PREDICTION OF JOB PERFORMANCE FROM FACTORIALLY DETERMINED DIMENSIONS OF BIOGRAPHICAL DATA

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Twenty factors identified through a factor analysis of a 102-item biographical inventory were used as predictors in a multiple regression equation to predict on-the-job performance (supervisory ratings) of oil field employees. This yielded a multiple R of .41. A total of 295 subjects participated in the study. Cross-validation yielded a correlation coefficient of .06. The t-test analyses of the factor means of equipment operators and field mechanics proved that two factors could discriminate between the groups, Mechanical Experience ($p < .01$) and Social Orientation ($p < .05$).

The results of this study indicate that conducting a factor analysis of unvalidated biographical items and attempting to predict performance would be less appropriate than factor analyzing predictive items to gain an understanding of their underlying dimensions.

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Review of Literature

One fact that has become self-evident in the behavioral sciences is that one of the best predictors of future behavior is past behavior. There seems to be ample evidence to support this truism; for example, the best predictor of college grades has been shown to be high school grades (Fishman & Pasanella, 1960), and previous income has been shown to predict success in selling life insurance (Tanofsky, Shepp, & O'Neill, 1969). Also, Plag and Goffman (1966) have shown that completion of high school predicts completion of service school and enlistment in the Navy.

In the business community, personnel managers have attempted to predict future behavior by evaluating the past behavior of prospective employees through such techniques as interviews, application blanks, and letters of reference. Behavioral scientists have also attempted to improve upon the previously mentioned evaluative techniques by adding tests, questionnaires, and rating scales. One method which has often been used and has proved to be useful is the biographical inventory.

Since World War I, various types of biographical data have been used in the selection of individuals for occupational

specialties. As early as the 1920s, positive relationships were found between biographical items and vocational success (Goldsmith, 1922), and prior to the end of World War II, positive relationships had been reported between biographical data and success of students, industrial employees, and military specialists (Hadley, 1944; Kelly & Ewart, 1942; Viteles, 1933). However, an omnibus biographical information inventory was not developed until World War II (Henry, 1965).

There are three theoretical explanations reviewed by Asher (1972) which seek to explain the relationship between biographical items and work behavior. One explanation is that the weighted application blank is representative of an individual's history. Other predictors, however, may only be caricatures. One predictor often used is the unstructured selection interview. In the interview, the individual can present a fictionalized concept of himself, while the scorable application blank is more apt to be a systematic, comprehensive collection of factual information about the individual. He terms this the "nonfiction" theory since biographical items may be to the selection interview, what nonfiction is to fiction. Another theory is termed the "relevant item" theory. Since the validity of any test may be dampened because it is a set of "relevant" and "irrelevant" items, Asher (1972) states that all parts of the predictor space are not likely to be equally valid. Thus, the predictor space for a test is heteroscedastic since all of the

test items will not be relevant for predicting a specific criterion behavior.

The weighted application form has a predictor space that is homoscedastic since only "relevant" items are selected in the set used to predict the specific criterion behavior in the cross-validation.

The "point-to-point" theory relates to the fact that the weighted application blank may work because it escapes the fallacy of attempting to make predictions by measuring general mediators. One strategy used in testing is to assume that criterion behavior is controlled or determined by generalized mediators as traits, aptitudes, or intelligence.

This means that these mediators must be measured. How well the criterion is predicted depends on the accuracy with which the mediators are measured.

Asher (1972) believes that accurate prediction is a function of point-to-point correspondence between predictor space and the criterion space. The validity coefficient then depends upon the number of points they have in common.

This theory is supported by a study of National Merit finalists (Holland & Nichols, 1964). In this study, an attempt was made, using 500 boys and 500 girls, not only to predict college freshman grades, but also creative accomplishments in specific areas such as leadership, science, drama, literature, music, and art. Student achievement in high school was shown to be the best indicator of college

achievement. The results showed a point-to-point relationship between what the student did in high school and his behavior in college. High school grades predicted college grades, scientific activity in high school predicted similar achievement in college, and this specific one-to-one relationship also held for leadership, drama, writing, music, and art.

High school grade point average is predictive of college grades; if the one-to-one principle holds, adult achievement probably cannot be predicted from information as college grade point average. Hoyt (1965) concluded in a review that achievement in business, engineering, medicine, science, and law cannot be predicted, even with modest accuracy, from college grade point average. The above discussion yields an idea as to why biographical items are predictive. Below is a discussion of some of the research in this area.

In one study by Nevo (1976),personal data were gathered from a group of Israeli men and women through the use of biographical information blank. A total of 914 military personnel participated in this study. They were divided into two groups keying sample and replication sample. Thirteen variables were selected from the personal data to be used as predictors of success in the armed forces. The thirteen selected variables were father's educational level, father's age group, father's occupational level, mother's educational level, mother's age group, family income level, number of persons per room in family dwelling, number of

siblings, birth order in family, high school major, intensity of athletic activities in high school, and intensity of extra-curricular social activities in high school.

The criterion consisted of the individual's military rank. The author believed that military rank could serve as an index of the total success during military service. A numerical scale was devised for the criterion, private (1); corporal and sergeant (2); staff sergeant, sergeant-major (3); second lieutenant, lieutenant (4); and captain (5).

The correlation between the criterion and the predictors for men in the keying sample was .41. The correlation for women was .25. The correlation in the replication sample for men was .36 and for women .18. All correlations were significant at the .01 level.

A biographical inventory was also used in the Air Force to predict the final grades in technical schools (Levine & Zachart, 1951). Included in an early Airman Classification battery was a 378-item biographical inventory. About 50 questions asked for the strength of preference for representative technical sepcialties. The remaining items tapped educational background, socioeconomic status, and participation in activities directly related to the technical specialties of the postwar Air Force.

On the basis of item-analysis data, including item validities for various specialties, a separate empirically

derived key was developed for each of the specialty families. Through the use of these keys, the inventory was shortened to 125 items. These 125 items were combined into 8 keys and the authors presented the product-moment correlations between the keys and the final technical schools grades in a rather large matrix. The authors contend that the biographical inventory was very useful when combined with other instruments such as aptitude tests in a multiple regression equation.

In a study by Loughmiller, Ellison, Taylor, and Price (1973), the career performance of physicians was predicted using a biographical inventory. The authors were faced with two critical questions. They had a criterion problem of defining what constitutes a good career practitioneer and the predictor problem of assessing in advance which applicants to the various schools are most likely to become these good career practitioneers (and not just good students). The study, using a 333-physician sample, was designed to establish such criteria and predictors in the field of medicine, 7 important composite criteria, and summary criteria were established. Several keys were developed by the authors to predict the various criteria; the net result was that 5 of the 7 criteria were predicted successfully with cross-validities at levels beyond .40 and ranging as high as .56.

In a study by Lochwood and Parsons (1960), personal history information was used to predict the performance of production supervisors. A total of 284 male employees were

used in this study. The sample consisted of 146 first-line production supervisors who had retained their position during a work force reduction and 138 who had not. The criteria consisted of supervisory ratings and retention in supervision. A specially constructed Personal History Data Inventory was used in this study. It consisted of 120 questions with possible answers presented in four or five categories rather than open-ended statements. The form explored early family life, education, military experience, work experience, voting behavior, marital history, children, residences, personal property, finances, and many other variables.

The 284 subjects were split into two groups, a standardization group and a cross-validation group. Through the use of t-test analyses 14 items were identified that could discriminate between the two groups at the .10 level or better.

The 14 items were scored by assigning an integral weight of one for a significant response on each item. The total scores yielded validity coefficients with the supervisory ratings of .53 on the standardization group and .54 on the cross-validation group. The respective validity coeffificents were .51 and .55 on the retention in supervision criterion.

The 14 significant items were grouped into several a priori categories: ambition, flexibility, mathematics, sociability, and vigor.

Buel (1965) showed that biographical data could be used to predict the success of creative research personnel. The sample consisted of 132 male research personnel employed by a pharmaceutical research and manufacturing organization. Two criteria were used. Both were in the form of personnel evaluations. A biographical inventory was constructed from the work of other researchers in this area. The items covered topics such as schooling, previous work and professional experience, environmental preferences, and personal activities.

The author found 50 items to be significant; 41 of the items were amalgamated into a no-previous-experience key and the remaining items into a previous-experience key. Significant correlations between the keys and the criteria ranged from .29 to .57; only one correlation was nonsignificant. The author found that more creative men tend to have a positive self-image, a need for personal independence in work, a history of parental permissiveness insofar as decision-making was concerned, and a tendency to become over involved (in terms of time available to perform job-related activities).

Kavanagh and York (1972) found that biographical data could be used to predict the success of middle managers. The authors' rationale for using this approach was similar to that underlying the "consistency model of prediction" developed by Wernimont and Campbell (1968). They argued for

the use of pre-employment behavioral samples to predict future job behavior rather than using tests as signs or predispositions to behave in certain ways. Thus, personal history data, summarizing the previous behavioral experiences of an individual, should be expected to aid the prediction of future job performance.

The subjects consisted of 658 managers of three supervisory levels. The biographical data were collected by questionnaire. The criterion consisted of supervisory ratings. The results indicated that middle managers' responses to biographical items are significantly related to performance ratings, and thus, with further evidence of their predictive validity, could possibly be used as important information in managerial selection.

Scott and Johnson (1967) used a form of a biographical inventory commonly referred to as a weighted application blank to select unskilled employees. They pointed out that very little research had been done in this area. Dunnette and Maetzold (1955) had used biographical data to select unskilled workers, but their study was concerned only with seasonal employees. The above technique has been used often in the selection of office and sales personnel.

Subjects consisted of 150 long- and short-tenure employees of a small canning factory. The 19 biographical items listed on the application form were used as predictor variables. The criterion was tenure with the company. The

multiple correlation between 12 of the 19 items and the criterion was .71. The authors believed that this technique proved to be an effective one in selecting long-term unskilled workers. The higher the individual's score on the items, the greater the likelihood of his staying with the company a reasonable length of time. A factor analysis was conducted of the significant items and the factors "convenience" and "family responsibility" were identified. Convenience refers to the fact that employees living near the company tend to stay with the company. Family responsibility refers to the tendency of employees who were older, married, and living in their own home, to stay with the company.

From the above review, it has become obvious that biographical data has been shown to be related to success in a variety of occupations both in industry and in the military. In fact, as early as 1955, Ghiselli had published a review which indicated that biographical data had been proved valid in predicting trainability and proficiency criteria. What about the items themselves whether they appear on a biographical inventory or an application form?

Owens, Glennon, and Albright (1962) conducted a study to identify rules for writing and evaluating biographical items which would be favorable to the production or selection of those possessing high potential retest reliability or consistency. The method used required an inspection of

consistent and inconsistent items with a view to deriving rules, and the "blind" sorting of these items in accordance with a given rule by five independent judges to determine the coincidence of rule conformity with retest consistency.

An inventory consisting of 200 items was administered to a total of 43 subjects twice within a two-month period. Four rules were identified.

Rule 1. Brevity is desirable. For example, by actual line count, the average length of stem among the consistent items was approximately two lines as contrasted with two and one-half among the inconsistent.

Rule 2. Whenever possible, numbers should be used to graduate and to define options or alternatives.

Rule 3. Either all response options or alternatives should be covered or an "escape" option should be provided.

Rule 4. Items, particularly item stems, should carry a neutral or a pleasant connotation for the respondent.

Asher (1972) states that exactly what items should be classified as biographical is quite controversial. A biographical item may vary on any of the following dimensions: verifiable--unverifiable; historical-futuristic; actual behavior--hypothetical behavior; memory--conjecture; factual--interpretive; specific--general; response--response tendency; and external event--internal event.

Table 1 is taken from Asher's article giving specific examples of biographical items representing each dimension.

Table 1

A Taxonomy of Biographical Items

Verifiable	Unverifiable
How many full-time jobs have you had in the past 5 years?	What aspect of your last full-time job did you find most interesting?
Historical	**Futuristic**
List your three best subjects in high school.	Do you intend to further your education?
Actual Behavior	**Hypothetical Behavior**
Did you ever build a model airplane that flew?	If you had the training, do you think you would enjoy building innovative model airplanes for a toy manufacturer?
Memory	**Conjecture**
Before you were 12 years old, did you ever try to perform chemistry experiments at home?	If your father had been a chemist, do you think you would have performed chemistry experiments at home before you were 12 years old?
Factual	**Interpretive**
Do you repair mechanical things around your home such as appliances?	If you had the training, how would you estimate your performance as an appliance repair man?

Specific	General
As a child did you collect stamps?	As a child were you an avid collector of things?
Response	Response Tendency
Which of the following types of cameras do you own?	In buying a new camera, would you most likely purchase one with automatic features?
External Event	Internal Event
Did you ever have private tutoring lessons in any school subject?	How important did you view homework when you were in high school?

Some researchers believe that only verifiable items should be termed biographical. However, it has been shown that unverifiable items are very useful. For instance, Henry (1965) commented that the question "Did you ever build a model airplane that flew" was almost as good a predictor of success in flight training during World War II as the entire Air Force Battern even though it was almost impossible to verify.

Other researcher feel that any person-type item which describes the individual may be classified as a biographical item. This would include items such as personality, motivation, aspiration, attitudes, or values. This description fits the inventory used in the present study.

The predicitve power of biographical items may be evaluated by comparing them to other predictors. Ghiselli (1966) published the proportion of validity coefficient which resulted when tests were tried for specified jobs. Table 2 shows that when the minimal cutoff for a validity coefficient was .50, biographical items excelled the intelligence test by two to one (Asher, 1972). The criterion in nearly all cases was job proficiency.

Table 2

Proportion of Validity Coefficients .50 or Higher With Job Proficiency as the Criterion

Item	Percentage
Biographical	50%
Intelligence	28%
Mechanical Aptitude	17%
Personality	12%
Spacial Relations	3%

Asher (1972) believed that the application blank or biographical inventory should be expanded beyond verifiable-facual items in an attempt to measure past-work behavior. Self-descriptive items were also discussed and Walther (1961) was cited as generating coefficients in cross-validation of .49 and .60 for some positions. Below is an example of a self-description item:

Were your parents

a. always very strict with you

b. usually very strict with you

c. seldom very strict with you

d. never very strict with you.

Asher (1972) found that in comparison with other predictors as intelligence, aptitude, interest, and personality, biographical items had vastly superior validity.

Yet, according to several authors very little had been done to understand the real underlying meaning of biographical information. It was Henry's (1965) opinion that

1. The explicit problem of enhanced predictive efficiency has been solved. For whatever their meaning may be, biographical inventories work.
2. Since the biographical questionnaire is conceived of as an extended standardized interview on paper and since it samples all aspects of an individual's earlier behavior, therefore it partakes of all the former techniques for assessing past behavior. Thus, it is tacitly assumed to be measuring the same things but doing a better job of it. However, this merely underscores the fact that little is known about the meanings derived from the former methods.

3. Although the statistical tools have been available for analyzing biographical information, until recently the task has appeared very costly and formidable.
4. Aside from theoretical academic interest, there were not very persuasive reasons for tackling the program until a "prediction plateau" developed (p. 248).

Essentially, most of the research on the prediction of occupational success using personal background data has taken an empirical approach. Usually the discriminative power of the items in measuring some criterion is found and the items that discriminate are combined to produce a score. These scores have been individually cross-validated for a variety of occupations in industry and the armed forces (Dunnette & Maetzold, 1955; Elliott, 1960; Levine & Zachert, 1951; Lockwood & Parsons, 1960; Scollay, 1956). The above method was criticazed as being identified with a shotgun approach, the absence of generality, and a failure to discover logical relationship inherent in the data (Morrison, Owens, Glennon, & Albright, 1962). Dunnett (1962) stated that most users of the "empirical" method have been more intent on achieving statistical prediction than on gaining an understanding of the dynamics of success which may be suggested by the data.

Morrison et al. (1962) met the criticism of empiricism with a factor analysis of life-history items. The researchers first classified 75 previously validated biographical items to better understand the underlying dimensions represented by the data, and to examine the differential profiles of three criterion groups and their implication for industrial personnel policies.

Five factors, accounting for 23% of the variance, were extracted from a matrix composed of the discriminating life-history items and three criteria of research performance. Supervisory ratings made separately on creativity and overall performance, and the number of patent disclosures submitted during a 5-year period were used as criteria. The subjects in this study were petroleum research scientists. The five factors were identified as Favorable Self Perception, Utilitarian Drive, Tolerance for Ambiguity, Professional Orientation, and General Adjustment. The three criterion groups' profiles across the five factors showed great similarty between the profiles based on ratings, but substantial differences between those and the patent disclosure profile. This study indicated that most of the information needed to formulate sensitive and definitive personnel policies can be derived directly from biographical information.

Baehr and Williams (1967) stated that though the Morrison et al. (1962) study did generate factors which distinguished between different behavior patterns, these factors could not

be expected to be of sufficient generality for use in the broader areas of counseling and placement, or to contribute to an understanding of the dynamic relationships between biographical data and general occupational success. Therefore, Baehr and Williams were determined to take an additional step and find meaningful and significant background parameters for the general male population. The researchers conducted a factor analysis of the response of 680 male subjects to a variety of quantifiable personal-background data items. This sample represented a wide range of occupations: professionals, middle and upper executives, junior executives, district sales managers, salesmen, foremen, hourly auditor supervisors, school administrators, and community school directors.

The researchers identified 15 factors that accounted for 43.5% of the variance. These were labeled School Achievement, Higher Educational Achievement, Drive, Leadership and Group Participation, Financial Responsibility, Early Family Responsibility, Parental Family Responsibility, Stability, School Activities, Professional Successful Parents, Educational-Vocational Consistency, Vocational Decisiveness, Vocational Satisfaction, Selling Experience, and General Health. Baehr and Williams selected 8 out of 15 factors as having the most potential for operational use on the basis of clearness of factor definitions, the number of items defining the factor, the correlation between respective unit

weights and beta weight scores, and the Kuder Richardson reliability coefficients. They also discovered that for the primary factors across the 10 occupational groups, virtually all factors would discriminate between the occupational groups at the .05 level of confidence and the majority of them at the .001 level or better.

In a later study, Baehr and Williams (1968) used their previous results in order to determine if the background dimensions were related to occupational success. The predictor variables were the unit-weight factor scores derived from the 15 first-order factors previously identified. The criterion measures consisted of a paired comparison rating, mean sales-volume rank, maximum sales-volume rank, route difficulty, and tenure. Multiple regression analysis of the factor scores against each of five criterion measures yielded coefficients of .42, .50, .36, .27, and .30, respectively.

The results of the Baehr and Williams (1968) study indicated that there seems to be a logical and dynamic relationship between the underlying dimensions of personal background data and job behavior.

From the above review, it seems that one effective method of utilizing biographical data as a predictor of performance was that of Baehr and Williams (1968). The present study was conducted along the same lines to determine the relationship of the underlying dimensions of a collection of biographical data to on-the-job performance.

Method

Subjects

A sample of 245 male nonexempt (hourly) oil field workers was used in this study. These individuals were employed by a company in the Southwest in an oil-related business. Another sample of 50 employees was identified for cross-validation. These subjects were selected on the basis of their performance rating, division, district, and job titles, in order to match the original group.

Measure

A 102-item multiple-choice biographical inventory was constructed in order to assess previous experience and behavior. The items were categorized under six headings to promote the face validity of the instrument.

When the items were selected, care was taken to insure that items were brief but understandable, that escape options were provided (see Asher, 1972, p. 267), and that the items did not try to retrieve information beyond the subject's memory.

Some of the multiple-choice items contained alternatives which were discrete categories. These were scored as dichotomous items and greatly increased the number of variables in this study.

Continuous items were given a score that coincided with the actual number of the alternative. If a subject chose

alternative six, then the subject would have received a score of six on that item. Dichotomous items were scored as 1 (checked) or 0 (left blank).

Variables

The predictor variables were the unit-weight factor scores derived from 20 first-order factors. A total of 65 factors, accounting for 69.7% of the variance, were identified when using an eigenvalue of one. However, only the first 20 factors, accounting for 40.6% of the variance, were used as predictor variables. The factors were defined as Involvement, Marital Experience, Activities and Interests, Mechanical Experience, Educational Achievement, Social Experiences, Stability, Driving History, Need for Achievement, Work Experience Field, Energy, Vocational Stability, Maturity, Equipment Experience, Family History, Physical Characteristics, Financial Responsibility, Previous Employment History, Social Orientation, and Group Participation. The above factors were defined by studying those variables which loaded .3 or above on each factor.

Criterion

Supervisory ratings were used as an index of performance. The ratings ranged from 1 to 9 with 1 representing the best of the high performers and 9 as the worst of the poor performers. Rather than use the actual numerical rating, the scale was collapsed into three categories. These were high performers, average performers, and poor performers. This

was done because employees in different job categories tended to be rated differently. An average performer employed in a job category requiring little knowledge or skill tended to receive ratings of 6 or 7, while an average performer in a category requiring both knowledge and skill tended to receive ratings of 4 or 5. Therefore, placement in one of the three criterion groups was dependent upon the distribution of ratings within a job category. High, average, and poor performers received criterion scores of 1, 0, and -1 respectively.

Procedure

The biographical inventory was administered to the subjects during the summer of 1975. A factor analysis (BMDX072) was run on the responses of the subject to the inventory. Then the first 20 rotated factors (orthogonal) scores were used as predictors in a multiple regression equation with supervisory performance ratings as the criterion. A sample of 245 employees was used to identify the equation.

A cross-validation was conducted using 50 subjects, who were not included in the original stepwise multiple regression analysis. Also, t-test analyses were used to determine if field mechanics scored differently on the rotated factors than equipment operators since a review of the job descriptions of these two groups indicated differences in the types of work the groups performed. An equipment operator, at least in the company in which this study was conducted, was hired to

be trained to operate and drive equipment that is attached to a tractor-trailer rig. These personnel usually have little or no driving experience since it is extremely difficult to recruit experienced equipment operators. Mechanics, on the other hand, usually have experience in component replacement and diesel mechanics when they are hired. Their responsibility is to troubleshoot equipment and perform preventive maintenance.

The author notes that the above description is not true for all oil-related businesses and in the past (1973) was not the case in the company in which this study was conducted. However, a management decision was made in 1973 to cease utilizing field mechanics as equipment operators. Since this decision was made the field mechanic position has evolved into one which is quite different from that of an equipment operator. It should also be noted that because of high turnover in the mechanic positions in the past, very few of these equipment operators/mechanics are still employed.

Results

Multiple regression analysis (see Table 3) of the factor scores and performance criterion yielded a multiple R of .41 between the factors and the criterion scores. Only 9 of the 20 factors were related in any significant manner to on-the-job performance. These 9 are listed in Table 3.

Table 3

Multiple Regression Analysis Between Factor Scores and Performance Criterion

Predictor Factors	Simple r	Raw Coefficient (Weight)
Equipment Experience	.22	.15
Involvement	-.14	-.09
Energy	.13	.10
Stability	.12	.08
Work Experience Field	.11	.09
Physical Characteristics	.13	.09
Educational Achievement	.12	.08
Family History	.08	.06
Mechanical Experience	.09	.06

The predicted scores of the 50 subjects in the cross-validation sample derived from the multiple regression equation described above were correlated with the criterion scores of the cross-validation sample subjects. This yielded a correlation coefficient of .06.

Twenty t-tests analyses were run to determine if the mean factor scores could discriminate at a statistically significant level between equipment operators and field mechanics. The results of the t-test analyses are shown in Table 4.

Table 4

Significance of Difference Between Mean Factor Scores For Equipment Operators and Field Mechanics

Factor	Equipment Operators		Field Mechanics		t-Test
	$\bar{X}$[a]	SD[b]	$\bar{X}$	SD	
Involvement	.03	1.00	.10	1.09	.35
Marital Experience	.02	.96	.32	.58	1.61
Activities and Interests	-.18	.71	-.11	.85	.44
Mechanical Experience	.23	.79	-.94	1.11	6.55[c]
Educational Achievement	-.02	.99	-.07	.88	.27
Social Experiences	.09	.94	-.16	1.22	1.18
Stability	.02	.99	-.17	1.11	.88
Driving History	.09	.97	-.28	1.10	1.81
Achievement	-.04	1.00	-.18	1.16	.64
Work Experience Field	-.26	.99	.03	1.05	1.39
Energy	-.07	1.07	-.00	.94	.34
Vocational Stability	.06	.88	.03	.80	.18
Maturity	-.13	.93	-.02	1.42	.49
Equipment Experience	.04	1.02	-.33	.83	1.83
Family History	.08	1.06	.08	1.13	.00
Physical Characteristics	.03	.97	-.24	1.02	1.34
Financial Responsibility	-.09	1.10	-.13	.77	.20
Previous Employment History	-.00	.94	.08	.97	.40
Financial Stability	.05	.96	.52	1.01	2.32[d]
Group Participation	-.12	1.02	-.00	1.20	.51

[a]Mean

[b]Standard Deviation

[c]$p \leq .01$

[d]$p \leq .05$

Only two factors were able to discriminate between operators and mechanics. Mechanical Experience differentiated at a statistical level of .01 and Social Orientation at the .05 level.

Items loading high on the mechanical experience consisted of a series of dichotomous questions seeking to ascertain the experience level of the applicant in such areas as clutch rebuilding, differential rebuilding, electrical and ignition repair, diesel injection, welding, engine dynamometer, and vacuum or air brakes. Field mechanics tended to answer such questions in the affirmative.

Field Mechanics tended to score higher on the financial stability factor as opposed to Equipment Operators. Three items loaded heavily on this factor. One was related to the types of dwellings the individual had lived in, i.e., owned home or rented. Another item had to do with longest time spent unemployed between full-time jobs.

The final item was related to the amount of income the applicant received at his last place of employment. Field Mechanics tended to own their own homes, spent little time unemployed, and worked on commission.

Discussion

From the results, it seems that the 20 factors are not related in any meaningful manner to performance. This seems at odds with the findings of Baehr and Williams (1968), but the above factors were drawn from a different population of

items and were used to predict on-the-job performance of oil field personnel, not salesmen. Baehr and Williams (1968) did not cross-validate either.

Another major difference is the number of factors produced. Baehr and Williams' inventory yielded 15 first-order factors, while the inventory used in this study produced 65 factors. Differences in test construction probably account for the results. However, the factor analytic program used by Baehr and Williams might have been different.

If the 65 first-order factors had been used as predictors, the multiple regression coefficient would have been higher. However, the point in using factor analysis is to condense a multitude of individual items into a few meaningful factors or dimensions. In this case, the items representing the biographical inventory could not be condensed into a usable number of factors. Therefore, it was decided to use the first 20 factors as predictors, which meant that about 60% of the total test variance was unaccounted for. Obviously the loss of 60% of total test variance reduced the predictive power of the instrument, which may have resulted in a nonsignificant correlation in cross-validation.

Probably the most obvious shortcoming of this study was its reliance upon a criterion of supervisory ratings. Such ratings have been criticized frequently because of their poor reliability, validity, and presence of halo. The

tendency to rate an individual in the same manner on all traits because of a general overall impression is commonly referred to as halo. The reason supervisory ratings were used in this study is the same reason they are used in most studies--no other index of performance was available. For an in-depth discussion of the shortcomings of supervisory ratings see Guion (1965).

In the future, researchers would probably find the method used by Morrison et al. (1962) more appropriate than that used in this study. In other words, one should conduct a factor analysis of validated items rather than attempt to predict some criterion with factors based upon items that have not been validated. The merit of the former approach is that the factors produced would, in fact, represent dimensions related to the criterion.

In summary, the use of factors as predictors in a multiple regression equation to predict on-the-job performance appears not to be the best approach available in the applied setting. Predictability is strived for in industry. Although this approach has potential to produce a considerable amount of information which may be lost when items are used as predictors, it does not seem to have the predictive power of other more common methods of predicting performance with biographical information. In the future it might be possible to identify highly predictive factors which would produce

both a comparable predictive rate to other methods, and a meaningful and logical information source. Researchers are encouraged to strive for this relationship.

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