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An Inferential Approach to Occupational Reinforcement

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An Inferential Approach to Occupational Reinforcement

Summary

The Work Adjustment Project has as its purpose the study of the factors which affect the adjustment of the disabled person to work and the work environment. The *Theory of Work Adjustment* is the framework within which Work Adjustment Project research is being carried out.

The *Theory of Work Adjustment* requires that the work environment be described, in part, in terms of the set of reinforcers which are available in the environment for the satisfaction of various needs. One method of fulfilling this requirement involves the inference of such a reinforcer set from data on the need levels and accompanying satisfaction levels for a sample of workers from a given work environment. This monograph reports several studies in which an inferential approach to the identification of occupational reinforcer patterns is utilized.

Two multivariate prediction techniques, linear multiple regression and reciprocal averages prediction, were utilized in the analysis of need and satisfaction data for the purpose of inferring occupational reinforcers. General job satisfaction (measured by the Minnesota Satisfaction Questionnaire) was used as the criterion, and need scales (the 20 scales of the Minnesota Importance Questionnaire) were used as the predictors. Prediction equations were derived on development samples and tested on cross-validation samples when these were available. The influence of occupation, sex, tenure, and full- vs. part-time employment, in determining the pattern of occupational reinforcers, was investigated in a series of studies. Findings from these studies may be summarized as follows:

1. Stable (i.e., cross-validated) occupational reinforcer patterns were inferred for managers and supervisor nurses, but not for truck drivers or secretaries. For the group of managers, occupational reinforcers include those to be found in the satisfaction of ability utilization, achievement, authority, co-workers, creativity, moral values, social service and variety needs. Reinforcers for the supervisor-nurses include authority, achievement, and moral values as

positive reinforcers and a lack of reinforcement of compensation, recognition and supervision-technical needs.

2. Different patterns of reinforcers were found for groups of male, as compared with female, workers in the same occupation. This finding, however, was not cross-validated and must be considered tentative.

3. Reinforcer patterns inferred for workers with tenure of less than two years differed from those inferred for workers in the same occupation but with tenure of two years or more. Furthermore, longer tenure was associated with a larger number of reinforcers. These findings also were not cross-validated and are therefore tentative.

4. Differences in inferred reinforcer patterns were observed between groups of full-time and part-time nurses. More reinforcers were included in the set for the full-time nurses than the set for the part-time nurses. For full-time nurses, occupational reinforcers included those to be found in authority, co-workers, independence, moral values, responsibility, and security. Occupational reinforcers for the part-time nurses included those found in ability utilization, social status and working conditions. Ineffective reinforcers included variety for the full-time nurses, and advancement and compensation for the part-time nurses. While cross-validation studies confirmed the inferred reinforcer patterns, different patterns were obtained on different samples from the same group of full-time or part-time nurses, indicating some lack of stability for occupational reinforcer patterns derived by inferential methods.

5. Different multivariate techniques functioned differently in these determinations, indicating the differential significance of predictor-variable interaction and of nonlinear predictor-criterion relationships.

Introduction

Vocational rehabilitation counselors, as vocational psychologists, have been concerned with the traditional problem of predicting job satisfactoriness for the disabled. A major approach to the problem, which has met with considerable success, is based on determining the correspondence between an individual's abilities and the ability requirements for various jobs. While vocational psychologists have also been concerned with the problem of predicting job satisfaction, no solution paralleling the success of the ability correspondence approach has been advanced.

The *Theory of Work Adjustment,* published in Monograph XV of this series,[1] proposes that the correspondence approach can be used in the prediction of job satisfaction. According to the theory, satisfaction as well as satisfactoriness can be explained through the principle of individual-environment correspondence.

Proposition II of the *Theory of Work Adjustment* states that satisfaction is a function of the correspondence between the reinforcer system of the work environment and the individual's set of needs. "Needs" are defined in terms of the reinforcing properties (reinforcement "strengths") the individual associates with broad but recognizable categories of stimulus (environmental) conditions. The reinforcer system in the work environment is defined in terms of the reinforcement strengths of the stimulus categories constituting the environment.

The use of the correspondence principle in the prediction of satisfaction or satisfactoriness requires the description of the individual and his work environment in the same set of terms. Determination of the degree of correspondence is facilitated and made more precise when man and job are measured on the same set of dimensions.

The idea of describing man and job on the same dimensions had its early beginnings in Viteles' proposal of a "job psychograph."[2] The job psychograph was to be a graphic profile of the amounts (degree) of selected "mental traits" which were considered essential for success on a particular job. It was to be developed, according to Viteles' proposal, from the ratings of trained job analysts. The job psycho-

[1] Dawis, R. V., England, G. W., Lofquist, L. H. A theory of work adjustment. *Minnesota studies in vocational rehabilitation,* XV, 1964.

[2] Viteles, M. S. *Industrial psychology.* New York: W. W. Norton, Inc., 1932.

graph, therefore, defined the trait pattern which best predicted success on a job.

To use the job psychograph, an individual's scores or ratings on the various traits were compared with the "ideal" pattern for the job as defined by the psychograph. Correspondence with the "ideal" pattern was reason to expect successful performance of the job, while deviation from the "ideal" pattern indicated varying degrees of less successful job performance.

The job psychograph method became the basis for the development of Occupational Aptitude Patterns (OAPs) by the United States Employment Service (USES) for use with the General Aptitude Test Battery (GATB).[3] The rationale for the OAP was the same as that for the job psychograph. However, instead of basing the determination of the "ideal" pattern of traits solely on the judgment of job analysts, the OAP method required, in addition, the use of observed relationships between the traits (as measured by the GATB) and a job success criterion (such as productivity or performance ratings). Thus the OAP "psychograph" was determined by two methods: inference from empirical data and direct observation (the method originally proposed by Viteles).

In using OAPs, the vocational counselor compares the individual's scores on three selected GATB tests (the OAP variables) with the OAP's cutting scores for each test. Agreement between the pattern of individual scores and the OAP pattern leads to a prediction of satisfactoriness in work performance on jobs for which the OAP applies. Thus, the OAP is a description of the ability requirements of the job in psychometric terms.

The OAP has no parallel in the prediction of job satisfaction. Little attention has been directed in the research literature toward the use of the correspondence approach in the prediction of job satisfaction. Few attempts have been made to describe the work environment with respect to a set of reinforcement dimensions on which workers may also be described. Furthermore, few studies have compared occupational reinforcement for the disabled with that of the non-disabled. Consequently, the study of occupational reinforcement has been given the highest priority in the Work Adjustment Project.

[3] United States Department of Labor, Bureau of Employment Security.

Monograph XVIII in this series[4] presented some evidence indicating that job satisfaction is indeed a function of the correspondence between the individual's need set and the job's reinforcer system. In this study, the reinforcement strengths of various job reinforcers were estimated by judges. Reinforcement strengths were estimated by comparing jobs with one other and ranking them according to the degree to which the given reinforcer was present in the different jobs. The judges did not actually observe the jobs but made comparisons based on job descriptions and from personal knowledge of these jobs. This approach is analogous to that proposed by Viteles in the abilities-satisfactoriness area.

If the analogy with abilities-satisfactoriness is carried further, it would seem reasonable that occupational reinforcer patterns (ORPs) analogous to OAPs could be developed using satisfaction as the criterion with which to determine the effective reinforcers in a given job environment. An ORP would indicate the reinforcers effective in a job and the relative strengths of these reinforcers.

This monograph reports the first study in a contemplated series of studies on occupational reinforcement. In the studies reported, an attempt was made to identify the effective reinforcers in various occupational environments from the statistical relationships between measured needs and measured satisfaction. Two different statistical techniques were used in the inference of effective reinforcers. Sets of reinforcers that were identified by this inferential method were compared for groups differing in sex, length of tenure, and hours worked (full-time vs. part-time), as well as in occupation. A major objective of these studies is the ultimate development of ORPs after the fashion of the OAPs.

Future studies in this series will include: the use of other methods in the identification of effective occupational reinforcers and the development of ORPs (see page 6); increasing the number of reinforcement dimensions used in the description of the work environment; the study of occupational reinforcement for homogenous populations in homogenous environments; and the long-term study of occupational reinforcement as it occurs during the entire work career of the individual. Of special interest to vocational rehabilitation counselors will be the comparison of findings for disabled and nondisabled individuals in these proposed studies.

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[4] Weiss, D. J., Dawis, R. V., England, G. W., Lofquist, L. H. Construct validation studies of the Minnesota Importance Questionnaire. *Minnesota studies in vocational rehabilitation*, XVIII, 1964.

Alternate Methods for the Development of ORPs

Three basic methods may be used in the study of occupational reinforcement for the development of ORPs: direct observation, judgment or estimation, and inference from statistical data.

Direct Observation. This method for the development of an ORP follows the lead of the early work on the job psychograph. It would seem feasible to train observers to observe the worker on the job, determine what the effective reinforcers for the job might be, and the relative strengths of these reinforcers. However, the direct observation method poses several difficulties. First, very little as yet is known about occupational reinforcement and how various job reinforcers operate, making it difficult to train an observer to observe these reinforcers. Secondly, it does not seem feasible to observe directly some of the kinds of reinforcers which have been hypothesized by personality theorists to be present in various jobs, e.g., feelings of achievement and security. A third difficulty is that even when reinforcers, such as working conditions, may be directly observed, the method does not provide for *individual* differences. Thus, working conditions may be rated "excellent" (of high-reinforcement strength) by the trained observer, but they may be ineffective as reinforcers for some employees.

Estimation. As the term suggests, a group of judges may be used to identify effective job reinforcers and to estimate their relative strengths. Two groups may qualify as judges. First, estimation may be done by individuals on the job or closely related to the job (such as supervisors or individuals from the personnel department of the company). It may be assumed that these individuals possess a thorough knowledge of the job derived from continued direct contact with the job. However, the estimates of employees may not always coincide with those of their supervisors, or of the personnel department staff. The frame of reference of the individual making the estimates may be of critical importance.

A second possible group of "judges" is suggested in the development of the job psychograph and such tools as the Minnesota Occupational Rating Scales (MORS) and the Worker Trait Requirements (WTR).[5] For these instruments, estimates of the abilities re-

[5] Paterson, D. G., Gerken, C. d'A., and Hahn, M. E. *Revised Minnesota occupational rating scales.* Minneapolis: Unversity of Minnesota Press, 1953; U. S. Department of Labor. *Estimates of worker trait requirements for 4,000 jobs as defined in the Dictionary of Occupational Titles.* Washington: Government Printing Office, 1956.

quired in the performance of a job were made by vocational psychologists and other "outside experts" rather than by individuals connected directly with the job. Judges of the "outside expert" kind were used in the construct validation studies of the MIQ, reported in Monograph XVIII of this series.[6]

One of the primary problems of estimation by "outside experts" is that of obtaining agreement among the judges. Experience with this approach in the MIQ construct validation studies shows that agreement among judges may be difficult to obtain for some reinforcement dimensions.[7] With an improved methodology (for example, the use of a paired comparisons approach) it may be possible to increase the consistency of these estimates.

Inference. The development of OAPs by the USES is an example of an inferential approach which might prove useful in the development of ORPs. As previously indicated, an OAP is a pattern of abilities which shows a significant relationship with a criterion of satisfactoriness. These abilities are predictors of the criterion, and therefore represent the ability requirements of the job. To apply the OAP approach to the development of ORPs, the criterion would be job satisfaction and the predictors for the satisfaction criterion would be the measured needs of individuals on the job. From the relationships between needs and the satisfaction criterion, inferences can be made about the effective reinforcers in the job.

The inferential approach was chosen for initial study in the development of a methodology for the determination of reinforcer systems in different occupations. This monograph details the use of the inferential approach in the study of occupational reinforcement and hopefully represents a first step toward the development of ORPs.

Inferential Approaches to the Study of Occupational Reinforcement

Several different questions may be investigated in the study of occupational reinforcement by the inferential approach. One question might be, "What are the significant reinforcers in a job?" A second question may be, "Which reinforcers are of high strength and which of low strength?" Still a third question might be, "How

[6] *Minnesota studies in vocational rehabilitation*, XVIII, op. cit.
[7] Ibid, pp. 22-26.

much reinforcement (by various kinds of reinforcers) is there in a given job?" This question might be phrased alternatively as "How important are each of the reinforcers? How much does each contribute toward the prediction of job satisfaction? Which reinforcer makes the most contribution and which makes the least?"

Investigation of these questions involves different approaches to the study of occupational reinforcement. To answer the categorical question ("What are the significant reinforcers?"), the OAP approach would be applicable. The OAP approach as developed by the USES, may be described as follows:

An OAP indicates "whether an individual is qualified or nonqualified" in a given occupation.[8] GATB scores indicating qualification or nonqualification in an occupation are determined by comparing scores for the occupational group with those of a normative group. A "significant" ability is indicated by these characteristics: (1) a higher mean score relative to the general population and to each of the other mean predictor scores; (2) a lower standard deviation relative to the general population and to each of the other predictor standard deviations. In addition to this, the linear correlation between each predictor and the criterion is computed. Predictors are included in the OAP whose linear correlation with the criterion is significant. As supplementary indicators of significant abilities, the OAP approach uses corroborative evidence from job analysis or curriculum information that the ability is required for the satisfactory performance of the job or satisfactory completion of the course.

As a result of this procedure, the ability requirements for an occupation are indicated in a categorical manner, e.g., ability A is an important requirement, ability B is not, ability C is, ability D is not. In addition, the OAP approach requires the determination of "cutting scores" for the predictors (minimum scores required to qualify for the job). These cutting scores yield categories of "pass" or "fail" for the prediction of the criterion.

To adopt the OAP approach in the study of occupational reinforcement, one would substitute "satisfied" and "dissatisfied" (or more realistically, "more satisfied" and "less satisfied") for the criterion groups of "qualified" and "nonqualified." The predictors would be scores on vocational need dimensions. Using the same analytic

[8] United States Department of Labor, Bureau of Employment Security. *Guide to the use of the General Aptitude Test battery: Section III: Development.* I-1.11. Washington: Government Printing Office, 1958.

method, need dimensions which are important to satisfaction could be identified, and "cutting scores" could be derived for these dimensions to yield categories of "predicted satisfied" and "predicted dissatisfied or less satisfied" on the criterion. The fact that this approach results in only two categories of prediction is perhaps its most serious limitation.

The question of whether a reinforcer is related to high or low job satisfaction requires somewhat more complex analysis. One analytic approach may be derived from Proposition II of the *Theory of Work Adjustment* which states that "satisfaction is a function of the correspondence between an individual's needs and the reinforcements available to him on a job."[9] Table 1 provides a numerical example for this analysis.

Table 1. Satisfaction level as a function of need level and reinforcement level

Need Level	Reinforcement level				
	5	4	3	2	1
5	5[a]	4	3	2	1
4	5	5	4	3	2
3	5	5	5	4	3
2	5	5	5	5	4
1	5	5	5	5	5

[a] Cell entries are satisfaction levels.

In Table 1, one dimension of classification is reinforcement level, varying from 5 to 1, with 5 as the highest level. The other classification dimension is need level, which also varies from 5 to 1, with 5 as the highest level. The numerical entries in the body of Table 1 indicate expected level of satisfaction. For example, for need level 5 and reinforcement level 5 (where need is highest and reinforcement is highest), satisfaction is also level 5 (i.e., satisfaction is expected to be at the highest level). At the next level of reinforcement, level 4, if need level is 5, satisfaction is predicted to be somewhat lower than in the preceding instance, thus level 4. This trend continues, reading horizontally across Table 1, for need level 5.

According to Table 1, the combination of high need and high reinforcement yields highest satisfaction. Holding need level constant, decreases in reinforcement level result in decreases in satisfaction level. Furthermore, as the satisfaction levels below the diagonal of

[9] *Minnesota studies in vocational rehabilitation,* XV, op. cit., p. 10.

Table 1 indicate, where reinforcement is higher than need level, it is expected that maximal satisfaction occurs. Therefore, satisfaction is shown as level 5 in every instance where reinforcement level is greater than need level.

This type of matrix is concerned with a specific reinforcer, its associated need dimension and satisfaction on a parallel dimension. Satisfaction for this purpose is measured as "satisfaction with a specified reinforcer," as, for example, in the Minnesota Satisfaction Questionnaire described in Monograph XVIII of this series.[10]

From Table 1, the difference between need and satisfaction levels can be determined. A matrix of such difference scores is shown in Table 2. The number appearing in each cell of Table 2 is the difference between satisfaction level and need level (D = S — N).

Table 2. Differences between need and satisfaction, by need level and reinforcement level

Need Level	Reinforcement level				
	5	4	3	2	1
5	0[a]	−1	−2	−3	−4
4	1	1	0	−1	−2
3	2	2	2	1	0
2	3	3	3	3	2
1	4	4	4	4	4
Mean	2.0	1.8	1.4	0.8	0.0
Variance	2.5	3.7	5.8	8.2	10.0

[a] Cell entries are differences between need level and satisfaction level, i.e., S — N. (Cf Table 1).

Table 2 shows that for any given level of need, a relationship exists between the difference scores and the level of reinforcement. This relationship becomes less pronounced as one moves from need level 5 to need level 1. Furthermore, when all need levels are combined, the average difference score for reinforcement level 5 is 2.0; for reinforcement level 4, it is 1.8; for reinforcement level 3, 1.4; and eventually the average difference score becomes zero for reinforcement level 1. In other words, high reinforcement level is identified by a *higher* average difference score. In addition, Table 2 shows that the variance of the difference scores is inversely related to the level of reinforcement. That is, high reinforcement level has

[10] *Minnesota studies in vocational rehabilitation,* XVIII, op. cit.

lower difference score variance and low reinforcement level has higher difference score variance.

The relationships illustrated in Table 2 show that it is possible to determine whether a reinforcer exists at a relatively high or relatively low level for a given occupation. This is done by comparing the mean and variance of satisfaction-level-minus-need-level difference scores for individuals in the occupation with the mean and variance of similar difference scores for individuals in other occupations. Where reinforcement level is high in an occupation, the mean of the difference scores will be relatively higher and their variance lower than corresponding statistics for other occupations. Conversely, where reinforcement is low, the mean of the difference scores will be relatively lower and the variance higher. In each case, reinforcement, need, and satisfaction must be measured on parallel dimensions.

While this approach to the identification of high-strength and low-strength reinforcers is appealing, there are two major difficulties in its application. First, the approach requires a reference group of some kind against which to compare the mean and variance of difference scores for a given occupational group. Whenever a reference group is used, the nature of the reference group is critical, since different results might be obtained with different kinds of reference groups. Secondly, and more importantly, this approach assumes that at least an interval-scale type of measurement is possible, that is, measurement wherein differences between adjacent points on the measuring scale (scale intervals) are equal.[11] The approach requires the subtraction of need level from satisfaction level, and this type of arithmetic operation necessitates at least an equal interval scale, or if possible, a ratio scale with a natural zero point. Thus, at the current stage of development of measures for both need and satisfaction, the difference-score approach to the study of occupational reinforcement, while promising, seems impractical.

A third, correlational approach to occupational reinforcement can also be derived from Proposition II of the *Theory of Work Adjustment* which implies that satisfaction is a function of the relationship between need and reinforcement. According to this proposition, if reinforcement is held constant, satisfaction becomes a function of need. That is, for a high level of reinforcement, the

[11] Stevens, S. S. *Handbook of experimental psychology.* New York: Wiley, 1951.

higher the level of need, the higher the level of satisfaction. Conversely, for a low level of reinforcement, the higher the level of need, the lower the level of satisfaction. Consequently, it might be inferred that higher levels of reinforcement would be indicated by positive correlations between need and satisfaction, while lower levels of reinforcement would be indicated by negative correlations between need and satisfaction. The criterion measure for this type of analysis would be general or overall job satisfaction (rather than the specific job satisfaction measures used in the difference score approach) since reinforcers are being compared with one another in terms of their contribution to satisfaction. Besides identifying the reinforcers which are important, this approach also indicates the degree to which the various reinforcers are related to satisfaction. It is, therefore, superior to the first (categorical) approach and, unlike the second (difference score) approach, it is practicable. For these reasons, it is the approach which is followed in this monograph.

Method

The inferential approach to occupational reinforcement discussed below is based on the covariation between need and satisfaction. When need and satisfaction measures are correlated, those need scales which covary with satisfaction indicate the dimensions of reinforcement in an occupation. It is also possible to combine scores in various need scales into some form of multivariate prediction equation, using satisfaction as the criterion. Such an equation would allow the derivation of a predicted satisfaction score for an individual, in addition to indicating the needs which are important in the job environment (and therefore the significant occupational reinforcers).

Multivariate techniques applicable to the study of occupational reinforcement

The best known multivariate technique applicable to the inferential study of occupational reinforcement from measured needs and satisfaction data is that of linear multiple regression. Linear multiple regression has several useful characteristics. The technique provides a predicted criterion score for each individual. The correlation between the predicted criterion scores and the actual or observed criterion scores, expressed as multiple R, indicates the amount of relationship between predictors and criterion and the degree to which the criterion may be predicted by the predictors.

The linear multiple regression technique also yields a set of partial regression coefficients which, when standardized, indicates the relative contribution of each predictor to the prediction of the criterion. Thus, by comparing the standard partial regression coefficients derived from the multiple regression of need scale scores on general job satisfaction, it is possible to determine which needs make a greater or lesser contribution to the prediction of satisfaction. The standard partial regression coefficients indicate the comparative amounts by which each predictor is related to the criterion. Furthermore, since the method of linear multiple regression considers the interaction of each variable with every other variable, and controls for this interaction in the computation of the partial regression coefficients, the partial regression coefficient indicates the unique contribution of each variable to criterion prediction, which contribution is not duplicated by that of any other variable.

However, the technique of linear multiple regression is premised on an assumption which might limit its use in the study of occupational reinforcement. This is the assumption of linearity between each predictor variable and the criterion, and between each predictor variable and every other predictor variable. If the predictor variables are not linearly related to each other and to the criterion variable, the linear multiple regression technique will yield poorer results than might be possible through the application of a nonlinear prediction technique.

Another problem with the use of the linear multiple regression technique arises from the fact that the technique takes account of interaction among predictor variables. Very frequently, significant predictions are obtained on development groups but on cross-validation these predictions shrink to nonsignificance. This result is obtained when interaction among predictor variables is relatively unique to the group studied, that is, when interaction among predictor variables does not cross-validate.[12]

Another multivariate technique which may be used in the study of occupational reinforcement is the method of *reciprocal averages prediction.*[13] In this prediction technique, integer weights are assigned to the intervals or categories of each predictor variable, based on the relationship between the predictor and the criterion. These weights become the "scores" on the predictor variables. An individual's "scores" are then added across all predictor variables to constitute a summary score. The summary score is what is used to predict the criterion.

The weights developed through the reciprocal averages prediction method are capable of reflecting nonlinear relationships between predictors and the criterion. In addition, these weights do not reflect the interaction among the predictor variables. The method considers each variable separately, in terms of its bivariate relationship with the criterion. Since reciprocal averages prediction can take account of linearity and/or curvilinearity between predictors and the criterion, and does not consider interaction among the predictor variables, this technique is a useful complement to the

[12] The uniqueness of the interaction is a function, among other things, of the number of variables. See DuBois, P. H. *An introduction to psychological statistics.* New York: Harper & Row, 1965. Chapter 7.

[13] Weiss, D. J. *A technique for curvilinear multivariate prediction.* Unpublished doctoral dissertation, University of Minnesota, 1963.

method of linear multiple regression. For this reason, and to compare the two methods, both techniques were utilized in the studies reported in this monograph.

In more detail, the reciprocal averages prediction technique may be described as follows: The distribution of scores for each predictor variable is divided into intervals (or categories, if the predictor variable is categorical). A mean *criterion* score is computed for all individuals whose *predictor* scores fall in a given interval. Mean criterion scores are computed for each interval of each predictor variable. The range of the mean criterion scores for all intervals on all predictors is determined and divided into a predetermined number of intervals. Consecutive integer weights are assigned to these intervals in progression. (The number of integer weights corresponds to the number of intervals, e.g., integer weights range from 1 to 7 for seven intervals.) In this manner, an integer weight gets assigned to each mean criterion score. Each mean criterion score is assigned the integer weight for the interval in which the mean criterion score falls.

Following the determination of integer weights for the mean criterion scores, all predictor variable scores are converted into integer weight scores. This is accomplished, for a given predictor variable score, by determining (a) the interval of the predictor variable in which the score falls; (b) the mean criterion score for interval (a); and (c) the integer weight assigned to mean criterion score (b). Each individual's predictor variable scores, consequently, are expressed as a set of integers (the weights corresponding to his original scores). These integers are summed to constitute the individual's *predicted score.*[14] Predicted scores are then correlated with the actual criterion scores and the size of the correlation coefficient indicates the degree of precision in prediction. This correlation coefficient is comparable to the multiple R of linear multiple regression (which is actually the correlation between observed and predicted criterion scores).

Variables

In these studies, general job satisfaction was the criterion to be predicted from the need scores of individuals in different job groups.

[14] This predicted score is analogous to that in linear multiple regression derived by multiplying observed scores by regression coefficients.

General job satisfaction scores were obtained through the following procedures:

All individuals in the different samples completed the Minnesota Satisfaction Questionnaire (MSQ)[15] at the same time that the Minnesota Importance Questionnaire (MIQ)[16] was administered. Scale scores were derived on each of the 20 satisfaction scales of the MSQ. For each occupational group separately the matrix of intercorrelations among the 20 satisfaction scales was factor analyzed, using a principal components solution. Following factor analysis, factor scores for the first principal component were derived (for each occupational group separately). For all groups, the first principal component accounted for a major proportion of the common variance, and all 20 satisfaction scales loaded significantly on it. It was therefore a general satisfaction factor. An exact factor scoring solution[17] was used to derive general satisfaction scores from the first principal component. These general satisfaction scores, derived for each occupational group separately, were used as the criterion variable in both the linear multiple regression and reciprocal averages prediction studies.

The predictor variables for these studies were the 20 scales of the MIQ.

Analyses and Samples[18]

Several questions were investigated in the inferential study of occupational reinforcement, in addition to the comparison of the two methods of prediction. One question was that of occupational group differences in reinforcer patterns predictive of job satisfaction. To explore this question, four occupational groups were compared, using the MIQ as predictor variables and general satisfaction as the criterion variable. Each group was randomly divided into development and cross-validation samples. Table 3 lists the sample sizes for the different groups.

For each of the first three groups (managers, secretaries, and truck drivers), the cross-validation sample was approximately one-

[15] *Minnesota studies in vocational rehabilitation,* XVIII, op. cit.

[16] Weiss, D. J., Dawis, R. V., England, G. W., Lofquist, L. H. The measurement of vocational needs. *Minnesota studies in vocational rehabilitation,* XVI, 1964.

[17] Harman, H. H. *Modern factor analysis.* Chicago: University of Chicago Press, 1960, pp. 338-348. A "complete regression solution" was used.

[18] Data used in these investigations were obtained in Industrial Relations Center studies and Ph.D. theses carried out with the use of instruments developed by the Work Adjustment Project.

Table 3. Sample sizes for occupational groups, by type of sample

Occupational Groups	Type of Sample: Development N	Type of Sample: Cross-validation N
Managers	90	44
Secretaries	80	42
Truck Drivers	77	40
Supervisor Nurses, Group I[a]	99	99
Supervisor Nurses, Group II	99	99

[a] A double cross-validation design was used for this group. The cross-validation sample for Group I was the development sample for Group II, and vice versa.

third of the total group. For the supervisor nurses group, the total group of 198 was divided randomly into two samples of 99 each for a double cross-validation study. In a double cross-validation study, prediction equations developed on one group are cross-validated on the other group, and vice versa.

The managers group and truck drivers group ($N = 134$ and $N = 117$ respectively) were all male. The secretaries and supervisor nurses groups were all female. The first three groups participated in the construct validation studies reported in Monograph XVIII[19] of this series. Data on the supervisor nurses group were obtained through a former member of the Industrial Relations Center staff.[20]

Another question investigated concerned sex differences in occupational reinforcement. Two occupational groups were utilized for this study. The first group consisted of 68 male and 34 female packers. These N's were too small to permit division into development and cross-validation samples. The second group studied were 167 social workers, of whom 110 were female and 57 were male. Only the female social workers could be divided randomly into development and cross-validation samples, of 70 and 40 members respectively. The group of packers was among the groups studied in Monograph XVIII.[21] Data on the social workers were obtained in connection with a Ph.D. dissertation.[22]

[19] *Minnesota studies in vocational rehabilitation*, XVIII, op. cit.

[20] For details of the data collection process see, Nelson, R. *Factors related to preferences for contract agreements covering selected conditions of employment for a group of professional employees.* Unpublished doctoral dissertation, University of Minnesota, 1964.

[21] *Minnesota studies in vocational rehabilitation*, XVIII, op. cit.

[22] Shapiro, S. *A study of the needs and satisfactions of social workers as perceived by college students and social workers.* Unpublished doctoral dissertation, University of Minnesota, 1964.

A third question investigated was the influence of tenure on occupational reinforcement. For this study, two occupational groups were used: a group of 205 male general factory laborers, and a group of 312 female toy assemblers. The former was one of the groups reported on in Monograph XVIII.[23] Data on the latter group were obtained by the Industrial Relations Center in another study.[24]

The factory laborer group was divided into two, a "long tenure" subgroup composed of individuals who had been on the same job for two or more years ($N = 117$), and a "short tenure" subgroup of individuals who had been on the same job for less than two years ($N = 88$). The long-tenure subgroup was randomly divided into development and cross-validation samples ($N = 77$ and $N = 40$ respectively). The short-tenure subgroup was too small to allow such division.

The female toy assembler group was also divided into a long-tenure subgroup of 197 individuals who had been on the same job for two or more years, and a short-tenure subgroup of 115 individuals who had been on the same job less than two years. The long tenure subgroup was randomly divided into samples of $N = 99$ and $N = 98$, for a double cross-validation study. The short tenure subgroup was randomly divided into a development and a cross-validation sample of $N = 75$ and $N = 40$, respectively.

A final question investigated was the influence of full-time versus part-time employment on occupational reinforcement. The data for this study were obtained on a group of 763 non-supervisory nurses.[25] Of this group of 763 nurses, 423 reported working 35 hours or more per week. The remaining 340 nurses reported working less than 35 hours per week. The former subgroup was designated "full-time," and the latter, "part-time." Each subgroup was randomly divided into two samples, N's of 212 and 211 for the full-time subgroup, and N's of 169 and 171 for the part-time subgroups. A double cross-validation study was conducted on each subgroup.

In summary, differences in occupational reinforcement patterns due to four factors were investigated: first, differences among occupational groups; second, differences between male and female workers; third, differences between short-tenure and long-tenure employees; and finally, differences between full-time and part-time

[23] *Minnesota studies in vocational rehabilitation*, XVIII, op. cit.

[24] This study was one of a continuing series of studies on employees conducted by the Triple Audit Laboratory of the Industrial Relations Center.

[25] This was a sub-sample of the nurses group reported on in Nelson, R., op. cit.

employees. For each study, a multiple regression prediction equation and a reciprocal averages prediction equation were developed and (where appropriate) cross-validated. In these studies, the 20 MIQ scales were the predictors, and general job satisfaction derived for the occupational group involved was the criterion, for the prediction equations.

Results

Experience with linear multiple regression and reciprocal averages prediction suggests that the two techniques are complementary to each other and often yield similar results, but they also may yield different results.[26] It was therefore necessary to make explicit rules for the interpretation of results of analysis by the two methods. These rules were: First, under both methods, a prediction equation was considered reliable only when the correlation between predicted and criterion scores was statistically significant on cross-validation.

Secondly, for the linear multiple regression method, significant occupational reinforcers would be indicated by statistically significant partial regression coefficients (as determined by the ratio of the partial regression coefficient to its standard error, a ratio of 1.96 being considered statistically significant at the .05 level of significance). It will be recalled that the partial regression coefficients indicate the *unique* contribution of each predictor variable to the prediction of the criterion.

For the reciprocal averages prediction method, significant reinforcers would be indicated by the eta coefficients (nonlinear correlation coefficient or correlation ratio)[27] for each predictor variable as regressed on the criterion. When an eta coefficient was not statistically significant, but its corresponding linear correlation coefficient was, the reinforcer would be considered significant and the linear correlation coefficient would then be taken as the index of predictor-criterion relationship.

Occupational differences

The multiple correlation coefficients (correlation of observed and predicted scores) for the four occupational groups—managers, secretaries, truck drivers, and two groups of supervisor nurses—are shown in Table 4. The equations, both linear multiple regression and reciprocal averages prediction, developed on the development samples were cross-validated on second samples. For the supervisor

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[26] See Weiss, D. J., op. cit., also Haak, L. A. *An investigation of the validation characteristics of four statistical techniques in the prediction of certain educational achievement variables.* Unpublished doctoral dissertation, University of Minnesota, 1964.

[27] See McNemar, Q. *Psychological statistics* (third edition). New York: Wiley, 1962, pp. 275-278.

Table 4. Correlations between observed and predicted scores in the prediction of general job satisfaction from MIQ scores in four occupational groups, by linear multiple regression and reciprocal averages prediction techniques

	Multiple Regression				Reciprocal Averages	
	Development		Cross-validation		Development	Cross-validation
Group	N	R	N	r	r	r
Managers	90	.56	44	.01	.54**	.43**
Secretaries	80	.64**	42	.26	.59**	.23
Truck Drivers	77	.53	40	.27	.50**	.26
Supervisor Nurses Group I	99	.70**	99	.48***	.43**	.28**
Supervisor Nurses Group II	99	.68**	99	.30**	.44**	.23*

* Statistically significant at $p \leq .05$.
** Statistically significant at $p \leq .01$.
*** Statistically significant at $p \leq .001$.

nurses group the development equation for sample 1 was cross-validated on sample 2, and the development equation for sample 2 was cross-validated on sample 1.

Table 4 shows that for the development groups, the multiple correlation coefficients (R's) ranged from a high of .70, for the supervisor nurses Group I, to a low of .53, for the truck drivers. The reciprocal averages method yielded lower development correlation coefficients (r's), with a high of .59 and a low of .43. These coefficients (R's and r's) are best interpreted as indicating the correlation between predicted general job satisfaction scores and actual (observed) general job satisfaction scores.

These results suggest some occupational group differences in the level of prediction possible when predicting general job satisfaction from vocational needs. Need scores accounted for about one-half of the variance in satisfaction among the supervisor nurses group, but only about one-fourth of the satisfaction variance for the truck drivers group.

The multiple correlation coefficients (R's) were statistically significant for the secretaries and the two supervisor nurses groups. Cross-validation of these prediction relationships held up for the two supervisor nurses groups but not for the group of secretaries.

With the reciprocal averages method, the correlations between predictor and criterion scores for the development groups were all

statistically significant.[28] Cross-validation coefficients for these relationships were statistically significant for the managers group and the two supervisor nurses groups.

These results indicate that reliable occupational reinforcer patterns may be derived for the managers and supervisor nurses, but not for secretaries and truck drivers. The patterns of reinforcers derived by inferential methods for the four occupational groups are discussed below.

Managers. For this group, the multiple correlation coefficient obtained for the development sample was .56, which was not statistically significant. Cross-validation yielded an r of .01. In contrast, predictor-criterion correlations for the reciprocal averages method were .54 for development, and .43 for cross-validation, both correlations being statistically significant at $p \leq .01$. Two implications may be drawn: (1) There were nonlinear relationships between predictors and the criterion, and/or (2) Interaction among the predictor variables did not cross-validate.

Following the rules set forth above (page 20), analysis by the reciprocal averages prediction technique was considered reliable, but not that of linear multiple regression. Therefore, the significant occupational reinforcers would be best indicated by the etas and r's between each predictor variable and the criterion.

Table 5 shows, for the managers group, the linear correlation coefficients and eta coefficients obtained between each of the 20 MIQ scales and general job satisfaction as the dependent variable. The linear correlation coefficients were statistically significant for five MIQ scales: Ability Utilization, Achievement, Creativity, Moral Values and Social Service. The correlation in each case was positive. The highest correlations were for Social Service ($r = .30$) and Moral Values ($r = .28$).

Statistically significant eta coefficients were obtained for four scales: Authority, Co-workers, Social Service and Variety. Authority had the highest eta coefficient (.33).

The test for linearity of relationship was statistically significant for Authority and Variety. In both cases, the dependent variable

[28] Because reciprocal averages prediction does not consider the interaction among predictor variables in the development of the prediction equation, the resulting correlation between observed and predicted scores need not be considered in relation to the number of predictor variables. The degrees of freedom for testing the correlation of observed and predicted scores from reciprocal averages prediction equations is, therefore, the same as for any product-moment correlation coefficient.

Table 5. Relationships between MIQ scales and general job satisfaction, for Managers development sample

MIQ Scale	Relationship with satisfaction[a] r	eta
1. Ability Utilization	.26*	.23
2. Achievement	.24*	.22
3. Activity	.17	.21
4. Advancement	.10	.03
5. Authority	.08	.33*
6. Company Policies and Practices	.05	.08
7. Compensation	−.05	.24
8. Co-workers	.20	.31*
9. Creativity	.24*	.24
10. Independence	.05	.11
11. Moral Values	.28**	.27
12. Recognition	−.07	.20
13. Responsibility	.15	.23
14. Security	.15	.06
15. Social Service	.30**	.31*
16. Social Status	.11	.25
17. Supervision—Human Relations	.02	.08
18. Supervision—Technical	.06	.09
19. Variety	.02	.28*
20. Working Conditions	−.05	.13

* Statistically significant at $p \leq .05$.

** Statistically significant at $p \leq .01$.

[a] While the theoretical lower limit of the eta coefficient is the product-moment correlation coefficient, it will be noted in this table (e.g., scales 1 & 2) and in some of the following tables that r exceeds eta. This occurs because (1) r is computed from the raw frequency distribution and eta from categorized data; (2) number of observations in categories for eta are not equal; and (3) category variances, on which eta is dependent, are unequal.

(satisfaction) means exhibited a V-shaped relationship with the predictor variable.

These results indicate that reinforcers for managers are to be found in the satisfaction of ability utilization, achievement, authority, co-workers, creativity, moral values, social service and variety needs. The Authority and Social Service scales had the highest relationships with the criterion, suggesting that in the satisfaction of these two needs lie the most potent reinforcers (of those studied) for managers.

Secretaries. The multiple correlation coefficient obtained for the secretaries development sample was .64, significant at the .05 level. When the regression equation was applied to the cross-validation group, however, the resulting correlation between observed and

predicted scores was .26, which was not statistically significant. Similar results were obtained with the reciprocal averages method—a statistically significant development correlation coefficient (.59) which failed to cross-validate (.23) (see Table 4).

While these results indicate instability in the occupational reinforcer patterns for the secretaries, the analysis for the development sample might yield some clues to the significant reinforcers for this occupational group. It should be kept in mind, however, that these indications are extremely tentative, since they did not cross-validate.

Table 6 lists the partial regression coefficients (b's), linear correlation coefficients and eta coefficients for the regression of the MIQ scales on general job satisfaction, for the secretaries group. As shown in Table 6, none of the regression coefficients were statistically significant, meaning that these coefficients were not useful as indicators of reinforcers. The linear correlation coefficients and the eta coefficients, however, did yield some clues.

Table 6. Partial regression coefficients (b), linear correlation coefficients and eta coefficients for the regression of MIQ scales on general job satisfaction, for Secretaries

MIQ Scale	b	r	eta
1. Ability Utilization	.04	.06	.12
2. Achievement	.37	.21	.22
3. Activity	.28	.29**	.37*
4. Advancement	.07	−.04	.26
5. Authority	28	.09	.22
6. Company Policies and Practices	−.55	−.07	.13
7. Compensation	−.38	−.23*	.24
8. Co-workers	.00	.27*	.31*
9. Creativity	.40	.29**	.23
10. Independence	.10	.21	.28
11. Moral Values	.13	.20	.24
12. Recognition	−.44	−.03	.24
13. Responsibility	−.54	.12	.17
14. Security	−.08	.14	.25
15. Social Service	−.00	.28*	.32*
16. Social Status	−.10	−.03	.14
17. Supervision—Human Relations	.20	.22*	.21
18. Supervision—Technical	.48	.31**	.30
19. Variety	.05	.22*	.30*
20. Working Conditions	−.03	.02	.15

* Statistically significant at $p \leq .05$.
** Statistically significant at $p \leq .01$.

Statistically significant linear r's and/or etas were observed for the Activity, Compensation, Co-workers, Creativity, Social Service, Supervision-Human Relations, Supervision-Technical, and Variety scales of the MIQ. For all scales except Compensation, the relationship with the criterion was positive. This suggests that reinforcers found in the satisfaction of activity, co-workers, creativity, social service, supervision-human relations, supervision-technical, and variety needs are effective reinforcers in the secretary's job. The most important of these reinforcers are those associated with activity, social service and co-workers needs. Compensation, on the other hand, seems to be an ineffective reinforcer (i.e., the secretary's pay is poor). This inference is based on the significant negative correlation coefficient observed for the Compensation scale, indicating that higher need levels are associated with lower satisfaction levels, and vice versa.

Truck Drivers. As Table 4 shows, the multiple correlation coefficient for the regression equation was not statistically significant for the truck drivers group. Thus, for this group, linear multiple regression analysis was not useful for the purpose of the study. In contrast, the development sample correlation coefficient for reciprocal averages method (.50) was statistically significant. Therefore, the linear correlation coefficients and eta coefficients were useful in indicating significant reinforcers for the truck drivers group. However, as previously emphasized for the secretaries group, one should keep in mind that these results did not cross-validate, and therefore represent very tentative indications.

Table 7 shows the linear correlation coefficients and eta coefficients for the truck drivers group. Statistically significant relationships indicated by both eta's and r's were found for the Activity and Social Service scales. This would suggest that the reinforcers found in the satisfaction of activity and social service needs are reinforcers for truck drivers.

Supervisor Nurses. The supervisor nurses group was divided into two groups of 99 and 98 members, respectively. This permitted a double cross-validation study, in which a prediction equation developed on one group was cross-validated on the other group, and a prediction equation developed on the second group was cross-validated on the first group.

The results of the prediction analysis for the supervisor nurses are summarized in Table 4. Statistically significant multiple correla-

Table 7. Linear correlation coefficients and eta coefficients for the regression of MIQ scales on general satisfaction, for Truck Drivers

MIQ Scale	r	eta
1. Ability Utilization	.15	.20
2. Achievement	.14	.15
3. Activity	.27*	.37**
4. Advancement	—.04	.13
5. Authority	.01	.13
6. Company Policies and Practices	.18	.12
7. Compensation	—.12	.19
8. Co-workers	.17	.17
9. Creativity	—.06	.11
10. Independence	—.06	.12
11. Moral Values	.13	.17
12. Recognition	—.09	.20
13. Responsibility	.06	.24
14. Security	.17	.24
15. Social Service	.25*	.30*
16. Social Status	—.06	.10
17. Supervision—Human Relations	.12	.24
18. Supervision—Technical	.16	.27
19. Variety	—.04	.21
20. Working Conditions	.14	.11

* Statistically significant at $p \leq .05$.
** Statistically significant at $p \leq .01$.

tion coefficients were obtained for both groups, using the linear multiple regression technique. Furthermore, the prediction equations, applied to the cross-validation samples, resulted in statistically significant r's of .48 and .30 respectively. Use of the reciprocal averages method also resulted in statistically significant correlation coefficients for both development and cross-validation samples. However, the reciprocal averages coefficients were not as high as the coefficients obtained through the linear multiple regression technique. It would seem that predictor variable interaction effects were important for the supervisor nurses group. Therefore, the partial regression coefficients were used as indicators of the occupational reinforcers for the supervisor nurses group.

Table 8 shows the partial and standard partial regression coefficients for the supervisor nurses group. For Group I, there were four significant regression coefficients. These were for the Achievement, Authority, Moral Values and Recognition scales. Comparing standard partial regression coefficients (beta), Recognition received the highest weight (—.55), followed by Moral Values (.38), Authority (.34), and Achievement (.33). The regression coefficient was

negative for Recognition and positive for Moral Values, Authority and Achievement. This indicates that for this group, the reinforcers found in the satisfaction of achievement, authority and moral values needs are effective reinforcers, and that recognition is an ineffective reinforcer (i.e., supervisor nurses do not receive adequate recognition), since higher recognition need levels are associated with lower satisfaction levels, and vice versa.

For Group II, statistically significant regression coefficients were obtained for the Authority, Compensation and Supervision-Technical scales. For this group, Compensation and Supervision-Technical had negative regression coefficients, indicating poor reinforcers. Authority had a positive regression coefficient in the second group as it did in the first. The highest standard partial regression coefficient for Group II was for Compensation (—.44), followed by Authority (.33) and Supervision-Technical (—.31).

A conservative interpretation of these results would suggest that only the reinforcers found in the satisfaction of the authority need

Table 8. Partial regression coefficients (b's) and standard partial regression coefficients (betas), for two supervisor nurses groups

	Group I		Group II	
MIQ Scales	b	beta	b	beta
1. Ability Utilization	—.13	—.08	.32	.25
2. Achievement	.57*	.33	.12	.09
3. Activity	.14	.11	—.03	—.02
4. Advancement	.13	.10	—.13	—.12
5. Authority	.31*	.34	.26*	.33
6. Company Policies and Practices	—.15	—.09	—.02	—.02
7. Compensation	.06	.04	—.54**	—.44
8. Co-workers	.14	.08	.30	.23
9. Creativity	—.24	—.17	—.24	—.22
10. Independence	.11	.12	.07	.09
11. Moral Values	.53**	.38	.00	.00
12. Recognition	—.56**	—.55	.01	.01
13. Responsibility	.15	.12	.08	.06
14. Security	.13	.08	.24	.17
15. Social Service	—.24	—.14	.13	.11
16. Social Status	.01	.02	.08	.11
17. Supervision—Human Relations	.06	.04	.17	.14
18. Supervision—Technical	—.26	—.16	—.35*	—.31
19. Variety	—.05	—.04	—.11	—.11
20. Working Conditions	.17	.12	.21	.19

* Statistically significant at $p \leq .05$.
** Statistically significant at $p \leq .01$.

are the significant reinforcers for supervisor nurses. A less restrictive interpretation, which is subject to further verification, would include the reinforcers for achievement and moral values needs as effective reinforcers, and a relative lack of reinforcement in the compensation, recognition, and supervision-technical areas, for supervisor nurses.

Sex Differences

Occupational reinforcement differences between the sexes were studied in two occupational groups. One group consisted of 68 male and 34 female packers. The second group was composed of 110 female and 57 male social workers. The female social workers subgroup was randomly divided into a development sample ($N = 70$) and a cross-validation sample ($N = 40$). The remaining groups—male social workers, and male and female packers—were not large enough to permit cross-validation.

A summary of the results for all groups is presented in Table 9. The multiple correlation coefficients for the development samples were statistically significant only for two groups: female social workers and female packers. Cross-validation of the multiple regression equation for the female social workers was not statistically significant.

Table 9. Correlation between observed and predicted scores in the prediction of general job satisfaction from MIQ scores in four occupational sex groups, by prediction method

	Multiple Regression				Reciprocal Averages	
	Development		Cross-validation		Development	Cross-validation
Group	N	R	N	r	r	r
Packers—male	68	.64	.....	.....	.56**	.....
Packers—female	34	.92*	.....	.....	.70**	.....
Social workers—male	57	.70	.....	.....	.65**	.....
Social workers—female	70	.66*	40	−.09	.64**	−.10

* Statistically significant at $p \leq .05$.
** Statistically significant at $p \leq .01$.

The correlation coefficients for the reciprocal averages prediction development samples were all statistically significant. However, cross-validation of the prediction equation for the female social workers was also nonsignificant.

Table 10. Linear correlation coefficients and eta coefficients in the correlation of MIQ scales with general job satisfaction for packers and social workers, by sex groups

MIQ Scale	Packers				Social Workers			
	Male (N = 68)		Female (N = 34)		Male (N = 70)		Female (N = 57)	
	r	eta	r	eta	r	eta	r	eta
1. Ability Utilization	.13	.15	−.08	.15	.27*	.34*	−.03	.11
2. Achievement	.29*	.23	.27	.24	.03	.08	−.15	.07
3. Activity	.50**	.38**	.34*	.27	.17	.22	.06	.19
4. Advancement	.02	.16	.01	.20	−.28*	.16	.17	.09
5. Authority	.29*	.43**	.11	.05	.04	.11	.15	.14
6. Company Policies and Practices	.15	.06	−.13	.07	.05	.14	.14	.10
7. Compensation	.15	.12	−.19	.16	−.13	.24	.04	.15
8. Co-workers	.26*	.19	−.25	.08	.20	.22	−.04	.11
9. Creativity	.32**	.29	.28	.15	.23	.35*	−.04	.12
10. Independence	.24	.40*	.42*	.48*	.14	.13	−.14	.15
11. Moral Values	.30*	.41**	.06	.16	.26	.19	.24*	.28
12. Recognition	.36**	.32*	.16	.06	−.10	.07	−.23	.19
13. Responsibility	.38**	.38**	.37*	.43*	.09	.10	−.03	.11
14. Security	.29*	.33	−.29	.33	.15	.23	.11	.19
15. Social Service	.32**	.27	.08	.....[a]	.30*	.35*	.45**	.39**
16. Social Status	.28*	.28	.12	.38	−.01	.14	−.21	.23
17. Supervision—Human Relations	.22	.17	−.06	.03	.24	.08	.08	.21
18. Supervision—Technical	.33**	.20	−.03	.01	.19	.30	.08	.25
19. Variety	.19	.32*	−.16	.20	.01	.12	−.32**	.33*
20. Working Conditions	.10	.27	−.24	.15	−.08	.02	.13	.12

* Statistically significant at $p \leq .05$.
** Statistically significant at $p \leq .01$.
[a] Variable insufficiently distributed to compute eta with large enough category frequencies.

Notwithstanding the lack of cross-validation data, a comparison of the predictor-criterion relationship patterns for the two sex groups in the development samples would show to some extent whether or not sex was a factor in determining occupational reinforcers. Table 10 lists the linear correlation coefficients and eta coefficients obtained between each MIQ scale and the satisfaction criterion for the packers and social workers groups, and for the sexes separately within each occupational group.

Table 10 shows several differences in occupational reinforcement between the sexes. For the packers, the male workers apparently find a wider variety of reinforcers in the work setting than do the female workers (significant relationships on 14 scales for the males in contrast with only three scales for the females). This finding was not observed for the social workers (significant relationships on four scales for the males, three scales for the females). Where, for the packers, the three significant scales for females were among the 14 scales significant for the males, for the social workers, only one scale was significant in common for the sexes. These findings suggest that occupational reinforcer patterns may differ markedly for the sexes even when they work in the same occupation and (in the case of the packers who were all employed in one firm) even when they work in the same work setting.

Tenure Differences

Occupational reinforcement differences due to length of tenure were studied in a group of male factory laborers ($N = 195$) and a group of female toy assemblers ($N = 272$). The "long tenure" group was defined as individuals who were in the same job with the same company for two or more years. The "short tenure" group included those who had been on the same job or with the same company for less than two years.

Laborers. Table 11 shows the correlations between observed and predicted scores in the prediction of satisfaction from MIQ scores in two tenure groups of laborers, using both multiple regression and reciprocal averages methods. For both groups, prediction by multiple regression yielded coefficients greater by .10 than the coefficients resulting from reciprocal averages prediction. However, prediction by the reciprocal averages method was significant for both long and short tenure groups and at a higher level (.01), compared with multiple regression prediction, which was not significant for the short

Table 11. Correlations between observed and predicted scores in the prediction of general job satisfaction from MIQ scores in five occupational-tenure groups, by prediction method

	Multiple Regression				Reciprocal Averages	
	Development		Cross-validation		Development	Cross-validation
Group	N	R	N	r	r	r
Laborers—long tenure	77	.63*	40	.22	.53**	.14
Laborers—short tenure	88	.59	.....	.....	.49**	.....
Assemblers—long tenure (I)	99	.59*	98	.38**	.46**	.39**
Assemblers—long tenure (II)	98	.60*	99	.44**	.45**	.30**
Assemblers—short tenure	75	.63*	40	.42**	.57**	.17

* Statistically significant at $p \leq .05$.
** Statistically significant at $p \leq .01$.

tenure laborer group. Cross-validation of prediction equations on the long tenure laborer group was not statistically significant for either method.

Since prediction by the reciprocal averages method was significant for both long- and short-tenure laborer groups, comparison of the r's and eta coefficients obtained in correlating MIQ scales with general job satisfaction for the two groups would show differences in occupational reinforcer patterns due to the tenure factor, at least for the development samples. Table 12 shows the r's and the etas obtained for both long and short tenure groups. As Table 12 shows, the obvious difference between the two groups is the number of significant predictor-criterion relationships, there being fifteen for the long-tenure group and only four for the short-tenure group. With the exception of the Independence scale, the significant MIQ scales for the short-tenure group were among the scales significant for the long-tenure group. One explanation for this finding might be that with increasing tenure there is an accompanying increase in the number of reinforcers experienced by workers, i.e., correspondence between the need sets of the workers and the reinforcer systems of the work environment increases, as predicted by Proposition IX of the *Theory of Work Adjustment.* Without cross-validation and without other confirming or supporting data, this explanation must be considered only as a tentative one.

Assemblers. Correlations between observed and predicted scores in the prediction of satisfaction from MIQ scores for the three assemblers groups are also shown in Table 11. Development sample

Table 12. Linear correlations coefficients and eta coefficients in the correlation of MIQ scales with general job satisfaction for laborers, by tenure group

MIQ Scale	Long tenure group (N = 77)		Short tenure group (N = 88)	
	r	eta	r	eta
1. Ability Utilization	.26*	.22	.16	.17
2. Achievement	.35**	.19	.14	.22
3. Activity	.37**	.33*	.19	.16
4. Advancement	.28*	.15	−.07	.20
5. Authority	.37**	.34*	.16	.22
6. Company Policies and Practices	.28*	.16	.03	.11
7. Compensation	.19	.10	.19	.22
8. Co-workers	.27*	.35**	.20	.26
9. Creativity	.07	.22	.13	.24
10. Independence	.18	.25	.22*	.30*
11. Moral Values	.27*	.30*	.21*	.34*
12. Recognition	.14	.19	.15	.25
13. Responsibility	.41**	.44**	.24*	.28*
14. Security	.32**	.28*	.05	.21
15. Social Service	.34**	.36**	.15	.19
16. Social Status	.25*	.32	.36**	.37**
17. Supervision—Human Relations	.31**	.17	.05	.21
18. Supervision—Technical	.30**	.33*	.07	.02
19. Variety	.06	.12	.10	.25
20. Working Conditions	.16	.38**	.03	.07

* Statistically significant at $p \leq .05$.
** Statistically significant at $p \leq .01$.

multiple correlation coefficients were .59 and .60 for the two long-tenure groups, and .63 for the short-tenure group. For reciprocal averages prediction, development sample coefficients were .46, .45 and .57 respectively. All development sample coefficients for both methods were statistically significant at $p \leq .05$. On cross-validation, all prediction equations yielded significant results, with the exception of reciprocal averages prediction for the short tenure group. In view of these results, analysis by the linear multiple regression method was used in studying occupational reinforcement differences due to tenure in the group of assemblers.

The regression coefficients (b's and betas) for the three prediction equations are shown in Table 13. For Long Tenure Group I, the significant betas were −.42 for the Compensation scale and .38 for the Activity scale. These results suggest that for this long-tenure group of assemblers, activity is an effective reinforcer, while compensation is an ineffective reinforcer.

Table 13. Partial regression coefficients (b's) and standard partial regression coefficients (betas) in the regression of MIQ scales on general job satisfaction for assemblers, by tenure group

MIQ Scale	Long Tenure				Short Tenure	
	Group I		Group II			
	b	beta	b	beta	b	beta
1. Ability Utilization	.24	.20	—.09	—.07	—.06	—.05
2. Achievement	—.24	—.21	.26	.19	.09	.07
3. Activity	.41**	.38	.26	.20	.54*	.36
4. Advancement	—.11	—.11	—.09	—.08	—.27	—.26
5. Authority	—.08	—.08	.07	.08	.17	.19
6. Company Policies and Practices	.18	.18	.09	.08	—.18	—.18
7. Compensation	—.46**	—.42	—.49**	—.41	.17	.13
8. Co-workers	.05	.06	.19	.15	—.10	—.10
9. Creativity	—.03	—.03	.08	.07	—.24	—.22
10. Independence	.00	—.01	.00	.00	.11	.12
11. Moral Values	.11	.11	—.09	—.07	—.05	—.05
12. Recognition	—.01	—.01	—.13	—.12	.00	.00
13. Responsibility	.09	.09	—.08	—.08	—.12	—.12
14. Security	.22	.22	.37*	.32	.11	.09
15. Social Service	.10	.10	.06	.05	.45*	.38
16. Social Status	—.03	—.04	.15	.17	—.10	—.11
17. Supervision—Human Relations	—.11	—.11	.13	.12	.20	.21
18. Supervision—Technical	.17	.16	.11	.09	—.07	—.07
19. Variety	.02	.02	—.05	—.05	—.07	—.07
20. Working Conditions	—.15	—.15	—.11	—.09	.10	.09

* Statistically significant at $p \leq .05$.
** Statistically significant at $p \leq .01$.

For Long Tenure Group II, a somewhat different pattern of significant regression coefficients emerged. Highest betas were —.41 for the Compensation scale and .32 for the Security scale. The beta for the Activity scale was not statistically significant although it was the third highest beta. (The beta for the Security scale, although non-significant, was third highest for Long Tenure Group I.)

The results for the two long-tenure groups of toy assemblers tend to be in some agreement. The highest regression coefficient for both groups was for the Compensation scale. In both cases, the regression coefficient was negative indicating that compensation is an ineffective reinforcer in the toy assembler's job. The second and third highest regression coefficients in both cases were for the Activity and Security scales. From these results, it can be concluded

that activity and security are highly reinforcing for the toy assemblers but their compensation is poor.

Table 13 also shows the regression coefficients for the short tenure group. For this group, the highest significant betas were .38 for the Social Service scale and .36 for the Activity scale. These results suggest that the short-tenure group has activity in common with the long-tenure group as an effective reinforcer. In addition, satisfaction of the social service need is a significant reinforcer for the short tenure group of toy assemblers. While this result does not conform with usual stereotypes about the work environment of toy assemblers, it should be noted that the company in which the workers were employed uses in its recruitment an approach which emphasizes the social service aspect of working in a toy factory, i.e., making things that will make little children happy. This recruitment practice helps explain the finding of social service as a significant reinforcer in toy assembly jobs.

Several conclusions may be drawn in comparing the findings for the short- and long-tenure groups. First, Activity is a significant reinforcer for both groups. In addition, while satisfaction of the social service need is a significant reinforcer for short-tenure toy assemblers in this company, this aspect of reinforcement does not appear for the long-tenure group. Instead of social service, security and compensation become significant in the reinforcement of toy assemblers with longer tenure. Thus, the satisfied toy assembler with two years or more of job tenure is characterized by having relatively high need levels for activity, and for security and a relatively low need level for compensation. These results indicate that tenure does have an effect on the occupational reinforcer patterns of toy assemblers.

This finding, like the earlier finding for the laborers group, is one which is consistent with the *Theory of Work Adjustment,* specifically, Proposition IX, which states that correspondence between the need set of the individual and the reinforcer system of the job increases as a function of time. Thus, it can be anticipated that on a given job, individuals with more tenure would have need sets somewhat different from those who have been employed for only a short time.

Part-time vs. Full-time Employment Differences

Occupational reinforcement pattern differences between those employed part-time and those employed full-time were studied in

a sample of 763 nurses. The "part-time" group included 340 nurses who worked less than 35 hours a week. The "full-time" group consisted of 423 nurses who reported working 35 hours or more a week. Each group was randomly divided into two samples for a double cross-validation study.

The correlations between observed and predicted scores for both linear multiple regression and reciprocal averages prediction are shown in Table 14. The multiple correlation coefficients obtained for the development samples were of the order of .50, varying from .46 to .55, all coefficients being statistically significant at the .01 level. The reciprocal averages method yielded correlation coefficients of around .40, varying from .34 to .47, all statistically significant also at .01 level.

Table 14. Correlations between observed and predicted scores in the prediction of general job satisfaction from MIQ scores for part-time and full-time employed nurses, by prediction method

	Multiple Regression				Reciprocal Averages	
	Development		Cross-validation		Development	Cross-validation
Sample	N	R	N	r	r	r
Part-time (I)	169	.50**	171	.26**	.34**	.32**
Part-time (II)	171	.54**	169	.24**	.47**	.14
Full-time (I)	212	.46**	211	.32**	.40**	.28**
Full-time (II)	211	.55**	212	.27**	.40**	.24**

* Statistically significant at $p \leq .05$.
** Statistically significant at $p \leq .01$.

Upon cross-validation, the correlations between observed and predicted scores obtained by using the multiple regression equations were statistically significant for all four samples. Using the reciprocal averages prediction equations, the correlations obtained were statistically significant for three of the four samples. Since the multiple regression equations for these data yielded the better results on cross-validation, the regression coefficients were utilized in studying the occupational reinforcement patterns for the different samples. The regression coefficients for the part-time samples are shown in Table 15; those for the full-time samples in Table 16.

Table 15 shows two significant regression coefficients for Sample I of the part-time nurses. These were obtained for the Advancement and Working Conditions scales. The regression coefficient for Ad-

Table 15. Partial regression coefficients and standard partial regression coefficients in the regression of MIQ scales on general job satisfaction for part-time nurses, by sample

MIQ Scale	Sample I		Sample II	
	b	beta	b	beta
1. Ability Utilization	.20	.15	.31*	.25
2. Achievement	—.07	—.05	.06	.05
3. Activity	—.16	—.14	.00	.00
4. Advancement	—.29**	—.28	—.08	—.08
5. Authority	.07	.07	—.11	—.13
6. Company Policies and Practices	.21	—.16	—.06	—.06
7. Compensation	.05	.04	—.33**	—.29
8. Co-workers	.14	.11	.09	.08
9. Creativity	.02	.02	.03	.03
10. Independence	.14	.18	—.09	—.11
11. Moral Values	.21	.17	—.15	—.12
12. Recognition	—.01	—.01	—.15	—.16
13. Responsibility	—.08	—.06	.06	.06
14. Security	.09	.07	.19	.16
15. Social Service	.05	.04	.22	.18
16. Social Status	—.09	—.11	.21**	.26
17. Supervision—Human Relations	—.10	—.07	—.11	—.09
18. Supervision—Technical	.25	.19	.13	.12
19. Variety	.13	.12	.16	.15
20. Working Conditions	.29*	.22	.11	.10

* Statistically significant at $p \leq .05$.
** Statistically significant at $p \leq .01$.

vancement was negative, indicating ineffective reinforcement through advancement opportunities for the part-time nurses. On the other hand, the regression coefficient for working conditions was positive, suggesting that working conditions are a source of job satisfaction for the part-time nurses.

The patterns of regression coefficients for Sample II of the part-time nurses group is different from that of Sample I, indicating some instability in the occupational reinforcement pattern of the part-time nurse's job. The highest significant regression coefficient for Sample II was obtained for the Compensation scale. Other significant regression coefficients included those for Social Status and Ability Utilization. The regression coefficient for Compensation was negative, indicating compensation to be an ineffective reinforcer for the part-time nurses. Positive regression coefficients for Social Status and Ability Utilization suggest that reinforcers for the satis-

Table 16. Partial regression coefficients and standard partial regression coefficients in the regression of MIQ scales on general job satisfaction for full-time nurses, by sample

MIQ Scale	Sample I		Sample II	
	b	beta	b	beta
1. Ability Utilization	−.14	−.10	.16	.12
2. Achievement	.08	.05	−.02	−.01
3. Activity	.15	.12	.10	.10
4. Advancement	−.16	−.14	−.12	−.11
5. Authority	.22*	.23	.16*	.18
6. Company Policies and Practices	−.10	−.07	−.11	−.08
7. Compensation	−.13	−.11	−.04	−.03
8. Co-workers	.07	.05	.30*	.20
9. Creativity	−.17	−.16	−.12	−.12
10. Independence	−.03	−.03	.22**	.25
11. Moral Values	.28*	.22	−.06	−.05
12. Recognition	−.08	−.10	−.11	−.12
13. Responsibility	.04	.03	.25*	.19
14. Security	.38**	.27	.21	.16
15. Social Service	.11	.08	.05	.04
16. Social Status	.02	.02	−.11	−.12
17. Supervision—Human Relations	−.09	−.07	−.13	−.09
18. Supervision—Technical	−.03	−.02	.23	.16
19. Variety	.02	.02	−.19*	−.18
20. Working Conditions	.10	.07	.02	−.01

* Statistically significant at $p \leq .05$.
** Statistically significant at $p \leq .01$.

faction of these two needs are to be found in the part-time nurses job.

These results may be interpreted in at least two ways. A strict interpretation would lead to the conclusion that the pattern of occupational reinforcement for part-time nurses is unstable. A somewhat less rigorous interpretation of the results is that advancement and compensation are ineffective reinforcers for part-time nurses, while ability utilization, social status and working conditions are highly reinforcing for these nurses.

The regression coefficients for the full-time nurses appear in Table 16. Statistically significant regression coefficients for Sample I were obtained for the Authority, Moral Values and Security scales. All three regression coefficients were positive.

The pattern of regression coefficients for Sample II differed somewhat from that of Sample I. Significant regression coefficients were obtained for the Independence, Responsibility, Co-workers,

Variety, and Authority scales. The coefficient was negative for Variety and positive for the other four scales.

A rigorous interpretation of these results would be that authority is the only reinforcer identified by the multiple regression method for full-time nurses. A less rigorous interpretation would add security, moral values, responsibility, co-workers and independence as effective reinforcers and variety as an ineffective reinforcer (i.e., the need for variety is not satisfied in a full-time nurse's job).

Comparing the occupational reinforcement patterns indicated by multiple regression for the part-time nurses and the full-time nurses, two points of difference may be noted: (a) more reinforcers were identified for the full-time nurses than for the part-time nurses; and (b) the set of reinforcers identified for the full-time nurses was completely different from that identified for the part-time nurses. These findings tend to suggest that part-time vs. full-time employment is a factor which may affect the occupational reinforcement patterns identified by inferential methods.

Conclusions

The studies described above support the following conclusions:

1. Multivariate prediction methods, specifically linear multiple regression and reciprocal averages prediction, may be used profitably in the study of occupational reinforcement by the inferential approach.

2. Stable differential reinforcement patterns may be identified for some occupations. These patterns are stable in the sense that they may be used to predict satisfaction in new (cross-validation) samples and significantly better-than-chance predictions will be obtained. They are differential in that different reinforcer patterns are identified for different occupations.

3. There is reason to believe that the factors of sex, job tenure and full- vs. part-time employment may significantly affect the reinforcement pattern that is found to operate in a given work environment. That is, the same work environment may actually "offer" different sets of reinforcers for different groups of people. It may be necessary, in future studies of occupational reinforcement, to stratify or group workers according to need types or patterns before applying multivariate analysis in the search for occupational reinforcer patterns.

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