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LABOR TURNOVER OF GAS AND WATER METER READERS AS RELATED TO A STANDARDIZED PRE-EMPLOYMENT TEST BATTERY

A Thesis

Presented to

the Faculty of the Department of Psychology

The University of Omaha

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

By

Donald Louis Stevens

August 1958

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CHAPTER I

INTRODUCTION AND THE PROBLEM

INTRODUCTION

Labor turnover is of major concern to most employers. The desire of industry to get and keep qualified employees is evidenced by the increased use of extra incentives or "fringe benefits". Benefits above the normal pay scale such as paid vacations, paid holidays, free life and hospitalization insurance, time off with pay during times of illness, retirement plans, stock purchase plans, company picnics, parties, and company sponsored sports programs are all instituted primarily to enable the employer to maintain an adequate work force with a minimum of turnover. Even with these benefits, turnover is still a very real and serious problem due to the high costs of hiring and training employees.[1]

Officials of most organizations realize that people are not alike by nature, training, education, or inclination. A job may be well done by one, fairly well by another and

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[1] Spengler & Klein, Introduction to Business (Second Edition), McGraw-Hill Book Company, Page 221.

very poorly by a third. A job may be a source of great personal satisfaction to one, a monotonous and boring task to another, and entirely beyond the capacity of a third. Of major importance to the success of personnel placement is the placing of an individual on a job that matches the capacity of that individual. If the job is too difficult, the results may be confusion, low production, possibly injury to the employee or dissatisfaction and, eventually, termination. If the job is too easy, the result may be boredom, mind wondering, daydreaming with the dissatisfaction so often accompanying these activities, possible injury to the employee and eventually termination.

Psychologists have long recognized the existence and importance of individual differences in training and skills. These basic differences are probably related to future productivity, accuracy, accident proneness, promotion, tenure with the company, and many other factors that differentiate between the profitable and non-profitable employee.

A search of the personnel records of a local public utilities dating back to 1944 and going through 1956, reveals that the services of 724 employees had been terminated for one reason or another. In twelve years this represented a turnover of approximately 100% within this organization.

These figures do not reflect the number of temporary or part-time employees hired or released during those years.

This study is to utilize the standardized tests as used in the selection process of this firm. This firm's first attempt to use standardized tests as an aid in selection was in June of 1945. At that time four female employees submitted to a testing program administered by a consultant. The findings of this consultant were a deciding factor in the selection of the employee to be promoted.

It was not until 1948, however, that this organization began to use standardized tests as an aid in the selection of future employees. The testing program was limited to individuals interested in mechanical type jobs and a few clerical classifications. In 1950 the groundwork was laid for a comprehensive testing program that would include all jobs not classified as temporary. The preliminary work was completed late in 1950 and the program was instituted in 1951. The same basic testing program is used today. Because of this it was necessary to limit the study sample to employees in the years 1951 to and including 1956.

During the six years to be covered by the study the organization as a whole suffered an average turnover rate of slightly over 7% per year. The meter reading division

within this organization had, during the same six year period, an average turnover rate of 43% per year. Since the meter reading division has a fairly large number of employees and a reduction of turnover would represent considerable savings, it was decided that this study should deal with the turnover of this division.

STATEMENT OF THE PROBLEM

1. To determine what factors, as measured by standardized tests, used in employee selection, are related to the length of service of gas and water meter readers.

2. To devise a method of prediction to be validated on a separate sample of employed meter readers.

CHAPTER II

RELATED RESEARCH

Many studies have been made in the past eight years attempting to predict labor turnover. Several of these studies have utilized tests in one way or another. The tests used, however, have most generally been of the apptitude, ability or intelligence nature. In a search of the psychological abstracts no studies involving the use of standardized personality tests in conjunction with intelligence and apptitude as related to labor turnover were discovered. In one study, "The Prediction of Labor Turnover by Apptitude Tests" by Clarence W. Brown and Edwin E. Ghiselli, the subjects used in the investigation were taxi cab drivers. Ten tests measuring seven kinds of apptitudes were administered to groups of taxi cab drivers when they applied for work. To some extent the scores were taken into account in decisions regarding employment. The taxi cab drivers so hired were divided into two groups, the first group consisting of individuals who stayed on the job three months or more. The second group consisting of individuals who left in less than three months. There was no distinction made between individuals who resigned and those who were fired. Individuals who terminated because of illness, because they were called into the service or

because they were transferred to other type work were not included in the study. It was discovered in this study that seven of the tests showed a relationship to turnover. These seven tests consisted of three arithmatic tests, three speed tests and one spatial test.[1]

In another study, "The Prediction of Turnover among Clerical Workers" by Phillip H. Kriedt and Marguerite S. Gadel, tests were used on high school girls hired in June of 1951 to work for an insurance company. The tests consisted of a measure of intelligence that was arrived at by use of: (1) a vocabulary test in conjunction with an arithmatical reasoning test, (2) an interest questionnaire that was developed by the company, (3) biographical data was used, factors and attitudinal information related to education and family background, (4) a job preference questionnaire, and (5) a measure of clerical apptitude that was arrived at by combining the scores on four tests. These four tests consisted of a number checking test, a name checking test, a dotting and lettering test and a digit substitution test. This battery was administered to 358 employees. Sixty-five

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[1] The Journal of Applied Psychology, Vol. 37, No. 1, 1953, Page 9.

of these employees left in three months, forty-five of these employees left after three months and before the end of twelve months. The point biserial correlations were computed for each of the five predictor variables for three months and twelve month turnover. It was discovered that this method could predict quick turnover (that under three months) among newly hired girls for routine clerical jobs moderately well using a combination of biographical data, the interest questionnaire, the general ability test and the clerical speed test. It was reported, however, that the biographical data was the best predictor. The other measures tended to increase only slightly the effectiveness of predictions as estimated by multiple correlation.[2]

As has been shown by the two foregoing studies the use of standardized personality tests was not included in the study. These studies also dealt with short-term turnover or quick turnover that utilized three months of service as their cutting-off point.

It is indicated by these studies that there is still much to be learned about the cause of labor turnover.

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[2] The Journal of Applied Psychology, Vol. 37, No. 5, 1953, Page 338.

CHAPTER III

PROCEDURE

A list was compiled of the names, test results, employment dates, and the date of termination of all gas and water meter readers employed from January 1, 1951 to and including December 31st, 1956. This list included 163 individuals.

It was then necessary to determine the length of employment required to enable the employer to reach the "break-even point" on his original investment in the employee. After several discussions with the head of the meter reading division concerning evaluation of the hiring process, the breaking-in process, and the length of time necessary to reach proficiency, it was decided that nine months of continuous service was necessary to reach this "break-even point". The individuals whose data was not complete as well as the present employees who had not been employed for nine consecutive months were eliminated from the study.

The sample was divided into two groups, the "quit" group and the "stay" group on the basis of less than or more than nine months duration. The names of individuals who fell within the "quit" group category were arranged in order of

date of employment. They were numbered consecutively and the odd numbered former employees were placed in a "hold-out quit" group for future use. The remaining "quit" group is used in the primary analysis. The names of employees or former employees who fell in the "stay" group category were arranged in order of their date of employment. Consecutive numbers were assigned to the names in this group and the odd numbered names were placed in a "hold-out stay" group. The remaining "work-stay" group was used in the primary analysis.

Upon completion of the division of the sample it was discovered that there were 28 individuals in the "work-stay" group, 28 individuals in the "work-quit" group, 29 individuals in the "hold-out stay" group, and 27 individuals in the "hold-out quit" group.

There are eight standardized tests that have been used since 1951 as an aid in the selection of gas and water meter readers. This test battery consists of:

1. "Personnel Test. Form 'A'" by E. F. Wonderlic.
2. "Test of Mechanical Comprehension. Form 'BB'" by G. K. Bennett and D. E. Fry.
3. "Minnesota Clerical Test" by D. M. Andrew and D. G. Paterson.
4. "Primary Business Interests Test" by A. J. Cardall.
5. "The Personality Inventory" by R. G. Bernreuter.
6. "The Johnson Temperament Analysis" by R. H. Johnson.
7. "The Personal Audit" by C. R. Adams.
8. "The Minnesota Multiphasic Personality Inventory" by S. R. Hathaway, PH.D. and J. C. McKinley, M. D.

DESCRIPTION OF THE TESTS

THE PERSONNEL TEST by E. F. Wonderlich.

Mental ability as defined in this test consists of ability to think and understand in terms of ideas, words, sybols and numbers. This has been called "abstract intelligence". The mental ability of the individual does not determine the job for which he is best suited but does limit the level of complexity at which he can operate in terms of intellectual demands presented by jobs. This test requires only twelve minutes to administer. There are fifty items on this form which constitutes the examination. There are five forms of this test available. Form "A" is the test used in this battery.[1]

TEST OF MECHANICAL COMPREHENSION. Form "BB" By George K. Bennett and Dinah E. Fry.

Mechanical comprehension as defined on this test consists of a measure of the person's fund of knowledge of the fundamental principles and relationships in operation of machinery, tools and materials. It does not measure skill in the use of the hands, but is reflective of the ease with which the individual could master the most complex contents of a trade school curriculum. The norms used in this battery

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[1]E. F. Wonderlic, Wonderlic Personnel Test Manual.

are based upon the performances of persons engaged in light mechanical work.[2]

MINNESOTA CLERICAL TEST. By D. M. Andrew and D. G. Paterson.

This is an aptitude test that attempts to measure certain aspects of clerical work. It is a speed and accuracy test.

The test consists of two parts, a Number Checking and a Name Checking test. Each of the tests contain two hundred items, one hundred identical pairs and one hundred dissimilar pairs. The numbers range from three through twelve digits, and the names from seven through sixteen letters.[3]

THE PRIMARY BUSINESS INTEREST TEST By Alfred J. Cardahl.

This test is designed to measure an individual's preferences for the specific job activities which characterize beginning business occupations. These immediate and specific preferences point to the initial job, predict the individual's interest or boredom in his first activities, and determine to some extent his progress in his work. Scores indicate the relative extent of interest in five

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[2]George K. Bennett, Mechanical Comprehension Test Form BB Manual.

[3]Dorothy M. Andrew and Donald G. Paterson, Minnesota Clerical Test Manual.

functional occupational classifications.[4] The five fields measured by this test are:[5]

ACCOUNTING. This type of interest is found in individuals who are successfully employed on jobs such as public and private accounting, bookkeeping, various jobs related to bookkeeping, and general office work.

COLLECTIONS AND ADJUSTMENTS. This type of interest is found in individuals who are successfully operating in jobs such as collector, claim work and production control clerks.

SALES - OFFICE. This type of interest is found in individuals who are successfully employed in positions in sales work such as order clerks, sales promotion clerks and rate clerks.

SALES - STORE. This type of interest is found in individuals who are successfully employed in jobs such as retail salesman, counter clerk, delivery clerk, and telephone solicitor.

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[4]Alfred J. Cardall, M.B.A., Ed.D., Manual for the Primary Business Interests Test.

[5]Ibid.

STENOGRAPHIC - FILING. This type of interest is found in individuals who are successfully employed in positions such as secretary, stenographer, typist, office clerk, record clerk and receptionist.

THE PERSONALITY INVENTORY By Robert G. Bernreuter.

This is a self-administering personality test that is supposedly able to measure six different personality traits. It is important that each person interpret the questions for himself. There are no time limits on this test. Accurate results can be expected only when the individual taking the test is willing to cooperate thoroughly.[6] The traits measured are:[7]

THE MEASURE OF NEUROTIC TENDENCY referred to as the B1-N scale.

This scale is reported to indicate whether the individual considers himself to be well adjusted emotionally to his environment.

A MEASURE OF SELF-SUFFICIENCY which is referred to as the B2-S scale.

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[6]Robert G. Bernreuter, Manual for the Personality Inventory.

[7]Ibid.

This scale is reported to indicate whether or not a person is able to operate in a group situation as a member of a team or if the person is able to operate as an individual being on his own.

A MEASURE OF INTROVERSION-EXTRAVERSION. This scale is referred to as the B3-I scale.

This scale is reported to measure whether an individual is inclined to operate in such a way that they are imaginative or tend to live within themselves or it is indicative of a person's ability to seldom suffer emotional up-sets and rarely substitute daydreaming for action.

A MEASURE OF DOMINANCE-SUBMISSION. This is referred to as the B4-D scale.

This scale is reported to indicate whether or not a person is inclined to wish to dominate others in face-to-face situations.

A MEASURE OF CONFIDENCE IN ONES SELF. This is referred to as the F-1C scale.

This scale is reported to indicate whether or not an individual is inclined to be hamperingly self-conscious and to have feelings of inferiority.

A MEASURE OF SOCIABILITY. This is referred to as the F2-S scale.

This scale is reported to indicate whether or not an individual is inclined to be sociable and gregarious or not.

JOHNSON TEMPERAMENT ANALYSIS By Roswell H. Johnson.

The test is a self-administering temperament analysis that strives to measure nine personality traits. The persons taking the test read the instructions on the outside cover of the test booklet and the examiner answers any questions that the testee has provided. He stays close to the specific directions themselves. In this test there has been a substitution of three answer columns instead of the usual "Yes" and "No" responses. No single question is used to measure two traits. The language used is that that should be easily understood by high school seniors and adults.[8]

DESCRIPTION OF THE TRAITS:[9]

1. Nervous.
   This trait is reported to measure whether or not an individual operates under too much inner-nervous strain or tension.

2. Depressive.
   This trait is reported to measure the individual's liklihood of being subject to wide swings or ups and downs in mood.

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[8]Roswell H. Johnson, Manual of the Johnson Temperament Analysis.

[9]Ibid.

3. Active.
   This trait is reported to measure a person's willingness to undertake a variety of new activities readily.

4. Cordial.
   This trait is reported to measure whether or not a person is expressively warm-hearted.

5. Sympathetic.
   This trait is reported to measure the ability of the individual to feel the joys and sorrows of others.

6. Subjective.
   This trait is reported to measure an individual's self-centeredness or whether or not he is able to view things in an objective light.

7. Aggressive.
   This trait is reported to measure an individual's ability or desire to push ahead of other people competitively.

8. Critical.
   This trait is reported to measure whether or not an individual is inclined to criticize others in order that he might get the superior feeling produced by it.

9. Self-Mastery.
   This trait is reported to measure an individual's ability to act and control his impulsiveness in the interest of planning.

THE PERSONAL AUDIT By Clifford B. Adams.

The personal audit is entirely self-administering. It attempts to measure nine different personality traits. It is possible to give this test with or without supervision

and in either a group or individual situation.[10]

DESCRIPTION OF THE TRAITS:[11]

Part I. Seriousness-Impulsiveness.
It is indicated that this trait measures the degree to which an individual is in need of socializing.

Part II. Firmness-Indecision.
It is indicated that this trait measures an individual's ability to make and maintain independent decisions readily.

Part III. Tranquility-Irritability.
It is indicated that this trait measures the degree to which an individual is easily irritated by other people and their actions.

Part IV. Frankness-Evasion.
It is indicated that this trait measures an individual's ability to be frank and forthright in expressing his opinions. It is also an indication as to whether or not an individual wouldbe inclined to "pass the buck" or project blame on others.

Part V. Stability-Instability.
It is indicated that this trait measures an individual's ability to undertake responsibility.

Part VI. Tolerence-Intolerence.
It is indicated that this is a measure of an individual's ability to be tolerent of other people and their actions when they differ radically from their own.

Part VII. Steadiness-Emotionality.
It is indicated that this trait measures an individual's ability to stand routine type activities.

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[10]Clifford R. Adams, The Personal Audit.

[11]Ibid.

Part VIII. Persistence-Fluctuation.
It is indicated that this trait measures whether or not an individual's attitudes and interests are stabilized.

Part IX. Contentment-Worry.
It is indicated that this trait measures whether or not an individual is bothered by unsolved or unresolved personal problem.

THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY By S. R. Hathaway, PH. D. and J. C. Mc Kinley, M. D.

This test is a psycho-symetric instrument designed to provide in a single test scores on all of the more important phases of personality. The person being tested is asked to answer by true or false 550 statements. Very little instruction is required and this test need not be supervised closely.[12]

DESCRIPTION OF THE SCALES:[13]

THE HYPO-CONDRYASIS SCALE (Hs). This scale was designed to measure the amount of concern that an individual has about his bodily functions. It is reported that persons who score high on this trait are unduly worried over their health.

THE DEPRESSION SCALE (D). It is indicated that this scale measures the amount of depression to which an individual is subject. It is reported that a high score indicates poor morale of the emotional type with accompanying feelings of uselessness and a person's inability to assume normal optimism with regard to the future.

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[12] S. R. Hathaway, PH.D. and J. C. McKinley, M. D., Minnesota Multiphasic Personality Inventory.

[13] Ibid.

THE HYSTERIA SCALE (Hy). This scale, it is indicated, measures the degree to which an individual is like patients that have developed conversion-type hysteria symptoms. It is reported that persons scoring high on this scale tend to solve personal problems on an emotional rather than a logical basis during times of extreme stress or strain.

THE PSYCHOPATHIC-DEVIATE SCALE (Pd). It is indicated that this scale measures the similarity of the person being tested to persons whose main difficulty lies in their absence of deep emotional response, their inability to profit from past mistakes and experience and their disregard of social mores. It is reported that high scores are indicative of individuals who are resistive to authority and may be inclined to question the methods and ways of operation of superiors.

THE INTEREST SCALE (Mf). It is indicated that this scale measures the individual's tendency towards masculinity or femininity of interest patterns. It is reported that a high score indicates a deviation of the basic interest pattern in the direction of the opposite sex.

THE PARANOIA SCALE (Pa). It is indicated that this scale measures suspiciousness or oversensitivity. It is reported that persons scoring high on this scale tend to be overly suspicious of other persons and their actions.

THE PSYCHASTHENIA SCALE (Pt). It is indicated that high scores on this scale tend to identify persons who are bothered by re-occurring thoughts or ideas. It is reported that persons scoring high on this scale are also inclined to be bothered by inability to concentrate.

THE SCHIZOPHRENIA SCALE (Sc). It is indicated that Individuals scoring high on this scale are less integraded personality-wise than the average individual. It is reported that they may be bothered by bizarre and unusual thoughts or behavior.

THE HYPO-MANIA SCALE (Ma). It is indicated that individuals scoring high on this scale are inclined to be bothered by an excessive amount of thinking. This reflects quantity and in no way reflects quality of thought.

Using the "work-stay" and "work-quit" groups the relationship between the pre-employment test scores and the criterion of "quit" or "stay" was determined. This relationship was found by using the biserial coefficient of correlation.

The reason the biserial coefficient of correlation was used in this study may be found in Allen Edward's Book on "Statistical Analysis", Chapter 6, Page 112 where we find:

"Biserial Correlation: Sometimes an investigator is faced with a situation in which he desires to find the relationship between two variables, but the data for one variable are expressed in terms of a dichotomy or else have been reduced to a dichotomy. We might, for example, be interested in the relationship between the classification of a group of employees as 'satisfactory' and ' unsatisfactory' and the scores of the group on some test."

A weighted test scoring system to predict "stay" or "quit" was then developed using multiple correlation techniques.

Since "multiple correlation analysis is not limited to studying the relationship between two variables considered jointly and a third, but can be extended to determine the relationship between a combination of several factors and some other one".[14]

As a check this system of scoring was correlated with the criterion in the work group. The newly developed scoring system was then applied to individual tests in the "hold-out quit" and "hold-out stay" groups. The validity coefficient

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[14]Allen Edward's, Statistical Analysis, Chapter VI, Page 126.

of correlation between the developed scoring system and the criterion groups was found.

FORMULA USED IN STATISTICAL PROCEDURE

THE FORMULA FOR THE BISERIAL COEFFICIENT OF CORRELATION

$$r_{bis} = \left(\frac{M_p - M_t}{\delta t}\right)\left(\frac{p}{y}\right) \quad *$$

Where:

M_p = the mean score on the continuous variable of the individuals in the category with the higher means.

M_t = the mean score on the continuous variable of the entire distribution (both categories combined).

δt = the standard deviation of the continuous variable for the entire distribution.

p = the proportion of the total "N" in the category with the higher mean on the continuous variable.

y = the ordinate or height of the normal curve at the point of division between the two groups.**

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*Statistical Analysis By Allen L. Edwards, Page 95.
**Fundamental Statistics in Psychology and Education by Joy Paul Guilford, Page 393.

THE PRODUCT-MOMENT CORRELATION COEFFICIENT

$$r_{xy} = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}} \quad *$$

Where:

Σxy = the sum of cross products.

Σx^2 = the sum of the "X" squared values.

Σy = the sum of the "Y" values.

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*Statistical Analysis By Allen L. Edwards, Page 95.

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MULTIPLE REGRESSION EQUATION

$$X' = AX_1 + BX_2 + CX_3 + DX_4 + EX_5 + F \ *$$

Where:

A = Weight for the X_1 Values.

B = Weight for the X_2 Values.

C = Weight for the X_3 Values.

D = Weight for the X_4 Values.

E = Weight for the X_5 Values.

F = A Constant.

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*Fundamental Statistics in Psychology and Education By Joy Paul Guilford, Page 411.

CHAPTER IV

RESULTS OF THE STUDY

The correlation of tests in the work groups are shown and if the correlation is not significantly different from zero at or below the 10% level then no test will be made in the "hold-out" group.

The biserial coefficient of correlation necessary for significance at the 1% level was found to be .425. The biserial coefficient of correlation necessary for significance at the 5% level was found to be .322. The biserial coefficient of correlation found to be necessary for significance at the 10% level was .272. It was decided that in the employment situation a biserial coefficient of correlation showing significance from zero at the 10% level would provide a fine enough measuring instrument to be of value.

THE PERSONNEL TEST

The biserial coefficient of correlation between the criterion groups and the scores on the Wonderlic Personnel Test Form "A" was discovered to be -.191. Upon examination it is seen that no significant co-efficient of correlation exists on this test. The mean and standard deviation are shown on Table I.

TABLE I

WONDERLIC PERSONNEL TEST

TEST FORM	MEAN OF THE ENTIRE DISTRIBUTION	MEAN OF THE CATEGORY WITH THE HIGHER MEAN	STANDARD DEVIATION
A	22.304	23.250	6.199

TEST OF MECHANICAL COMPREHENSION

The biserial coefficient of correlation between the criterion groups and the scores on the mechanical comprehension Test Form BB was found to be -.431*. It is interesting to note that the coefficient of correlation is a negative one, indicating that by looking for a high score in this test for the selection of gas and water meter readers this firm may be screening out the more promising applicants.

The mean and standard deviation are shown in Table II.

TABLE II

MECHANICAL COMPREHENSION TEST

TEST FORM	MEAN OF THE ENTIRE DISTRIBUTION	MEAN OF THE CATEGORY WITH THE HIGHER MEAN	STANDARD DEVIATION
BB	24.036	27.286	9.441

*Significantly different from Zero at the 1% Level.

MINNESOTA CLERICAL TEST

The biserial coefficient of correlation between the criterion groups and the scores on the two sections of the Minnesota Clerical Test were found to be .343** on the number checking section and .118 on the name checking section.

The mean and standard deviation for each section are shown in Table III.

TABLE III

MINNESOTA CLERICAL TEST

PART	MEAN OF THE ENTIRE DISTRIBUTION	MEAN OF THE CATEGORY WITH THE HIGHER MEAN	STANDARD DEVIATION
I. Number Checking.	102.554	108.607	22.087
II. Name Checking.	91.268	93.786	26.556

PRIMARY BUSINESS INTERESTS TEST

The biserial coefficient of correlation between the criterion groups and the scores on the Primary Business Interest test's five interest patterns are shown on Table IV.

Upon examination of Table IV it is seen that no significant difference exists on any of the five interest patterns

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**Significantly Different from Zero at the 5% Level.

as measured by this test.

TABLE IV

PRIMARY BUSINESS INTEREST TEST

Interest Patterns	r bis
Accounting	.000
Collections and Adjustments	.241
Sales-Office	- .106
Sales - Store	- .182
Stenographic-Filing	- .111

The mean and standard deviation on each interest pattern are shown in Table V.

TABLE V

PRIMARY BUSINESS INTEREST TEST

PATTERN	MEAN OF THE ENTIRE DISTRIBUTION	MEAN OF THE CATEGORY WITH THE HIGHER MEAN	STANDARD DEVIATION
Accounting	27.321	27.321	
Collections & Adjustments	18.893	20.464	8.180
Sales-Office	17.821	18.357	6.347
Sales-Store	53.339	56.214	19.818
Stenographic-Filing	13.000	13.571	6.467

THE PERSONALITY INVENTORY

The biserial coefficient of correlation between the criterion groups and the scores on the six personality scales

as measured by the personality inventory are shown on Table VI.

Upon examination of Table VI, it is seen that the correlation of -.294*** on the F_2S scale is significantly different from zero at the 10% level.

Table VI also shows that none of the other scales as measured by this test show a significant difference at or below the 10% level.

TABLE VI

PERSONALITY INVENTORY

Scale	r bis
B_1N	.133
B_2S	-.074
B_3I	.220
B_4D	-.152
F_1C	.119
F_2S	-.294***

The mean and standard deviation for each scale are shown in Table VII.

*** Significantly Different from Zero at the 10% Level.

TABLE VII

PERSONALITY INVENTORY

SCALE	MEAN OF THE ENTIRE DISTRIBUTION	MEAN OF THE CATEGORY WITH THE HIGHER MEAN	STANDARD DEVIATION
B_1N	-146.018	-151.679	53.163
B_2S	25.804	27.535	29.389
B_3I	- 84.143	- 89.571	30.984
B_4D	94.554	99.786	43.282
F_1C	-118.393	-123.964	58.814
F_2S	- 58.357	- 67.750	39.980

THE JOHNSON TEMPERAMENT ANALYSIS

The biserial coefficient of correlation between the criterion group and the scores on the Johnson Temperament Analysis as measured by the nine personality traits are shown on Table VIII.

The correlation of -.273*** found on the active trait and the correlation of .274*** found on the impulsive trait are significantly different from zero at the 10% level. It is interesting to note that the coefficient of correlation of -.273*** as found on the active trait is a negative one which

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*** Significantly Different from Zero at the 10% Level.

would tend to indicate that individuals who tend to score low on this trait are more inclined to stay on the job.

It is also shown that none of the other traits measured by this test are significantly different from zero at or below the 10% level.

TABLE VIII

JOHNSON TEMPERAMENT ANALYSIS

Trait	r bis
Nervous	.129
Depressive	.111
Active	- .273***
Cordial	- .244
Sympathetic	- .225
Subjective	.110
Aggressive	- .209
Critical	.018
Self-Mastery	.274***

The mean and standard deviation on each trait are shown in Table IX.

***Significantly different from Zero at the 10% Level.

TABLE IX

JOHNSON TEMPERAMENT ANALYSIS

SCALE	MEAN OF THE ENTIRE DISTRIBUTION	MEAN OF THE CATEGORY WITH THE HIGHER MEAN	STANDARD DEVIATION
Nervous	64.786	65.357	5.548
Depressive	63.179	63.893	8.031
Active	78.089	79.393	5.981
Cordial	97.571	99.286	9.586
Sympathetic	90.196	91.107	5.072
Subjective	71.000	71.643	7.270
Aggressive	75.857	76.714	5.129
Critical	64.482	64.571	6.118
Self Mastery	100.696	102.536	8.405

THE PERSONAL AUDIT

The biserial coefficient of correlation between the criterion groups and the scores obtained on the nine traits measured by the Personal Audit are shown on Table X.

Upon examination of Table X it is seen that none of the correlations are significantly different from zero at or below the 10% level on any of the traits measured.

TABLE X

THE PERSONAL AUDIT

	Trait	r bis
I	Impulsive-Serious	-.159
II	Indecisive-Firm	-.019
III	Irritable-Tranquil	-.200
IV	Evasive-Frank	- .021
V	Instability-Stability	-.203
VI	Intolerance-Tolerance	-.185
VII	Emotionality-Steadiness	-.225
VIII	Fluctuation-Persistency	-.032
IX	Worry-Contentment	-.035

The mean and standard deviation on each trait are shown on Table XI.

TABLE XI

THE PERSONAL AUDIT

PART	MEAN OF THE ENTIRE DISTRIBUTION	MEAN OF THE CATEGORY WITH THE HIGHER MEAN	STANDARD DEVIATION
I	90.910	91.785	6.884
II	42.464	42.643	11.825
III	80.714	83.821	19.483
IV	50.500	50.714	12.477
V	41.411	44.857	21.242
VI	84.607	88.036	23.182
VII	27.268	29.143	10.427
VIII	36.964	37.500	20.107
IX	71.411	72.036	22.192

THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

The biserial coefficient of correlation between the criterion groups and the scores on the nine personality traits as measured by the Minnesota Multiphasic Personality Inventory are shown on Table XII.

Upon examination of Table XII it is evident that no significant difference exists at or below the 10% level on any of the traits as measured by this test.

TABLE XII

MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Trait	r bis
Hs	.147
D	.000
Hy	- .131
Pd	- .038
Mf	- .141
Pa	- .020
Pt	- .111
Sc	- .071
Ma	- .106

The mean and standard deviation on each trait are shown on Table XIII.

TABLE XIII

MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

SCALE	MEAN OF THE ENTIRE DISTRIBUTION	MEAN OF THE CATEGORY WITH THE HIGHER MEAN	STANDARD DEVIATION
Hs	11.500	11.786	2.428
D	17.036	17.036	0.000
Hy	18.518	18.929	3.919
Pd	21.554	21.643	2.909
Mf	20.696	21.143	3.973
Pa	7.964	8.000	2.268
Pt	23.071	23.321	2.828
Sc	23.161	23.321	2.840
Ma	18.893	19.214	3.778

It was discovered that five of the factors measured and used in the test battery indicated a biserial coefficient of correlation significantly different from zero at or below the 10%.

In order to produce a formula for the prediction of "Quit" or "Stay" it was necessary to discover the relationship between each of the five biserial coefficients that indicated a difference significant from zero at or below the 10% level.

By use of the product-moment method of determining the correlation coefficient of two variables the extent of relationship between each of the five significant factors was determined. The five factors that produced a significant biserial coefficient of correlation were:

1. The Mechanical Comprehension Test Form "BB".
2. The Minnesota Clerical Test - Number Checking Section.
3. The Johnson Temperament Analysis - Self Mastery Trait.
4. The Johnson Temperament Analysis - Active Trait.
5. The Personality Inventory - F_2S scale.

The results of these computations are shown in Table XIV. This Table shows that three of the ten pairings give a product-moment correlation coefficient significantly different from zero at the 10% level. The highest intercorrelations were found to be between (1) The Mechanical Comprehension Test Form "BB" and the Johnson Temperament Analysis Active Trait, (2) The Mechanical Comprehension Test Form "BB" and the Personality Inventory the F_2S Scale, and (3) The Johnson Temperament Analysis Self-Mastery Trait and the Personality Inventory the F_2S scale.

TABLE XIV

THE PRODUCT-MOMENT CORRELATION COEFFICIENT OF THE FIVE FACTORS FOUND BY THE BISERIAL COEFFICIENT OF CORRELATION TO BE SIGNIFICANTLY DIFFERENT FROM ZERO AT OR BELOW THE 10% LEVEL.

		Mechanical Comprehension Form BB	Minnesota Clerical Test No. Checking	Johnson Temperament Analysis Self-Mastery	Johnson Temperament Analysis Active	The Personality Inventory F_2S	Criterion
		1	2	3	4	5	6
Mechanical Comprehension Test Form BB	1	---	-.199	-.099	.293***	.290***	-.431*
Minnesota Clerical Test (Number-Checking)	2	-.199	---	.127	.004	.173	+.343**
Johnson Temperament Analysis Self-Mastery	3	-.099	.127	---	.219	-.289***	+.274***
Johnson Temperament Analysis (Active	4	.293***	.004	.219	---	-.161	-.273***
The Personality Inventory F_2S	5	.290***	.173	-.289***	-.161	---	-.294***
Criterion	6	-.431*	.343***	.274***	-.273***	-.294***	---

* Needed for significance at the 1% level - .425.

* * Needed for significance at the 5% level - .322.

* * * Needed for significance at the 10% level - .272.

From these calculations a multiple regression equation was developed using all five of the tests that indicated significance at or below the 10% level.

In order that this might be done it was necessary to replace the biserial coefficients of correlation with point biserial coefficients of correlation.[1]

After this was completed it was then possible to develop the multiple regression equation by the solution of a multiple-correlation problem by the Doolittle method.[2]

The multiple regression equation so devised may be written:

$$X^1 = - .017X_1 + .003X_2 + .026X_3 - .038X_4 - .010X_5 + .159.$$

Where: X_1 = the raw score on the Mechanical Comprehension Test Form BB.

X_2 = the raw score on the Minnesota Clerical Test Number Checking Section.

X_3 = the raw score on the Johnson Temperament Analysis Self Mastery Scale.

X_4 = the raw score on the Johnson Temperament Analysis Active Scale.

X_5 = the raw score on the Personality Inventory F_2S Scale.

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[1]Allen L. Edwards, Statistical Analysis, Pages 114-116.

[2]Joy Paul Guilford, Fundamental Statistics in Psychology and Education, Page 406.

Each score on the "hold-out" stay group and the "hold-out" quit group was inserted in its respective place in the newly devised equation. A Correlation was then run on the formula score with the criterion in the "hold-out" group. The point biserial coefficient of correlation indicated a validity coefficient of .016.

The mean and standard deviation are shown in Table XV.

TABLE XV

	MEAN OF HIGHER	MEAN OF LOWER	STANDARD DEVIATION
NEWLY DEVELOPED EQUATION	.208	.191	.508

CHAPTER FIVE

SUMMARY AND CONCLUSION

The results of eight separate psychological tests comprising 42 different measures taken by 112 men who were employed as gas and water meter readers were used in this study.

These men were divided into two groups. One group was comprised of men who were continuously employed for nine or more months. This group was called the "stay" group and composed of 57 men.

The other group was composed of men who left before completing nine months of service. This group was called the "quit" group and was composed of 55 men.

Each group was subdivided into "work" and "hold-out" groups by arranging the men by order of employment date, assigning consecutive numbers and then selecting the odd numbers for "hold-out" and even numbers for "work".

The "work" group was used to develop a regression equation to be validated on the "hold-out" group to predict whether or not a meter reader would stay with the firm long enough for the firm to "break-even" on its original invest-

ment in the new employee.

Significant differences were found on five of the 42 measures. All five of the significant measures were used in the development of a regression equation to predict "quit" or "stay".

The formula thus devised when applied to the "hold-out" group revealed a validity coefficient of .016.

CONCLUSIONS

Although five of the 42 measures in the "work" group indicated significance at or below the 10% level they were not stable enough to yield a significance when applied, in the form of a regression equation, to the "hold-out" group. The point biserial coefficient of correlation of .016 obtained when the regression equation was applied to the "hold-out" group indicates that the five measures that revealed a significant difference in the "work" group were just a chance development. This study indicates that there is no significant difference in the pre-employment test scores of applicants hired as meter readers that would indicate whether or not they would remain on the job for nine or more months.

SUGGESTIONS FOR FUTURE STUDY

The fact that no significant difference exists in the test scores of meter readers that would indicate the probability of staying on the job for nine or more months would indicate: (1) the consistency of the selection program or (2) the inability of the present test battery to determine the probability of "Stay" or "Quit". Further study of this problem would be necessary to determine the possibility of either of these suppositions.

It is suggested for future study that the group be divided into an upper and lower category instead of being divided by employment date.

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