Judgment

Case	Actual	Predicted	Residual
1	50.00	50.96	- 0.970
2	50.00	52.15	- 2.154
3	50.00	49.07	0.922
4	50.00	51.07	- 1.070
5	50.00	52.23	- 2.230
6	50.00	48.78	1.213
7	50.00	50.75	- 0.753
8	53.00	52.50	0.500
9	54.00	53.06	0.932
10	51.00	52.23	- 1.234
11	50.00	52.31	- 2.312
12	50.00	48.59	1.406
13	50.00	50.71	- 0.716
14	50.00	50.63	- 0.634
15	50.00	47.06	2.932
16	28.00	29.25	- 1.255
17	28.00	34.23	- 6.232
18	50.00	50.03	- 0.039
19	50.00	50.85	- 0.857
20	56.00	55.82	0.178
21	50.00	51.21	- 1.218
22	50.00	46.41	3.583
23	51.00	55.05	- 4.058
24	56.00	54.73	1.264
25	50.00	51.53	- 1.531
26	51.00	49.24	1.751
27	53.00	51.86	1.132
28	43.00	43.34	- 0.342
29	50.00	52.79	- 2.799
30	50.00	52.31	- 2.319
31	53.00	55.49	- 2.492
32	56.00	57.45	- 1.450
33	28.00	27.53	0.461
34	50.00	48.07	1.925
35	50.00	49.27	0.724
36	43.00	44.33	- 1.332
37	50.00	47.93	2.069
38	28.00	27.27	0.726
39	53.00	49.47	3.528
40	43.00	43.07	- 0.072

Table 13 - Continued

Case	Actual	Predicted	Residual
41	50.00	49.00	0.999
42	56.00	54.92	1.075
43	53.00	56.28	- 3.284
44	56.00	53.93	2.066
45	50.00	48.07	1.924
46	28.00	29.30	- 1.309
47	28.00	29.19	- 1.190
48	50.00	45.25	4.740
49	43.00	42.46	0.535
50	50.00	49.46	0.536
51	28.00	28.64	- 0.648
52	50.00	50.45	- 0.460
53	50.00	46.29	3.705
54	50.00	49.33	0.663
55	50.00	46.51	0.348

TABLE 14

Multiple Pearson-Product Moment Correlations Between the Criterion Cooperation and Significant Predictor Variables from the Research Group (N=55)

Name	Raw r's	Corrected r's
66 Teaching	.3386*	.3122*
69 Domestic Arts	.3118*	.2640
80 Dietitian (M)	.2672*	.2448
131 Veterinarian (F)	.2478	.2709*
132 Optometrist (F)	.3361*	.3705**
152 Interior Decorator (F)	.2520	.3657**
158 Ele. Sch. Teach (F)	.2651*	.2081
169 Home Ec. Teach (F)	.3931**	.2413
170 Flight Attendant (F)	.3510**	.3035*
d.f. = N-2 = 53	$p < .05 = .265$	** $p < .01 = .344$

TABLE 15

Multiple Regression Model Variables and B - Coefficients on the Criterion Cooperation

	Variable	B - Coefficient
B4D	Dominance	0.4746
L	Lie Scale	- 0.5303
MF	Masculine/Feminine	- 0.2139
SI	Social Introversion	0.4519
45	Types of People (LP)	0.0008
46	Types of People (IP)	- 0.4299
52	Characteristics (IP)	0.3043
71	Public Speaking	0.4012
74	Sales	0.3297
75	Business Management	1.4303
76	Office Practices	0.3293
83	Army Officer (F)	- 0.4419
87	Radiological Tech. (F)	0.4742
93	Army Officer (M)	- 0.4779
105	Nurse, Lic. Practical (M)	0.3440
110	YMCA Staff (F)	0.5639
115	Dentist (F)	0.4617
124	Optometrist (M)	0.0269
130	Biologist (M)	- 0.3850
169	Home Ec. Teacher (F)	- 0.3640
170	Flight Attendant (F)	- 1.3536
174	Life Insurance Agent (F)	1.0090
182	Credit Manager (M)	- 1.1131
187	Chiropractor (M)	- 0.9857

TABLE 16

Predicted Values from Multiple Regression Model on the Variable Cooperation

Case	Actual	Predicted	Residual
1	47.00	46.14	0.852
2	50.00	50.39	- 0.398
3	50.00	53.10	- 3.107
4	53.00	52.94	0.056
5	50.00	53.32	- 3.324
6	50.00	48.93	1.067
7	56.00	58.30	- 2.303
8	56.00	58.01	- 2.017
9	56.00	55.67	0.327
10	51.00	50.85	0.141
11	56.00	57.43	- 1.431
12	56.00	51.89	4.109
13	53.00	51.95	1.049
14	53.00	53.80	- 0.809
15	56.00	54.14	1.858
16	28.00	30.94	- 2.943
17	28.00	33.09	- 5.093
18	53.00	53.33	- 0.335
19	56.00	54.92	1.079
20	56.00	53.56	2.432
21	56.00	56.52	- 0.527
22	50.00	50.37	- 0.377
23	56.00	53.03	2.967
24	53.00	50.77	2.222
25	50.00	50.36	- 0.369
26	54.00	52.61	1.384
27	70.00	71.25	- 1.256
28	47.00	45.00	1.994
29	50.00	48.94	1.054
30	56.00	56.36	- 0.369
31	50.00	48.85	1.147
32	53.00	53.17	- 0.178
33	28.00	32.61	- 4.614
34	56.00	52.25	3.743
35	56.00	57.61	- 1.617
36	43.00	41.91	1.084
37	56.00	55.17	0.828
38	28.00	28.05	- 0.055
39	56.00	62.82	- 6.820
40	50.00	50.34	- 0.342

Table 16 - Continued

Case	Actual	Predicted	Residual
41	56.00	55.26	0.735
42	56.00	53.97	2.028
43	56.00	58.76	- 2.761
44	50.00	51.16	- 1.169
45	50.00	43.86	6.133
46	28.00	30.44	- 2.440
47	28.00	28,89	- 0.898
48	50.00	49.99	0.001
49	50.00	50.78	- 0.782
50	51.00	47.76	3.230
51	28.00	26.72	1.272
52	56.00	57.79	- 1.793
53	56.00	56.23	- 0.239
54	50.00	48.06	1.933
55	50.00	46.35	3.646

TABLE 17

Predicted Values From the Multiple Regression Model for the Cross Validation Sample on the Criterion Cooperation

Case	Actual	Predicted	Residual
56	53.00	48.49	4.501
57	47.00	25.98	21.01
58	50.00	44.21	5.780
59	54.00	52.47	1.522
60	53.00	65.38	- 12.38
61	56.00	55.83	.1603
62	56.00	65.41	- 9.415
63	50.00	29.28	20.71
64	56.00	59.07	- 3.076
65	50.00	38.97	11.02
66	28.00	23.13	4.863
67	54.00	39.64	14.35
68	50.00	26.87	23.12
69	56.00	40.33	15.66
70	56.00	66.24	- 10.24
71	54.00	43.94	10.05
72	50.00	9.254	- 42.54
73	56.00	44.01	11.98
74	48.00	59.53	- 11.53
75	53.00	51.82	1.173
76	54.00	56.80	- 2.803
77	56.00	31.21	24.78
78	56.00	59.10	- 3.105
79	53.00	68.82	- 15.82
80	53.00	70.11	- 17.11
81	28.00	67.60	- 39.60
82	56.00	28.71	27.28
83	28.00	59.78	27.28
84	56.00	40.46	15.53
85	56.00	55.40	.5981
86	56.00	14.79	41.20
87	28.00	38.44	- 10.44
88	51.00	43.49	7.504
89	28.00	42.42	- 14.42
90	56.00	71.37	- 15.37
91	56.00	59.76	- 3.762
92	50.00	66.40	- 16.40
93	28.00	29.56	- 1.562
94	50.00	34.37	15.62

TABLE 17 - Continued

Case	Actual	Predicted	Residual
95	28.00	55.22	- 27.22
96	56.00	79.98	- 23.98
97	56.00	53.34	2.651
98	56.00	57.56	- 1.562
99	53.00	54.64	- 1.647
100	56.00	62.52	- 6.526
101	56.00	25.92	30.07
102	56.00	49.24	6.757
103	56.00	43.09	12.90
104	56.00	51.71	4.288
105	56.00	62.40	- 6.407
106	56.00	49.91	6.084
107	28.00	11.66	16.33
108	61.00	63.55	- 2.551
109	50.00	69.00	- 19.00

APPENDIX D

Variable Designation

Basic Test Variables

1	ME	Mental Efficiency
2	LQ	Quantitative Problem-Solving
3	LV	Verbal-Logical Problem-Solving
4	VOC	Vocabulary
5	CLNO	Clerical Numbers
6	CLNA	Clerical Names
7	ODT	Oral Directions Test

Bernreuter Personality Inventory

8	B2S	Self-Sufficiency
9	B4D	Dominance
10	F1C	Social Self-Confidence
11	F2S	Desire for Social Contact

Minnesota Multiphasic Personality Inventory

12	L	Validity Scale
13	F	Validity Scale
14	K	Validity Scale
15	HS	Hypochondriasis
16	D	Depression
17	HY	Hysteria
18	PD	Psychopathic Deviate
19	PA	Paranoia
20	PT	Pschasthenia
21	SC	Schizophrenia
22	MA	Hypomania
23	MF	Masculinity-Femininity
24	SI	Social Introversion

Strong-Campbell Interest Inventory

25	Realistic
26	Investigative
27	Artistic
28	Social
29	Enterprising
30	Conventional
31	Academic Orientation
32	Introversion-Extroversion
33	Occupations LP
34	Occupations IP
35	Occupations DP
36	School Subjects LP
37	School Subjects IP
38	School Subjects DP

39	Activities LP
40	Activities IP
41	Activities DP
42	Amusements LP
43	Amusements IP
44	Amusements DP
45	Types of People LP
46	Types of People IP
47	Types of People DP
48	Preferences LP
49	Preferences IP
50	Preferences DP
51	Characteristics LP
52	Characteristics IP
53	Characteristics DP
54	Agriculture
55	Nature
56	Adventure
57	Military Activities
58	Mechanical
59	Science
60	Mathematics
61	Medical Science
62	Medical Service
63	Music/Dramatics
64	Art
65	Writing
66	Teaching
67	Social Service
68	Athletics
69	Domestic Arts
70	Religious Activities
71	Public Speaking
72	Law/Politics
73	Merchandising
74	Sales
75	Business Management
76	Office Practices
77	Farmer (M)
78	Instrument Assembler (F)
79	Vocational Agriculture Teacher (M)
80	Dietitian (M)
81	Police Officer (M)
82	Highway Patrol Officer (M)
83	Army Officer (F)
84	Physical Education Teacher (F)
85	Skilled Crafts (M)
86	Forester (M)
87	Radiological Technician (F)
88	Merchant Marine Officer (M)
89	Navy Officer (M)
90	Registered Nurse (M)
91	Veterinarian (M)
92	Cartographer (M)

93	Army Officer (M)
94	Air Force Officer (M)
95	Occupational Therapist (F)
96	Engineer (F)
97	Engineer (M)
98	Chemist (F)
99	Reporter (F)
100	Reporter (M)
101	English Teacher (F)
102	English Teacher (M)
103	Nurse, Registered (F)
104	Physical Therapist (M)
105	Nurse, Licensed Practical (M)
106	Social Worker (F)
107	Social Worker (M)
108	Priest (M)
109	Director Christian Education (F)
110	YMCA Staff (F)
111	Minister (M)
112	Physical Science (M)
113	Medical Te hnician (F)
114	Pharmacist (F)
115	Dentist (F)
116	Dentist (M)
117	Dental Hygienist (F)
118	Physical Therapist (F)
119	Physician (M)
120	Math/Science Teacher (M)
121	Math/Science Teacher (F)
122	Dietitian (F)
123	Medical Technician (M)
124	Optometrist (M)
125	Computer Programmer (F)
126	Computer Programmer (M)
127	Mathematician (F)
128	Mathematician (M)
129	Physicist (F)
130	Biologist (M)
131	Veterinarian (F)
132	Optometrist (F)
133	Physician (F)
134	Social Scientist (M)
135	College Professor (F)
136	College Professor (M)
137	Speech Pathologist (F)
138	Speech Pathologist (M)
139	Psychologist (F)
140	Psychologist (M)
141	Language Interpreter (F)
142	Architech (M)
143	Advertising Executive (F)
144	Artist (F)
145	Artist (M)
146	Art Teacher (F)
147	Photographer (M)

148	Musician (F)
149	Musician (M)
150	Entertainer (F)
151	Interior Decorator (F)
152	Interior Decorator (M)
153	Advertising Executive (M)
154	Language Teacher (F)
155	Librarian (F)
156	Librarian (M)
157	Elementry Teacher (M)
158	Elementry Teacher (F)
159	School Superintendent (M)
160	Public Administrator (M)
161	Guidance Counselor (M)
162	Recreation Leader (F)
163	Recreation Leader (M)
164	Guidance Counselor (F)
165	Social Science Teacher (F)
166	Social Science Teacher (M)
167	Personnel Director (M)
168	Department Store Manager (M)
169	Home Economic Teacher (F)
170	Flight Attendant (F)
171	Chamber of Commerce Executive (M)
172	Sales Manager (M)
173	Life Insurance Agent (M)
174	Life Insurance Agent (F)
175	Lawyer (F)
176	Lawyer (M)
177	Computer Sales (M)
178	Investment Fund Manager (M)
179	Pharmacist (M)
180	Buyer (F)
181	Buyer (M)
182	Credit Manager (M)
183	Funeral Director (M)
184	Realtor (M)
185	Agribusiness Manager (M)
186	Purchasing Agent (M)
187	Chiropractor (M)
188	Accountant (M)
189	Banker (F)
190	Banker (M)
191	Credit Manager (F)
192	Department Store Manager (F)
193	Business Education Teacher (F)
194	Business Education Teacher (M)
195	Executive Housekeeper (F)
196	Accountant (F)
197	Secretary (F)
198	Dental Assistant (F)
199	Nurse, Licensed Practical (F)
200	Beautician (F)