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The Measurement of Occupational Reinforcer Patterns

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Work Adjustment Project
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The Minnesota Studies in Vocational Rehabilitation

Purpose and Method

The Minnesota Studies in Vocational Rehabilitation, better known as the Work Adjustment Project, are a continuing series of research studies being conducted on the general problem of adjustment to work. Specifically, they focus on the work adjustment problems relevant to vocational rehabilitation services. These studies have two objectives: the development of diagnostic tools for assessing the work adjustment "potential" of applicants for vocational rehabilitation, and the evaluation of work adjustment outcomes. These primary goals are embodied in a conceptual framework for research, entitled the *Theory of Work Adjustment*. This theory uses the correspondence (or lack of it) between the work personality and work environment as the principal reason or explanation for observed work adjustment outcomes (satisfactoriness, satisfaction, and tenure). The theory states further that vocational abilities and vocational needs are significant aspects of the work personality, while ability requirements and reinforcer systems are significant aspects of the work environment. Work adjustment is predicted by matching an individual's work personality with work environments. In other words, work adjustment depends on how well an individual's abilities correspond to the ability requirements in work, and how well his needs correspond to the reinforcers available in the work environment.

Work Adjustment Project research has been directed at testing the usefulness of the *Theory of Work Adjustment* in counseling with rehabilitation clients. For example, it has been shown that vocational needs are measurable and can be measured separately from measured satisfaction. In addition, it has been demonstrated that satisfaction in a variety of work environments can be predicted from the correspondence of measured vocational needs and either estimated or inferred job reinforcer systems. It has also been demonstrated that satisfaction and satisfactoriness are measurable indicators of work adjustment, and that they can be measured independently of each other.

Current research in the Work Adjustment Project is aimed at improving available measures of vocational abilities and vocational needs, in order to provide vocational rehabilitation counselors with better tools for evaluating the work personalities of vocational rehabilitation applicants. More efficient and economical methods of describing ability requirements and reinforcer systems in work environments are being developed. In addition, research continues on testing, developing, and modifying the *Theory of Work Adjustment* and its implications for a psychology of disability.

The present monograph presents the methodology used for the measurement of Occupational Reinforcer Patterns (ORPs) for 81 occupations. The ORPs that were developed are presented in Monograph XXIV of this series. These ORPs are based on the judgments of 2,976 immediate supervisors of jobs in several hundred firms. Monograph XXIV presents the 81 ORP profiles, as well as other information describing these work environments, and indicates how the ORP information might be most useful to counselors. The present monograph, as a companion volume to Monograph XXIV, reports technical data concerning the development, reliability, and validity of the ORPs.

Data for the ORPs were obtained by asking supervisors of the 81 occupations to complete the Minnesota Job Description Questionnaire (MJDQ). The MJDQ contains 20 scales that parallel the scales in the Minnesota Importance Questionnaire and the Minnesota Satisfaction Questionnaire. To complete the MJDQ, the supervisor is asked to rank the reinforcer characteristics of the job he supervises. MJDQs were administered to the supervisors by mail. ORPs were developed only for occupations for which 20 or more completed MJDQs were obtained.

Results

Reliability studies showed that ORPs developed from sub-groups of supervisors for an occupation were very similar to those obtained from other subgroups of the same occupation, and to the ORP obtained from the total occupational group. These data reflected the high amount of agreement among supervisors for almost all occupations. Evidence for the validity of the ORPs was obtained from occupational differences and similarities among the 81 ORPs. Significant differences in scale values for all occupations were found on all scales, on a scale-by-scale comparison of mean scale scores. The grouping of similar ORP profiles resulted in nine occupational clusters. These clusters represent meaningful occupational groupings.

These studies suggest that supervisor ratings provide reliable and meaningful ORPs. The use of the MJDQ appears to be an efficient, reliable and valid method for obtaining ORPs for a variety of occupations.

Implications for Vocational Rehabilitation Practice

The *Theory of Work Adjustment* was developed as a model for predicting vocational rehabilitation outcomes. The theory specifies employment satisfaction and employment satisfactoriness as indicators of the quality of work adjustment achieved as a result of vocational rehabilitation. Using this model, job satisfaction and job satisfactoriness can be viewed as indicators of the success of vocational rehabilitation. Vocational rehabilitation counselors are concerned

with assisting counselees to choose occupations for which adjustment is likely. Adjustment, in terms of the theory, is indicated by satisfaction and satisfactoriness.

Tools for the prediction of employment satisfactoriness have been available for some time. An individual whose ability test scores, measured on an instrument such as the General Aptitude Test Battery, correspond to the Occupational Aptitude Pattern of a job is predicted to be satisfactory on the job. Similar tools for predicting job satisfaction in an occupation have not been available to vocational rehabilitation counselors.

The Occupational Reinforcers Patterns presented in Monograph XXIV complete the set of predictor variables specified by the *Theory of Work Adjustment* for the prediction of both job satisfaction and job satisfactoriness. These ORPs provide the vocational rehabilitation counselor with descriptions of work environments in terms of differential patterns of reinforcers for different occupations.

The Work Adjustment Project will continue to develop and refine ORPs with particular emphasis on increasing coverage and examining validity of the ORPs.

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The Measurement of Occupational Reinforcer Patterns

Introduction

The concept of congruence between the individual and his environment is a frequent theme in the literature of psychology. The pervasiveness of this concept is reflected in a recent review by Pervin (1968), who traced several of the diverse ways in which performance and satisfaction have been studied as a function of individual-environment fit. This theme has been equally prominent in both the theoretical and the more applied writings of psychologists. One of the first explicit theoretical uses of the congruency concept was in the personality theory of Murray (1938), which treated individual satisfaction as a function of the correspondence between needs of the individual and characteristics of the environment ("press"). In applied areas such as vocational counseling, vocational choice, academic performance, and job satisfaction, there seems to be substantial implicit agreement that a "good fit" between the individual and his environment facilitates individual adjustment.

In vocational counseling, the classic use of the concept of individual-environment fit is Frank Parsons' (1909) man-job matching model, which has influenced research and practice for decades. In the matching of individual abilities with the performance requirements of jobs, Parsons' thinking was followed by such developments as Viteles' (1932) Job Psychograph, the *Minnesota Occupational Rating Scales* (Paterson, Gerken, and Hahn, 1941), the Occupational Ability Pattern (Dvorak, 1935), and the extensive research of the United States Department of Labor in the development of the General Aptitude Test Battery and the corresponding Occupational Aptitude Patterns (U. S. Department of Labor, 1966).

Several recent studies (e.g., Pace and Stern, 1958; Astin and Holland, 1961; Astin, 1963, 1965) have examined the differential psychological characteristics of college environments with the eventual hope of helping an individual select a college which is optimal for his intrapersonal needs. A similar concern with the congruence between the characteristics of the individual and the environment has been present in the research of Holland (1959, 1966). In vocational

interest measurement, the development of the Strong Vocational Interest Blank (Strong, 1943) and the Minnesota Vocational Interest Inventory (Clark, 1961), rests on the assumption that job tenure is a function of the similarity of an individual's likes and dislikes with those of his work associates. Super's theory of career development (1963) emphasizes the matching of the individual's self-concept with his concepts of occupations.

The *Theory of Work Adjustment* (Dawis, England, and Lofquist, 1964; Dawis, Lofquist, and Weiss, 1968), which is the basis for the present study, explicitly hypothesizes that work adjustment is a function of the correspondence between the individual and his work environment. Furthermore, this theory proposes that "satisfactoriness is a function of the correspondence between the individual's abilities and the ability requirements of the work environment . . . " and that "satisfaction is a function of the correspondence between the reinforcer system of the work environment and the individual's needs." Much research in vocational psychology has been devoted to the determination of the ability requirements of occupations. Little effort, however, has been directed to the investigation of the reinforcer systems of occupations. A major concern, therefore, of the Work Adjustment Project has been the measurement of Occupational Reinforcer Patterns (ORPs).

The *Theory of Work Adjustment* is not the first theory to state that job satisfaction is a function of the correspondence between the individual and the work environment. Several theorists, such as Argyris (1957), Herzberg, Mausner and Snyderman (1959), and Hulin and Smith (1965), have included this assumption in their theoretical formulations. However, the various job satisfaction theories have differed widely in the explicitness with which expected empirical relations have been stated and in their proposals for measurement of the individual and the work environment.

One of the first efforts to relate job satisfaction to fulfillment of needs by the work environment was that of Schaffer (1953). In Schaffer's study, need-satisfaction scores were interpreted as measures of the extent to which the work environment fulfilled the needs of individuals. In commenting on Schaffer's work and related kinds of job satisfaction research, Darley and Hagenah (1955) make the following statement:

> In principle, at least, Schaffer was seeking a common vocabulary which would on the one hand contain a set of dynamic

> needs . . . and on the other hand describe the capacity of jobs to meet these needs. These terms would then acquire meaning by their relations to the criterion of over-all job satisfaction. The next obvious step is for some investigator to devise a new kind of job analysis system — an analysis that gives at least a first approximation of the extent to which families of occupations can satisfy some accepted set of intrapersonal needs. (p. 169)

In a sense, the present study is a follow-up of Darley and Hagenah's research mandate. The results of this study provide a first approximation to the identification of families of occupations with similar need-satisfaction systems.

Empirical studies of job satisfaction as a function of individual-environment fit have been reported by Morse (1953), Gordon (1955), Ross and Zander (1957), Froelich and Wolins (1960), Porter (1961), Blai (1963), and Kuhlen (1963). The first Work Adjustment Project studies of occupational reinforcement were reported in Monographs XVIII and XIX of this series (Weiss, Dawis, England and Lofquist, 1964, 1965). Unlike many previous studies, the present research framework permits measurement of individuals and work environments explicity, independently, and on a comparable measurement-scale. This methodology has the potential advantage over previous efforts of permitting the prediction of job satisfaction *in advance of* employment or before change to different jobs. Consequently, this method of matching men and jobs has distinct promise for use in vocational counseling or personnel placement.

The preceding monograph in this series (Borgen, Weiss, Tinsley, Dawis, and Lofquist, 1968) presented ORPs for 81 occupations. The present monograph describes in technical detail the research that was the basis for these ORPs.

Research Strategy for the Measurement of ORPs

Methods for the Development of ORPs

Occupational Reinforcer Patterns (ORPs) may be developed by any of three methods: direct observation, estimation, and inference.

Direct Observation. It would seem feasible to train observers to observe the worker on the job, determine what appear to be the effective reinforcers for the job, and determine 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 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. A group of judges may be used to identify effective occupational reinforcers and to estimate their relative strengths. Such estimation may be done by individuals on the job or in positions closely related to the job (such as supervisors or members of the personnel department). 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.

Another group of "judges" is suggested by the procedures that were used in the development of the job psychograph and of such tools as the Minnesota Occupational Rating Scales (Paterson, Gerken and Hahn, 1953) and the Worker Trait Requirements (United States Department of Labor, 1956). For these instruments, estimates of the abilities required in the performance of a job were made by vocational psychologists and other "outside experts" rather than

by individuals connected directly with the job. A major problem with the use of "outside experts" is their lack of specific information on the characteristics of many jobs.

Inference. The development of OAPs by the United States Department of Labor (1966) is an example of an inferential approach which might prove useful in the development of ORPs. An OAP is a pattern of abilities which shows a significant relationship with a criterion of satisfactory performance (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. It is obvious that this method of developing ORPs is easily the most expensive in terms of both cost and time.

Previous Research on the Measurement of ORPs

As indicated earlier, previous Work Adjustment Project studies of occupational reinforcement investigated the usefulness of the estimation method, utilizing "outside" experts, and the inferential method of developing ORPs.

Monograph XVIII in this series (Weiss *et al.*, 1964) reports on the estimation of ORPs by "outside experts." In this study, five vocational psychologists ranked 19 jobs in terms of relative reinforcement level available to employees in these jobs. The judges used an alternation ranking procedure, ranking the 19 jobs separately for each of 16 reinforcement dimensions. The jobs were then classified in terms of high or low reinforcement on each dimension. Within each job, and for each reinforcement dimension, employees were classified in terms of high or low need based on their scores on the Minnesota Importance Questionnaire on the parallel need dimension. Within this fourfold need-reinforcement classification, data were analyzed with respect to the average job satisfaction scores of each subgroup of individuals. These analyses, and other analyses using subsets of these data, showed that valid results were obtained for ten of the sixteen need-reinforcement dimensions studied.

While this method of estimating ORPs utilizing "outside experts" did yield valid results, some problems were noted. First among these

was the problem of obtaining agreement among the judges. The data indicate that agreement among "outside experts" is difficult to obtain for some reinforcement dimensions. Another problem was the wide range of differences among the "outside experts" in detailed knowledge of the jobs. Thus, while some experts might be rating a job on the basis of thorough knowledge, others might rate the same job simply on the basis of general stereotypes based on imprecise knowledge.

An inferential approach to the development of ORPs has also been studied by the Work Adjustment Project (Weiss *et al.*, 1965). In this study, the dependent variable was general job satisfaction, and the independent variables were the twenty scales of the Minnesota Importance Questionnaire (MIQ). MIQ scores were related to job satisfaction by two multivariate statistical methods (linear multiple regression and reciprocal averages prediction). The resulting patterns of statistically significant predictor variables were used to define the ORPs. In these studies, it was found that different patterns of needs were related to job satisfaction for different occupations. Thus, occupations were found to have different ORPs. To determine the stability of these inferentially obtained ORPs, the resulting multivariate prediction equations which defined the ORPs were cross-validated on hold-out groups from the same occupations. In most instances, the cross-validation yielded statistically significant correlations, but for a few occupations it was observed that the multivariate prediction equations yielded unstable ORPs.

Estimation of ORPs by Supervisors

The method of estimation by "outside experts" and the inferential method of developing ORPs were shown to be feasible and useful. However, both methods were found deficient as methods for the development of a large number of ORPs for a variety of occupations. Since the estimation method appeared to be relatively inexpensive as well as simple to administer, it was decided to concentrate effort on improving the method.

Several other classes of judges for the estimation of ORPs could be identified in addition to "outside experts." These include the employee himself, as the "expert" closest to the job; the worker's immediate supervisor, as someone who might know the job almost as well as the employee himself; and personnel department staff

members, whose knowledge of the job would permit their rating its characteristics.

As judges for the estimation of ORPs, personnel department staff members have many of the shortcomings of "outside experts." While they might have a general knowledge of the characteristics of many jobs, this knowledge might not be detailed enough to enable them to make useful estimates. Their ratings might reflect stereotypic, superficial, or non-discriminating characterizations of the reinforcing conditions of jobs. In addition, the limited number of knowledgeable personnel department staff members would require that they be asked to rate many jobs, thereby imposing a rather burdensome task on these individuals.

Employees who actually perform a job are obviously closest to the job and, in that sense, the most knowledgeable estimators of ORPs. However, individuals differ widely in their needs and job satisfaction, and it is likely that these factors would affect their estimation of the reinforcing characteristics of *their* jobs. Thus, employees may be "too close" to evaluate objectively the reinforcers in their jobs and may instead rate jobs either in terms of their own needs or their own satisfactions. Some unpublished Work Adjustment Project research results bearing on this problem indicate that job descriptions of reinforcers given by workers show moderate to high correlations with their expressed job satisfaction. These data imply that some employees are indeed "too close" to their jobs to describe effectively the job reinforcers independently of their feelings of satisfaction with their job.

Immediate supervisors, on the other hand, appear to represent a desirable compromise between employees and personnel managers as relevant experts for the estimation of ORPs. The supervisor of a job is close enough to the job to have a thorough knowledge of the job. Furthermore, he is likely to have observed several employees in that job over a period of time and thus is likely to have a fairly broad knowledge of how the stimulus conditions of the job affect workers. The immediate supervisor therefore probably has a more detailed knowledge of the job than "outside experts" or personnel department staff members. Moreover, the supervisor's ratings are less likely to be influenced by *his own* job satisfaction, since he is rating reinforcers for *another* job. In addition, there are many supervisors who can rate a given job, certainly more than the number of "outside experts" or personnel department staff members. Using

such a group of raters would require that each supervisor rate only one job, thus minimizing the amount of time needed for rating, and, hopefully, maximizing commitment to the rating procedure.

Criteria for a Measure of ORPs

Since supervisors appeared to be a desirable group of judges, they were chosen as raters for the present study. Several criteria were specified concerning the usefulness of supervisors as raters. First, if supervisors are to be considered as accurate raters, it is necessary that their ratings represent logically consistent judgments. Thus, if supervisors responded to the rating instrument in an illogical or inconsistent fashion, it could be concluded that supervisors are not able to make meaningful judgments about the work environment. A first criterion of the usefulness of supervisors as ORP raters is, then, their ability to make meaningful or logically consistent judgments.

Secondly, if a pattern of occupational reinforcers exists for a given job, and it can be meaningfully perceived by supervisors, supervisors in different environments (companies, locations, industries) should agree with each other on the presence and relative strength of these reinforcers. This criterion requires that agreement should exist among the ratings of the same job by supervisors in different locations.

A third important criterion of the usefulness of supervisor estimation is that, while ratings from supervisors of the same job should agree with each other, they should differ from the ratings from supervisors of other jobs. Combining this criterion with the other two, it is therefore desired that supervisors as estimators of ORPs should exhibit: a) intra-individual agreement or logical consistency; b) intra-job agreement, i.e., high correlation among the ratings of supervisors of the same job; and c) inter-job disagreement, i.e., low correlation among ratings of supervisors of different jobs. In the language of Campbell and Fiske (1959), supervisor ratings of the reinforcing characteristics of occupational environments must show both *convergent validity* (a and b, above), and *discriminant validity* (c, above).

These considerations in part dictated some of the characteristics of the rating instrument designed for use in the study. Certain other characteristics were also considered important. First, because of the objective of using ORPs in operationalizing the *Theory of Work Ad-*

justment, it was desirable to have an instrument which would yield ORPs with dimensions parallel to those measured by the Minnesota Importance Questionnaire (MIQ), a measure of intrapersonal vocational needs. In this way, measurement of correspondence between the ORPs and an individual's MIQ profile would be facilitated. Secondly, since not all reinforcers were expected to be found in a given work environment, and since reinforcers could be present at various levels in different environments, an instrument was desired which would yield estimates of magnitude or amount of reinforcement, as well as judgments of presence or absence. Additional desirable characteristics of the instrument were that it be self-administering, easy to understand, and could be completed in a brief period of time (preferably less than thirty minutes). Moreover, to obtain ratings inexpensively on a wide variety of jobs, it was desirable to have an instrument which could be administered by mail.

These considerations led to the development of the Minnesota Job Description Questionnaire (MJDQ), for use in the estimation of Occupational Reinforcer Patterns.

Development of the MJDQ

The psychometric method chosen for use in the MJDQ is based on the work of Gulliksen and Tucker (Gulliksen and Tucker, 1961; Gulliksen, 1964). This method, known either as the method of multiple rank orders or balanced incomplete blocks, is a special case of the general method of pair comparisons. The method of multiple rank orders provides all the essential information supplied by the method of complete pair comparisons, but presumably has the advantage of requiring less administration time. The principal distinction between the two methods is that the former presents stimuli in sets of *three or more* and the individual *ranks* them on the basis of some attribute, while in the latter, the stimuli are always presented in *pairs*. In both methods, however, each stimulus appears only once with every *other* stimulus.

When n stimuli are ranked, there are implicit within those ranking responses (n/2) (n–1) pair comparison responses. Thus, ranking in a set of five stimuli is essentially equivalent to ten pair comparison responses. Ranked responses can be converted to pair comparison responses as illustrated in Table 1. Both the columns and rows of the matrix are labeled from A to E. A score of 1 is used to indicate preference for the column stimulus over the row stimulus, while a 0 shows preference for the row stimulus over the column stimulus. Using the hypothetical responses in Table 1, the ranking of each stimulus is compared with the ranking of each of the other four stimuli. Thus, beginning with statement A, it can be seen that A received a lower rank (4) than B (3), so a 0 is entered in the cell of the matrix which is defined by column A and row B. Similarly, statement A is ranked lower (4) than C (1), so a 0 is entered in the cell representing column A and row C. By continuing in this manner the ranked data can be "unfolded" into complete pair comparison data. In the full pair comparison matrix it will be seen that corresponding cells from halves of the matrix above and below the principal diagonal provide exactly complementary information. In this respect one-half of the information is redundant, and therefore all the pair comparison information can be presented in the ten cells of either the upper or the lower triangle of the matrix.

For the MJDQ it was desired to present twenty stimulus statements analogous to the 20 Minnesota Importance Questionnaire statements in ranking blocks of five each. Unfortunately, in the

Table 1

Example illustrating the conversion of five ranked statements to complete pair comparison data

Statements about this job are in groups of five. You are asked to consider each group of five individually and rank the five statements in terms of how well they describe the job, using the numbers "1" to "5". Then go to the next group of five statements and make the same kind of ranking.

For example, your answers on a group of statements might look like this:

Workers on this job . . .

4 get full credit for the work they do. (A)

3 are of service to other people. (B)

1 have freedom to use their own judgment. (C)

5 do new and original things on their own. (D)

2 have the chance to get ahead. (E)

This means that, of the five statements, you consider "have freedom to use their own judgment" as most descriptive of the job; "have the chance to get ahead" as the next most descriptive statement; and so on.

You will find some of these comparisons more difficult to make than others, but it is important that you rank every statement in each group.

	A	B	C	D	E
A		1	1	0	1
B	0		1	0	1
C	0	0		0	0
D	1	1	1		1
E	0	0	1	0	
Number of votes	1	2	4	0	3

Note. — A 1 is entered in the matrix if the column stimulus is chosen over the row stimulus, and a 0 if the row stimulus is chosen over the column stimulus.

multiple rank order method, not any number of stimuli could be used and ranked in blocks of any size, and still result in complete pair comparison data. There are only a limited number of designs for given numbers of stimuli and given sizes of ranking blocks which pair each stimulus with every other stimulus once and only once. One such design required 21 stimuli presented in blocks of five. Consequently, a twenty-first statement was written for a dimension not included in the MIQ, and this was added to the 20 statements representing the MIQ dimensions. This additional statement, which represented the dimension of Autonomy, was "plan their work with little supervision." The other 20 statements were

Table 2

Revisions of MIQ pair comparison statements for multiple rank order MJDQ

Scale	MIQ Pair Comparison Statement Which is more important to me in my *ideal* job?	MJDQ Statement Workers on this job . . .
1. Ability utilization	I could do something that makes use of my abilities.	1. make use of their individual abilities.
2. Achievement	The job could give me a feeling of accomplishment.	2. get a feeling of accomplishment.
3. Activity	I could be busy all the time.	3. are busy all the time.
4. Advancement	The job would provide an opportunity for advancement.	4. have opportunities for advancement.
5. Authority	I could tell people what to do.	5. tell other workers what to do.
6. Company policies and practices	The company would administer its policies fairly.	6. have a company which administers its policies fairly.
7. Compensation	My pay would compare well with that of other workers.	7. are paid well in comparison with other workers.
8. Co-workers	My co-workers would be easy to make friends with.	8. have co-workers who are easy to make friends with.
9. Creativity	I could try out some of my own ideas.	9. try out their own ideas.
10. Independence	I could work alone on the job.	10. do their work alone.
11. Moral values	I could do work without feeling that it is morally wrong.	11. do work without feeling that is morally wrong.
12. Recognition	I could get recognition for the work I do.	12. receive recognition for the work they do.
13. Responsibility	I could make decisions on my own.	13. make decisions on their own.
14. Security	The job would provide for steady employment.	14. have steady employment.
15. Social service	I could do things for other people.	15. have work where they do things for other people.
16. Social status	I could be "somebody" in the community.	16. have the position of "somebody" in the community.
17. Supervision-human relations	My boss would back up his men (with top management).	17. have bosses who back up their men (with top management).
18. Supervision-technical	My boss would train his men well.	18. have bosses who train their men well.
19. Variety	I could do something different every day.	19. have something different to do every day.
20. Working conditions	The job would have good working conditions.	20. have good working conditions.
21. Autonomy	. . .	21. plan their work with little supervision.

derived from the MIQ pair comparison statements, appropriately reworded to denote reinforcing conditions rather than needs. Table 2 shows the statements used in the MIQ, along with the revisions which were made in the wording of the statements for use in the MJDQ.

Even more important than the rewording of the MIQ statements, however, was the context in which they were rated, i.e., the rating "set" provided by the rating instructions. The statements in the MIQ are rated with respect to their relative *importance* in an individual's *ideal* job, while in the MJDQ essentially the same statements were rated by several supervisors with respect to *how well they describe a particular job*. In other words, the MIQ was intended to measure the *needs* of an individual for specified reinforcing conditions, while the MJDQ was designed to measure the presence of reinforcers for the same needs in a particular work environment.

Table 1 also shows the example used in the MJDQ to introduce the questionnaire to the raters. As the example shows, supervisors are asked to rank the five statements on the basis of *how well they describe* the job they supervise. The numbers placed beside the statements show how some hypothetical individual might have ranked the items, ranking *"have freedom to use their own judgment"* as most descriptive of the job, and continuing down to *"do new and original things on their own"* as least descriptive of the job.

The statements in the MJDQ were worded to describe stimulus conditions in a work environment. As much as possible, they referred to observable kinds of behavior, but in some cases they required insights by the supervisor into the psychological environment which the job provides. For instance, supervisors were asked to make a relatively observable evaluation about whether workers on the job "are busy all the time," but they were also asked to describe the job in terms of the extent to which workers "get a feeling of accomplishment." In the printed instructions to the supervisors, technical terms such as "reward" and "reinforcement" were intentionally avoided, and the task was presented simply as a description of work activities and conditions.

A copy of the Minnesota Job Description Questionnaire is shown in Appendix A. The instrument contains 21 ranking blocks, each containing five statements. Each of the 21 statements appear in five ranking blocks in the instrument, but each time with a different set of four other items. As shown in Table 1, the responses to each of

the ranking blocks can be converted to ten pair comparison responses, so that from the instrument's 21 ranking blocks there are obtained 210 unique pair comparisons. The reduction in the raters' time and effort achieved by this method, in contrast to the regular pair comparison method, is apparent if one compares the 105 responses required by this method with the 210 responses required on a 21-statement complete pair comparison instrument, or the 190 responses on a 20-statement pair comparison instrument such as the MIQ. Furthermore, the multiple rank order method produces a shorter questionnaire. The MJDQ required 105 lines to present the statements to be rated, while a pair comparison format would have required a total of 420 lines since two statements have to be presented for each pair comparison response. Thus, the MJDQ requires much less administration time, and about one-fourth the

Table 3

Placement of 21 descriptive statements in the MJDQ

Block Ranking	Position within each block				
	A	B	C	D	E
1	3	15	9	7	4
2	15	19	2	18	6
3	11	17	19	1	3
4	6	9	1	8	16
5	18	21	17	9	20
6	12	11	21	15	8
7	17	6	7	12	5
8	19	8	13	20	7
9	1	5	20	14	15
10	13	3	14	6	21
11	2	13	5	11	9
12	8	14	4	17	2
13	21	4	16	5	19
14	7	2	10	21	1
15	5	18	8	3	10
16	14	7	18	16	11
17	10	16	15	17	13
18	9	12	19	10	14
19	4	1	12	13	18
20	20	10	6	4	11
21	16	20	3	2	12

Note. — The numbers in the table correspond to the statements listed in Table 2.

reading time that would have been required for a pair comparison instrument.

Special care was taken in the design of the MJDQ to insure that the final rankings assigned to each of the statements would be independent of any position preference which raters might have. Item placement within a block was arranged so that, as far as possible, each statement appeared only once in the same position in the different blocks. This objective was achieved in 99 out of 105 position assignments, and the deviations in the other six cases were minimal. Furthermore, the appearance of the same statement within adjacent blocks was minimized (Cf. Phillips, 1964). Once a design was developed which was balanced with respect to block position and serial effects, the 21 statements were randomly assigned to the design. Table 3 shows how the 21 statements were assigned to the 21 blocks. This design fulfills the critical pair comparison requirement that every statement is paired once and only once with every other statement.

Measurement of Inconsistency in Raters' Responses

Pair comparison data have the very useful attribute of providing an index of the degree of inconsistency in an individual's responses. This index is the total number of circular triads found in the total response matrix. In a circular triad, A is rated higher than B, B is rated higher than C, but C is rated higher than A, where A, B, and C represent any three statements. If an arrow is used to indicate a judgment of "higher than" or "preference over," Figure 1 illustrates a "circular triad." The "circular triad" shows arrows connecting the three statements all pointing in the same (circular) direction.

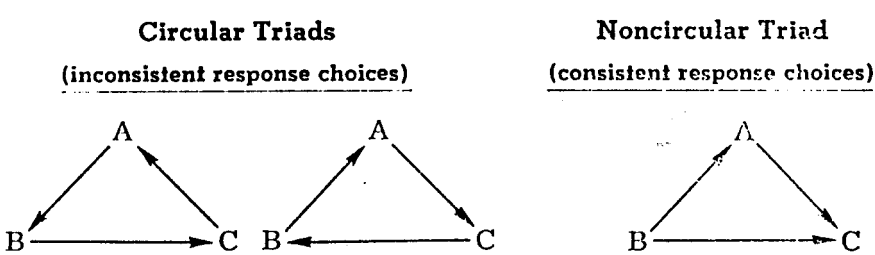


Fig. 1. Illustration of judgments in circular and noncircular triads

The distinction between a noncircular and a circular triad is that in the former the pair comparison responses are consistent with

a undimensional ordering of the three statements, while in the latter the statements cannot be ordered on a single dimension. Thus, in the noncircular triad shown in Figure 1, the ordering B-A-C is consistent with the pair comparison responses, but no such simple ordering can be constructed for the circular triads. For the MJDQ, if an individual were perfectly consistent in his ordering of the 21 statements describing the job environment, he would rank one statement above all the others, a second statement above all others but the first and second, and so on down to the twenty-first statement, which would be ranked above no other statement. In such a case the individual would have been perfectly consistent and his responses would form a perfect rank ordering of the 21 statements. If a "vote" had been given to each statement each time it was ranked over another, there would be, with perfectly consistent data, one statement with 20 votes, another with 19 votes, and so on, down to the "lowest" statement with zero votes.

At the other extreme, the totally inconsistent individual would establish no preference ordering, and would choose each statement over each other statement an equal number of times. This individual would obtain the maximum possible number of circular triads. For purposes of the present study, he would add little information about occupational reinforcer patterns, and his data should be excluded from the responses of those with consistent rankings.

The total number of triads possible from among the 21 statements is given by the formula for the total number of ways of selecting r distinct combinations of N objects, irrespective of order, where N is 21 and r is 3 (Hays, 1963, p. 137).

Thus, $$\frac{N!}{r!\,(N-r)\,!} \quad \text{or} \quad \frac{21!}{3!\,(21-3)\,!} = 1{,}330$$

There are potentially 1,330 triads within the MJDQ, but 210 of these are composed of triads *within* ranking blocks of five, and therefore are forced to be consistent (noncircular). This leaves 1,120 triads within the MJDQ which can be circular. However, even the most inconsistent individual will never exhibit this many circular triads because of the interdependency of responses across triads (Kendall, 1955). The formula for the maximum number of circular triads, when the number of statements is odd, is given by Gulliksen and Gulliksen (1966) as

$$d(\text{max-n-odd}) = n\,(n^2 - 1) / 24$$

For the MJDQ, therefore, the maximum number of circular triads is:

$$21\,(21^2 - 1) / 24 = 385$$

Thus, the totally inconsistent individual described above would have 385 circular triads within his response matrix. This could be verified by laying out his response matrix and checking each of the 1,120 triads for circularity. However, the total number of circular triads can be calculated directly from the number of "votes" for each statement, using the following formula developed by Kendall (1955):

where $\sum_{i=1}^{n} (V^2_i)$ equals the sum of the squared number of votes for each statement, and n is the number of different statements,

$$\text{TCT (Total Circular Triads)} = \frac{(1/6)\,n\,(n-1)\;(2n-1) - \sum_{i=1}^{n} (V^2_i)}{2}$$

For the totally inconsistent individual, with 10 votes for each of 21 statements, the last term in the numerator will be $21\,(10^2)$ or 2100, and the TCT score in fact turns out to be 385.

Gulliksen (1966) also presents formulae which permit the calculation of the mean and variance for the distribution of the TCT score to be expected under conditions of random response to the MJDQ, such as, if a person used coin flips to determine his responses. The mean, or expected value, for this distribution is given by:

$$\text{Expectation (TCT)} = (n/24)\;\;(n-1)\;\;(n-k)$$

and the variance of this distribution of TCTs under random responding is:

$$\text{Variance (TCT)} = (n/288)\;\;(n-1)\;\;(n-k)\;\;(k+1)^2$$

Where n is the number of statements
and k is the number of statements ranked
in each block.

For the MJDQ, the TCT mean, variance, and standard deviation for random response are 280, 840, and 29 respectively. Using these parameters, it is possible to estimate the probability that any individual supervisor's complete set of responses to the MJDQ are due to random responding. Thus, the probability of the TCT under ran-

dom responding being more than three standard deviations below the mean, that is, less than 193 circular triads, is .0013. Consequently, this is the cutoff score which has been used to assess inconsistency of response. Only data for individuals with fewer than 193 circular triads in their comparative judgment responses were used in the development of ORPs. Responses from less than one percent of supervisors were ultimately eliminated from the study on this basis.

While the TCT score is a clear-cut measure of *statistical* randomness of response, a high TCT score does not *necessarily* imply that the respondent was totally random in his response to the MJDQ. He may, in fact, have been trying his best to discriminate among the statements but was simply unable to see any difference in the appropriateness of the 21 statements for describing the job he was rating. This possibility of a dual meaning of circular triads in pair comparison data is emphasized by Gulliksen (1964):

> This confusion of the objects might be due to carelessness of the subject; or it might be due to the fact that the objects are really very much alike and hence cannot be successfully and consistently discriminated, even though the person was very careful; or it might be due to the fact that the person does not have a very stable preference system for making these judgments. In any case, the total number of circular triads is a valuable score. It could be used, for instance, for distinguishing some of the subjects whose responses are extremely out of line with others, or it could be used as an additional measure in itself. The varying stability of a preference system, or the varying carefulness among subjects, can be measured by using the total circular triads score. (p. 70)

In the present study there was justification for eliminating raters with high TCT scores, regardless of whether these were due to rater carelessness or nondiscriminability of the MJDQ statements. The purpose of the research, to develop differential occupational reinforcer patterns, requires that raters be able to discriminate among the statements. To include raters who are unable to make discriminations can only add error to the group pattern. On the other hand, the individuals with high TCT scores cannot be totally ignored. If, for instance, it is observed that a large percentage (say 30 to 40%) of supervisors for a particular job have a high number of circular triads, then the possibility that no reliable reinforcer pattern can

be developed for that particular occupation must be seriously considered.

The Absolute Judgment Section of the MJDQ

By asking supervisors to rank reinforcers in jobs with respect to how well they describe jobs, data are obtained about the *relative* importance of reinforcers in a certain job. However, information on only the rank order of the reinforcers was insufficient for the purpose of this research. One can imagine two different jobs, each with the reinforcers ranked in the same order, but with important differences in the *absolute level* of reinforcement available on each job. Thus, for example, the reinforcers for two jobs could be ranked in precisely the same order, yet for one job a significant level of reinforcement could be *present* for only two reinforcers, while for the other job, with the reinforcers occupying the same relative positions, significant reinforcement could be available for ten or twelve different reinforcers. In other words, it was desirable to design a questionnaire in which a rater could indicate not only the relative strength of reinforcers, but also, whether the reinforcers were *present* or *absent* in a particular job.

Information about the presence or absence of reinforcers was obtained in the MJDQ by the use of an absolute judgment section on the last page of the questionnaire (see Appendix A, p. 75). In this section the supervisor was asked to consider individually each of the 21 statements which he had previously ranked. He then was asked to indicate whether each statement *described* or *did not describe* the working environment he was rating, by marking "Yes" if he thought the statement described the job, and "No" if it did not describe the job.

With the addition of this section, two modes of psychometric measurement, comparative judgment and absolute judgment, were being used in combination in the measurement of Occupational Reinforcer Patterns. The *joint* use of these two kinds of measurement depends on rater consistency across the two modes of response. It was assumed that an individual's responses on the comparative and absolute judgment sections of the questionnaire would be at least moderately related; that is, the reinforcers he rates as *not present* on the absolute judgment section will tend to be the same reinforcers he ranks *lowest* on the comparative judgment section, and similarly, the reinforcers rated *present* will tend to be the re-

inforcers given the highest relative ranking. Data obtained from the administration of the MJDQ indicate that in the vast majority of cases supervisors were consistent in the way they responded to the two sections of the MJDQ.

Responses to the absolute judgment section of the MJDQ were used to determine a psychological "neutral point" such that reinforcers ranked above the neutral point could be considered *present* in the occupation, while reinforcers ranked below the neutral point could be considered *not present* in that particular occupation. In scoring the ranking data from the comparative judgment section, each of the 21 statements received an initial scale value. These scale values were then adjusted, with the neutral point used as the anchoring point. A more complete discussion of the procedure is presented on pages 27 and 30.

Interpretation of the Neutral Point

The scaling of the statements in the MJDQ with respect to the psychological neutral point plays a significant part in the way Occupational Reinforcer Patterns have been derived and interpreted. The scaling of the neutral point directly follows the method used by Gulliksen (1964). While statistical derivation of the neutral point is relatively simple — and in fact follows closely the classic methods of scaling comparative judgment data — the psychological interpretation of the neutral point is rather elusive and, therefore, demands special elaboration.

For purely didactic purposes, consider the fictitious example of a psychologist consulting with a high school cafeteria whose management is confused about the kind of vegetables students like and will eat. Using a random sample of the students, this investigator might set out to solve the problem by using a questionnaire. His immediate goal is to find an average preference ranking for 15 different vegetables. In addition, he wishes to locate the point, as one moves down the preference hierarchy from most preferred to least preferred, at which the majority of students will leave the particular vegetable uneaten. This point, where response changes from liking to disliking, might be thought of as the neutral point. If one were scaling vegetables on a preference hierarchy and wished to introduce a *neutral point* into the scaling, it would be reasonable to arrange matters so vegetables with scale values above the neutral point would be "liked" and the vegetables scaled below the neutral

point would be "disliked." To obtain data allowing such an interpretation a group of people could be asked to rank the vegetables on the basis of preference (using some comparative judgment method such as pair comparisons or multiple rank orders) and *also* asked to consider each vegetable individually and decide whether it was "liked" or "disliked."

For any particular individual, one would expect his ranking of vegetables and his like-dislike responses to be consistent. That is, if he is perfectly consistent and if he says he dislikes, say, two vegetables, then those two vegetables should be the lowest two in his ranking. If he is moderately consistent, those two he disliked should be at least among the lowest four or five in his ranking.

For scaling the neutral point, the categorical responses of like-dislike are treated *as if* they were ranking responses. In the ranking section each vegetable was ranked with respect to every other vegetable. Now, using the like-dislike responses, it may be said that the *neutral point* is ranked with respect to each vegetable. If the individual says he dislikes a vegetable, this is scored as a vote for the *neutral* point, since a dislike response puts the vegetable "below" the neutral point. Conversely, a "like" response is equivalent to placing the vegetable "above" the neutral point — which might be thought of as the threshold between liking and disliking. In the case of a "like" response the neutral point would not receive a vote, but the vote instead would be given to that vegetable.

Thus, individual responses are scored so that votes are given to each of the fifteen vegetables and also to a neutral point, which represents the threshold between "positive" and "negative" responses to the vegetable. Then, assuming that individuals respond consistently in their rankings and categorical responses, the responses of all the individuals in the group are combined, and average scale values are calculated for each of the 15 vegetables and also for the neutral point. Each of the vegetables with an average scale value greater than the average scale value given the neutral point is considered above the neutral point, i.e., liked by the majority of the group, and conversely, each vegetable with an average scale value less than the neutral point scale value might be considered disliked.

The design and scoring of the MJDQ is analogous to the example given for scaling vegetables. However, the statements on the MJDQ have been ranked with respect to whether they *describe* or *do not*

describe job environments, rather than whether they are liked or disliked, and thus the neutral point on the MJDQ is given a somewhat different interpretation from the one given in the vegetable example. In the absolute judgment section of the MJDQ the supervisor decides whether the statement describes the job. A "Yes" response implies that the characteristic is *present* on the job, a "No" implies that the characteristic is absent. Consequently, the neutral point on the MJDQ might be thought of as the threshold between the presence and absence on the job of the characteristic represented by the statement. If one further assumes that the statements measure dimensions of occupational reinforcement, then a statement with a scale value *above the neutral point* implies that that reinforcer is seen as *present* in the occupation, and a statement with a scale value *below the neutral point* implies that the reinforcer is *not present* in that occupation.

Treatment of Invalid or Incomplete Responses

The scoring system for the pair comparison data derived from the MJDQ required that all of the responses of each individual supervisor be complete and valid (i.e., according to instructions). Since all of the respondents were cooperating voluntarily, it was unreasonable to expect perfect response from all of the supervisors. At the same time, it would have been a waste of time and money to discard the responses of any supervisor who had left a few items unanswered. Consequently, appropriate random digits were substituted (using a random number generator) for the missing or invalid responses of any individual with six or fewer defective responses in the ranking section of the MJDQ, and two or fewer incomplete responses in the categorical section.

Scoring the MJDQ to Obtain ORPs

The basis for scoring data from the MJDQ is found in Thurstone's Law of Comparative Judgment (Thurstone, 1927). The comparative judgment data obtained with the MJDQ fulfill the conditions for Thurstone's Case V of the model (Guilford, 1954), or, equivalently, in Torgerson's (1958) terminology, Condition C of the law of comparative judgment. Responses in the comparative judgment section of the MJDQ were converted to a pair comparison response matrix (see page 10). For a specific group of supervisors, a frequency matrix was calculated from the supervisors' pair comparison matrices, showing the number of times each statement was chosen over every other statement by the group. The group frequency matrix was then converted to a proportion matrix indicating the proportion of times each statement was chosen over every other statement. An illustrative proportion matrix is shown in Table 4 for the 40 supervisors of mechanical engineers used in this monograph.

It will be noted that the matrix in Table 4 has 22 rows and 22 columns, while only 21 statements are ranked in the MJDQ. This is because the responses to the absolute judgment section of the MJDQ are included in the last row and column of the frequency and proportion matrices. For example, the first entry in the last column of the proportion matrix in Table 4 indicates that all of the 40 supervisors answered "Yes" to the question of whether the job of mechanical engineers allows them to "make use of their individual abilities." Scaling of the absolute judgment section follows the same procedure as for the pair comparison section, and results in a scale value for the "neutral point."

For purposes of illustration, data for mechanical engineers in Table 4 have been scaled by a least-squares solution (Torgerson, 1958), with the resulting scale values shown in Table 5. In this method, each proportion in the proportion matrix (e.g., Table 4) is changed to its corresponding unit normal deviate (z). The *scale value* for a particular MJDQ statement is the average of all the z's in the column which corresponds to that MJDQ statement. In this classic method of comparative judgment scaling, the scale values

Table 4

Proportion matrix for Mechanical Engineers
(N = 40)

Scale	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1		.25	.05	.20	.13	.07	.10	.15	.35	.05	.22	.10	.35	.25	.13	.05	.10	.07	.13	.17	.35	.00
2	.75		.20	.32	.20	.27	.15	.22	.47	.20	.20	.13	.45	.30	.25	.02	.22	.15	.32	.13	.55	.07
3	.95	.80		.70	.42	.50	.55	.47	.80	.35	.52	.63	.82	.63	.50	.22	.50	.50	.63	.65	.77	.38
4	.80	.67	.30		.38	.27	.35	.35	.67	.25	.30	.47	.57	.45	.35	.15	.15	.15	.50	.32	.67	.15
5	.88	.80	.57	.63		.38	.55	.55	.75	.27	.42	.63	.85	.60	.35	.25	.40	.55	.63	.50	.80	.10
6	.92	.72	.50	.72	.63		.52	.72	.85	.35	.50	.77	.77	.63	.52	.30	.38	.38	.70	.57	.85	.20
7	.90	.85	.45	.65	.45	.47		.38	.90	.38	.45	.57	.90	.55	.40	.22	.47	.42	.57	.63	.82	.22
8	.85	.77	.52	.65	.45	.27	.63		.77	.17	.60	.77	.90	.72	.42	.25	.52	.45	.60	.57	.82	.07
9	.65	.52	.20	.32	.25	.15	.10	.22		.07	.22	.22	.50	.27	.27	.13	.20	.10	.15	.27	.42	.02
10	.95	.80	.65	.75	.72	.65	.63	.82	.92		.60	.80	.90	.65	.60	.40	.57	.65	.70	.67	.90	.65
11	.77	.80	.47	.70	.57	.50	.55	.40	.77	.40		.65	.75	.65	.38	.30	.52	.42	.55	.55	.72	.07
12	.90	.88	.38	.52	.38	.22	.42	.22	.77	.20	.35		.60	.40	.35	.20	.27	.17	.38	.25	.60	.17
13	.65	.55	.17	.42	.15	.22	.10	.10	.50	.10	.25	.40		.27	.20	.05	.22	.20	.27	.22	.35	.22
14	.75	.70	.38	.55	.40	.38	.45	.27	.72	.35	.35	.60	.72		.27	.13	.40	.30	.50	.45	.72	.05
15	.88	.75	.50	.65	.65	.47	.60	.57	.72	.40	.63	.65	.80	.72		.32	.50	.47	.67	.72	.77	.35
16	.95	.97	.77	.85	.75	.70	.77	.75	.88	.60	.70	.80	.95	.88	.67		.77	.77	.80	.82	.90	.57
17	.90	.77	.50	.85	.60	.63	.52	.47	.80	.42	.47	.72	.77	.60	.50	.22		.30	.60	.65	.82	.17
18	.92	.85	.50	.85	.45	.63	.57	.55	.90	.35	.57	.82	.80	.70	.52	.22	.70		.70	.72	.85	.38
19	.88	.67	.38	.50	.38	.30	.42	.40	.85	.30	.45	.63	.72	.50	.32	.20	.40	.30		.45	.67	.40
20	.82	.88	.35	.67	.50	.42	.38	.42	.72	.32	.45	.75	.77	.55	.27	.17	.35	.27	.55		.65	.13
21	.65	.45	.22	.32	.20	.15	.17	.17	.57	.10	.27	.40	.65	.27	.22	.10	.17	.15	.32	.35		.13
22	1.00	.92	.63	.85	.90	.80	.77	.92	.97	.35	.92	.82	.77	.95	.65	.42	.82	.63	.60	.88	.88	

Note. — Matrix elements show the proportion of times the column stimulus was chosen over the row stimulus.

Table 5

Comparison of MJDQ scale values obtained by normal deviate transformation and by the estimation method for 40 Mechanical Engineer supervisors

MJDQ Scale	Scale Values		
	Normal Deviate Transformation	Estimates Based on Mean Number of Votes	Estimated Values Adjusted with Respect to Neutral Point
1. Ability utilization	1.06	.95	1.69
2. Achievement	.67	.59	1.34
3. Activity	–.24	–.21	.54
4. Advancement	.28	.25	1.00
5. Authority	–.12	–.11	.64
6. Company policies and practices	–.27	–.23	.51
7. Compensation	–.18	–.13	.61
8. Co-workers	–.16	–.15	.59
9. Creativity	.72	.63	1.38
10. Independence	–.60	–.54	.21
11. Moral values	–.11	–.12	.63
12. Recognition	.22	.21	.96
13. Responsibility	.65	.58	1.33
14. Security	.15	.12	.86
15. Social service	–.29	–.27	.48
16. Social status	–.85	–.77	–.03
17. Supervision-human relations	–.24	–.21	.53
18. Supervision-technical	–.41	–.36	.39
19. Variety	.03	.04	.79
20. Working conditions	.01	.01	.75
21. Autonomy	.58	.53	1.27
22. Neutral Point	–.89	–.74	0.00

are computed from normal deviate transformations in all 22 by 22, or 484, cells of the proportion matrix.

In the present study scale values have been obtained by a method which approximates the least-squares scale values described above. This approximation is similar to the method proposed by Guilford (1954, p. 169-170), known as the composite-standard method. In Guilford's method, instead of taking each proportion in the full matrix and changing it to a normal deviate, an *estimated scale value* is derived from the *average proportion* in each column of the matrix. Thus, normal deviate transformations are made for only 22 proportions, rather than for 484. Furthermore, the average column proportion can be derived directly from the mean number of votes

for each statement. The scale values estimated from the mean number of votes for each MJDQ statement are presented in Table 5 for the illustrative data on mechanical engineers. Estimation of the scale value for the first statement is described below, to demonstrate the approximation method.

The mean number of votes for the first statement (Ability Utilization) was 17.72 (Table 6). Following the rationale given by Guilford (1954), .50 was added to this value to represent the expected number of times the statement would have been ranked over itself, had such a comparison been made. The resulting value of 18.22 was then divided by the total number of possible votes, which was 22 for the MJDQ. The obtained proportion of .828 has a corresponding normal deviate of 0.946, which became the estimated scale value for the first statement. This value of .95 is an estimate of the complete least-squares value of 1.06. Table 5 presents scale values obtained for mechanical engineers by both the least-squares solution and the estimation method using mean number of votes for each statement.

Table 6

Mean and standard deviation of votes for each stimulus for Mechanical Engineers (N = 40)

Scale	Mean	S.D.
1. Ability utilization	17.72	3.29
2. Achievement	15.40	4.44
3. Activity	8.70	5.26
4. Advancement	12.70	5.21
5. Authority	9.55	5.67
6. Company policies and practices	8.47	4.22
7. Compensation	9.32	4.78
8. Co-workers	9.17	4.52
9. Creativity	15.70	4.39
10. Independence	6.00	5.79
11. Moral values	9.47	5.76
12. Recognition	12.35	4.45
13. Responsibility	15.35	4.90
14. Security	11.55	5.08
15. Social service	8.17	6.57
16. Social status	4.35	5.03
17. Supervision-human relations	8.67	3.97
18. Supervision-technical	7.42	4.48
19. Variety	10.87	5.75
20. Working conditions	10.57	5.46
21. Autonomy	14.92	4.22
22. Neutral point	4.52	2.64

It can be seen that the estimation method tends to produce scale values which are somewhat closer to zero than the least-squares values. However, the estimated values are found to be essentially linear transformations of the more rigorously determined least-squares values. A correlation of .99 was obtained between the scale values calculated by the two methods.

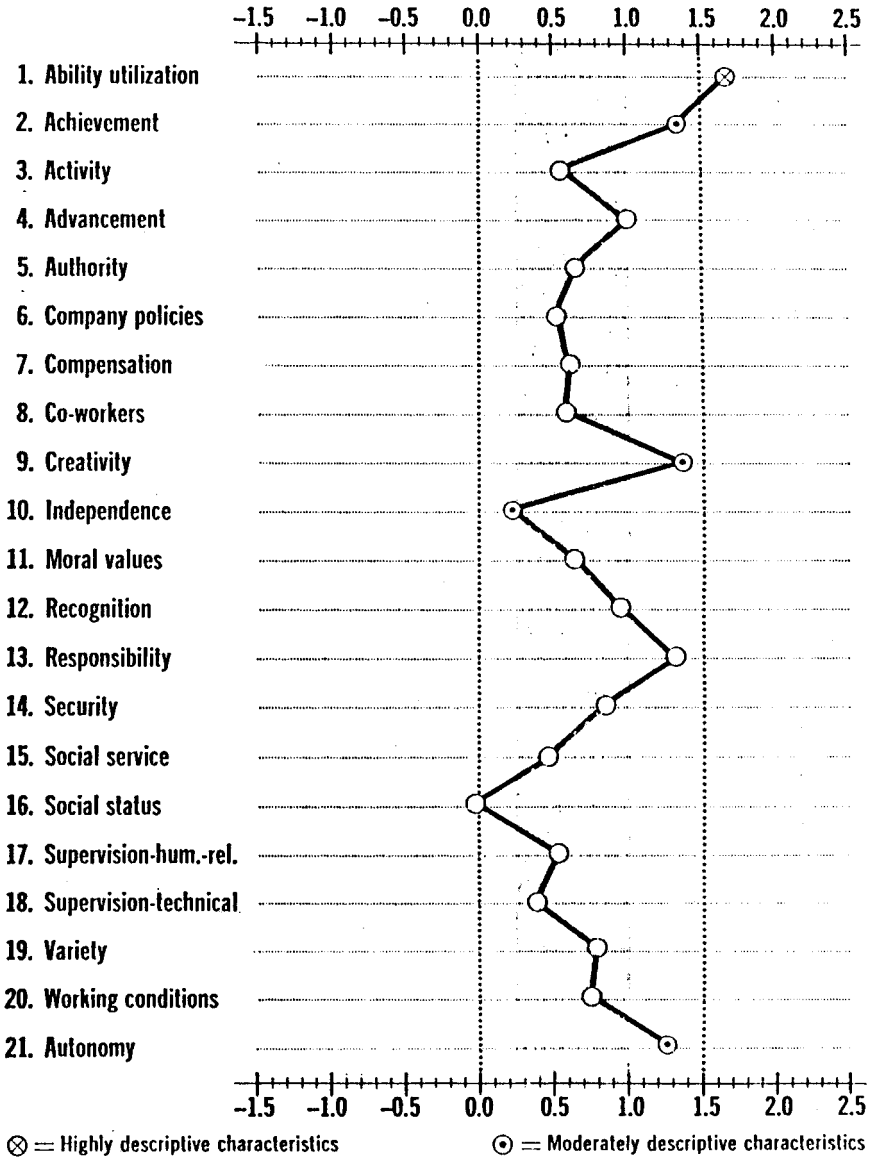
The advantage of the estimation method is not merely that it requires fewer computations. A significant contribution of the method is that it can be used to provide information about the amount of consensus among supervisors with respect to their ratings of MJDQ statements, in addition to the average scale values. This consensus is expressed by a standard error band on either side of the scale value for each MJDQ statement.

As explained above, the estimated scale values are derived directly from the mean number of votes for each statement. The mean number of votes has a standard deviation associated with it, which reflects the agreement among supervisors' rankings for a particular statement. Referring to the illustrative data for mechanical engineers in Table 6 one can see that the first statement received a mean of 17.72 votes, with a standard deviation of 3.29. The standard error for the mean of 17.72 would therefore be 3.29 divided by the square root of 40, where 40 is the total number of supervisors. Thus, the mean, with an error band of plus or minus one standard error, is 17.72 $\pm$ .52. In short, it might be said with some confidence that the "true" mean number of votes for the first statement lies somewhere between 17.20 and 18.24. Moreover, these means can be translated to scale values, using the previously described method for estimation. Such translation allows one to say that the "true" (population) scale value is likely to fall between 0.859 and 1.045, based on the data in the sample of 40. The standard error bands calculated in this fashion are shown in the tables of Summary Statistics which accompany the ORP profiles in Monograph XXIV. The error bands for mechanical engineers are also shown in the Summary Statistics table on page 29 of this volume.

Adjusting Scale Values with Respect to the Neutral Point

The specific measurement units obtained from pair comparison scaling have little intrinsic meaning and the values may be transformed in any linear manner which suits an investigator. In this study the scale values have been adjusted so that the neutral point

Engineer, Mechanical
(N = 40 Supervisors)



Engineer, Mechanical

(N = 40 Supervisors)

O.A.P. = 1 1965 D.O.T. = 007.081

Descriptive Characteristics

Make use of their individual abilities

Try out their own ideas

Get a feeling of accomplishment

Plan their work with little supervision

Do not do their work alone

Occupations with Similar ORPs

Engineer, Civil

Engineer, Time Study

Summary Statistics

	Adjusted Value	−1 SE	+1 SE	P	Q	Unadj. Value
1. Ability utilization	1.69	1.60	1.79	0.00	4.45	.95
2. Achievement	1.34	1.24	1.43	.07	3.07	.59
3. Activity	.54	.44	.63	.38	1.06	−.21
4. Advancement	1.00	.90	1.10	.15	2.08	.25
5. Authority	.64	.53	.74	.10	1.21	−.11
6. Company policies	.51	.43	.59	.20	1.15	−.23
7. Compensation	.61	.52	.70	.22	1.29	−.13
8. Co-workers	.59	.51	.67	.07	1.30	−.15
9. Creativity	1.38	1.28	1.48	.02	3.18	.63
10. Independence	.21	.08	.32	.65	.35	−.54
11. Moral values	.63	.52	.73	.07	1.18	−.12
12. Recognition	.96	.88	1.04	.17	2.21	.21
13. Responsibility	1.33	1.23	1.44	.22	2.87	.58
14. Security	.86	.77	.96	.05	1.82	.12
15. Social service	.48	.35	.60	.35	.79	−.27
16. Social status	−.03	−.15	.09	.57	.05	−.77
17. Supervision-hum.-rel.	.53	.46	.61	.17	1.26	−.21
18. Supervision-technical	.39	.30	.47	.38	.81	−.36
19. Variety	.79	.68	.89	.40	1.51	.04
20. Working conditions	.75	.65	.85	.13	1.49	.01
21. Autonomy	1.27	1.19	1.36	.13	3.03	.53
Adjusted neutral point	0.000	−.064	.061			
Unadjusted neutral point	−.744	−.808	−.683			

always falls at zero in the ORPs shown in Monograph XXIV. These new values, which have been called *adjusted scale values,* were obtained for each occupation by subtracting the value of the unadjusted neutral point from the unadjusted scale values for each of the 21 MJDQ scales. This process is illustrated in Table 5 for mechanical engineers. The adjusted values have the advantage of being positive when a given reinforcer is rated as being above the neutral point (i.e., *present* on the job) and negative when the reinforcer is below the neutral point (i.e., *not present* on the job).

Descriptive Characteristics of ORPs

Profiles of Occupational Reinforcer Patterns are shown in Monograph XXIV, Section II, pages 17 to 179 for each of the 81 occupations. The ORP profile for the occupation of mechanical engineer is also reproduced on pages 28-29 of this volume. Opposite the profile for each job is a list of descriptive phrases which summarize the salient characteristics for each profile. These descriptive phrases (which constitute a brief interpretation of the complete profiles) have been prepared for several reasons. First, they help direct attention to the high and low points of each profile, i.e., the characteristics which are rated most emphatically as either present or absent in each occupation. Secondly, the descriptive phrases, by emphasizing only the most prominent features of each profile, should help to emphasize the content and meaning of each of the 21 scales by describing each occupation in the same words as were used in the corresponding MJDQ items.

The same set of rules were used to select the descriptive phrases for all occupations. These rules were established to meet the following criteria:

1) Scales to be emphasized must be of a specified absolute level;

2) There must be consensus among the supervisors about the presence or absence of the reinforcer in the occupation.

The descriptive phrases have been classified as either highly descriptive or moderately descriptive. Within each of these levels a reinforcer may be either present (if the scale value is positive and high) or not present (if the scale value is low positive or negative). The set of rules which have been followed in developing the descriptive characteristics are shown in Table 7. These rules select descriptive

phrases jointly on the basis of the level (either positive or negative) of their corresponding scale values and the level of agreement among supervisors in both the comparative judgment and categorical judgment sections of the MJDQ. For example, a descriptive phrase was highly descriptive of an occupation only if three conditions were met: first, the adjusted scale value of the scale involved was equal to or greater than 1.5; second, on the categorical judgment section of the MJDQ, at least 90 percent of the supervisors agreed that the statement described the job; and third, the estimated overlap between the number of votes for the statement and the number of votes for the neutral point was less than or equal to 15%.

Table 7

Rules used for selecting ORP descriptive characteristics

	Adjusted scale value	Proportion agreeing present	Overlap with neutral point
Highly descriptive characteristic, present	≥ 1.5	$> .90$	$\leq 15\%$
Moderately descriptive characteristic, present	≥ 1.0	$> .80$	$\leq 30\%$
Moderately descriptive characteristic, not present	$\leq .25$	$< .40$	. . .
Highly descriptive characteristic, not present	$\leq .0$	$< .20$	$\leq 45\%$

Several considerations should guide the interpretation and use of the descriptive phrases which accompany the profiles. Most importantly, it must be understood that the utility of classifying the salient points of the profiles of occupational reinforcers has not been demonstrated at this time. The rules for generating the descriptive phrases have been developed rationally, and somewhat arbitrarily. The selection rules which will maximize the utility of such descriptive phrases will have to be established by additional research. For now, they seem to provide a reasonable and convenient method for describing the differential ORPs.

Data Collection

Selection of Occupations

The major objectives of this study were to test the Minnesota Job Description Questionnaire (MJDQ) as an instrument for developing Occupational Reinforcer Patterns (ORPs) and to obtain ORP data of practical utility for vocational counseling. These objectives were used as guidelines in deciding which occupations to study. A sample of 100 occupations was selected to allow a degree of coverage not possible in a smaller sample, thereby making possible a stringent test of the MJDQ. A much larger sample would have demanded more manpower, time, and financial resources than were available.

To insure breadth of coverage and availability of sufficient numbers of supervisors to rate the job, reference was made to the Twin Cities Skill Survey (Minnesota Department of Employment Security, 1966). Occupations were selected from a subsample of those jobs employing more than 500 persons in the Minneapolis-St. Paul Metropolitan area. Occupations were also selected to represent as many as possible of the U.S. Employment Service's thirty-six Occupational Aptitude Patterns (OAP; U.S. Department of Labor, 1966). Eighty-four occupations were selected, representing twenty-seven OAPs.

Sixteen occupations were added from a number of skill-educational levels to provide wider representation of the first-digit code groups of the Dictionary of Occupational Titles (DOT; United States Department of Labor, 1965).

Subsequently, twenty-five occupations were added. Twenty-two of these occupations resulted from extending the eleven office jobs by type of employer — civil service, manufacturer, or retailer. Data on the remaining three occupations became available during the course of other Work Adjustment Project research. A complete listing of all occupations comprising the target sample in this study, their frequency in the Twin Cities as reported by the Twin Cities Skill Survey, and their OAP and DOT codes appears in Appendix B. ORP data have not been obtained for all of the 125 occupations listed in Appendix B. Nine occupations were dropped from the study for various reasons, e.g., too few supervisors available, high similarity with other jobs, and obsolete job titles. In addition, 35 of the occupations have not been included in this study because fewer

than 20 MJDQs had been received for each occupation at the time this monograph was prepared. Consequently, the present monograph, as well as Monograph XXIV, reports ORP data for the 81 occupations which are listed in Appendix C.

Selection of Supervisors

A number of sources were utilized in locating supervisors. These included labor unions, professional organizations, and state regulatory agencies.[1] Most of the names were obtained by mail from employers listed in the Yellow Pages of the telephone books of Albert Lea, Alexandria, Austin, Duluth, Hibbing, Mankato, Minneapolis-St. Paul, Rochester, and St. Cloud, Minnesota, and, in a few cases, Milwaukee, Wisconsin.

The following procedure was used in contacting employers. A letter explaining the nature of the project and of the request, a "Name Form," and a self-addressed return envelope were sent to the employer. Both the cover letter and "Name Form" specified the job title for which names of supervisors were being requested. If no reply was received within a week, a follow-up postcard was mailed. Two weeks after the original letter was sent, a second letter which reiterated the request for names was mailed along with a "Name Form" and return envelope. A final postcard follow-up was mailed one week later if no response had yet been received. Cooperation with the research was strictly voluntary. Correspondence was terminated upon receipt of any communication from an employer stating that he did not wish to cooperate.

In most cases, an employer was asked to supply the names of supervisors of only one job. In no case was an employer asked to supply names for more than three jobs.

Completion of MJDQs by Supervisors

Upon receipt of the name and address of a supervisor, the supervisor was contacted by mail. Each supervisor was sent a letter explaining the nature of the research and requesting that he complete the enclosed MJDQ. The name of the occupation he was asked to rate appeared in the cover letter and on both the front cover and

[1] Sources of supervisors' names for each occupation are shown in the first column of the table in Appendix D.

demographic data page (back cover) of the MJDQ. If no response was received, a follow-up postcard, a second letter and MJDQ, and a second postcard were mailed at one week intervals. As in the case of employers, participation in the research was strictly voluntary. In no case was any supervisor asked to complete an MJDQ for more than one job.

A total of 4,850 MJDQs were mailed to supervisors of the 81 occupations in this study; 3,704 (76.4%) were returned; 2,976 (61.4%) of the MJDQs were usable in this study. The percentage of returned MJDQs ranged from 100.0% for photoengraver (stripper) to 50.7% for bartender. The percentage of usable MJDQs ranged from 97.0% for occupational therapists to 24.9% for statisticians.[2] A detailed summary of MJDQs mailed and returned by occupation appears in Appendix C. Appendix D summarizes the demographic characteristics of the supervisors of each job.

[2] For the statisticians group, no prior information was available to indicate which individuals were supervisors. The majority of non-completions for this group were due to the fact that the individuals contacted were not supervisors of other statisticians.

Reliability and Validity of ORPs

In the present study of ORPs, the concepts of reliability and validity used are somewhat different from those used in conventional psychological research. This is primarily because the unit, or object, being measured is not an individual person but a job environment. The MJDQ is designed as an instrument for measuring the environments of single occupations through the combined evaluations of a group of individuals. Consequently, it is the final profile for each occupation, representing the consensus of raters for that occupation, that is the object of scrutiny.

Reliability of Occupational Reinforcer Patterns

The aspect of reliability which is important in the present study is the precision of the measurement of reinforcer patterns for each occupation. One way to increase the precision of measurement, in conventional psychometric practice, is to increase the number of items measuring a particular domain. Analogously, the precision of measurement of ORPs should be positively related to the number of supervisors rating each job. The more supervisors used, the more accurate should be the estimates. The practical question, however, is how large a sample is necessary to attain the desired precision. Assuming equivalent sampling conditions, the pragmatic question is whether the ratings of a sample of, say, 20 high school principals will yield a pattern of occupational reinforcers for high school teachers which is essentially equivalent to the ORP obtained from the ratings of 40, or 100, high school principals.

An attempt was made to base each ORP on the ratings of at least 30 supervisors, although in a few cases results are based on as few as 22. A sample of 20 was thought to be the minimal sample which could be used to achieve a stable ORP profile. These may seem to be small samples for studying occupational differences. For example, samples of at least 200 have usually been required to establish empirical scales for the measurement of occupational interests. There is, however, an important difference in the two methodologies: in the development of an empirical scale for an interest inventory, the differences in item responses between the occupational group and a reference group are used to develop a uniquely weighted scoring key. A large sample is necessary to insure stability of the group responses at the *item* level. In the measurement of

ORPs an *a priori* scoring system has been used to score every supervisor's MJDQ in the same way; in no way does the item weighting system depend on the differential item responses of supervisors across jobs.

After the data had been collected, a reliability study was conducted to determine if the samples used were large enough to yield reliable ORPs. Respondents for each of the 81 occupations were randomly divided into halves, and ORPs were determined separately for each of these split-half groups. For example, complete responses were obtained from 32 high school principals (i.e., supervisors of high school teachers). This group was divided into random halves of 16 each, and ORPs were developed for each of these two subgroups of high school principals. The product moment correlation between the two ORPs thus developed was .96. For purposes of illustration, the split-half ORP profiles for the occupations of high school teacher and plumber are compared graphically in Figures 2 and 3 respectively, with the ORPs obtained from the split-half groups superimposed on one another.

The sample sizes in the split-half groups ranged from 11 to 48, and the product moment correlations between same-occupation ORPs ranged from .78 to .98 with a median of .91. It might be argued that these high profile correlations were merely an artifact of the tendency for supervisors in all occupations to respond in the same way, and that correlations between profiles for different occupations would be equally high. However, as shown in Figure 4, the frequency distributions of product moment correlations between profiles for same-occupations and for different-occupations are clearly separate and barely overlap. The median correlation between profiles from different occupations was .55, in contrast to a median reliability correlation of .91 between profiles for the same occupation.

In general, the results in Figure 4 provide strong support for the adequacy of the relatively small samples of supervisors used in this study. Because of the high consensus of supervisors within jobs, and also because supervisors with responses likely to be random were eliminated, the split-half groups showed high consistency. Each of these indices of consistency is a conservative underestimate, since they are "uncorrected" for full sample size.

These reliability data also suggest that no universal sample size can be established which will be best for all occupations. There apparently are differences across occupations in the consistency

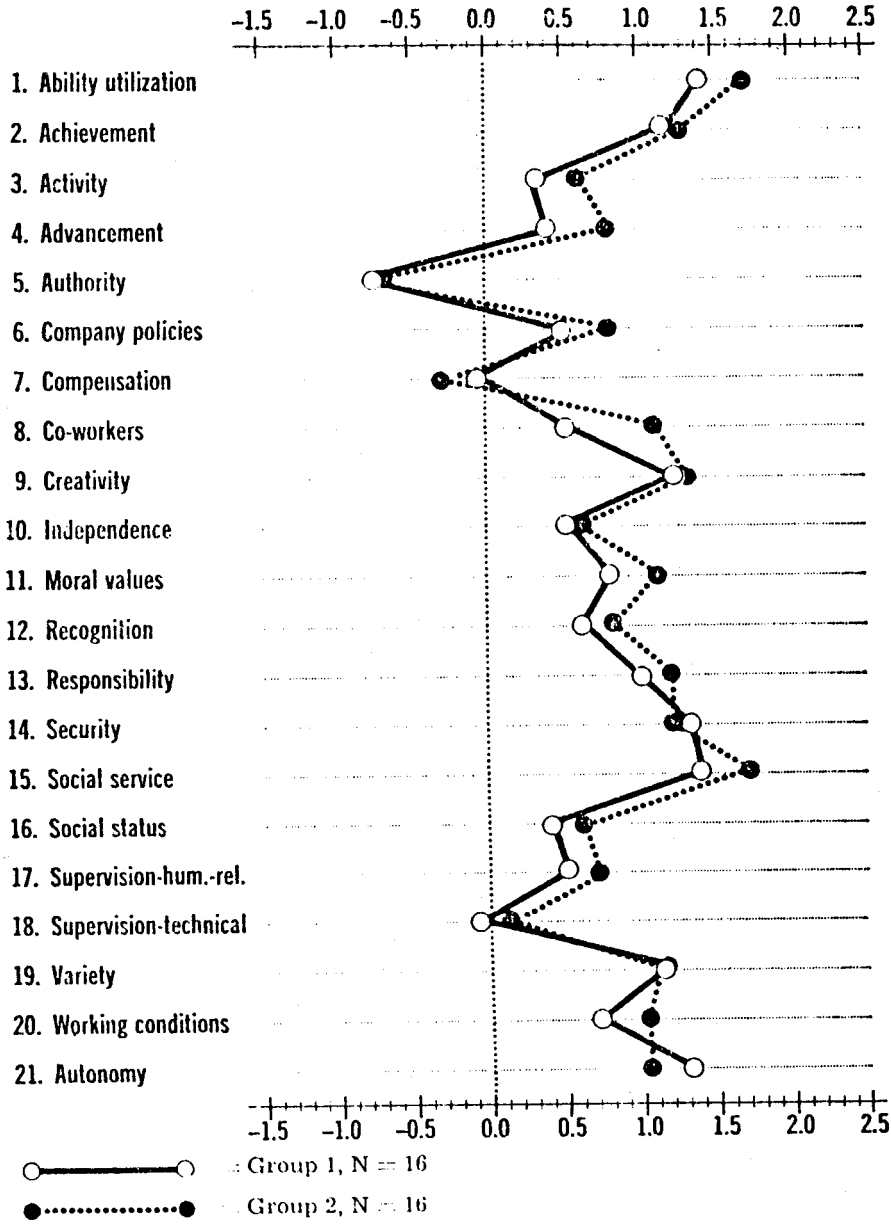


Fig. 2. Split-group ORPs for High School Teachers (r = .96).

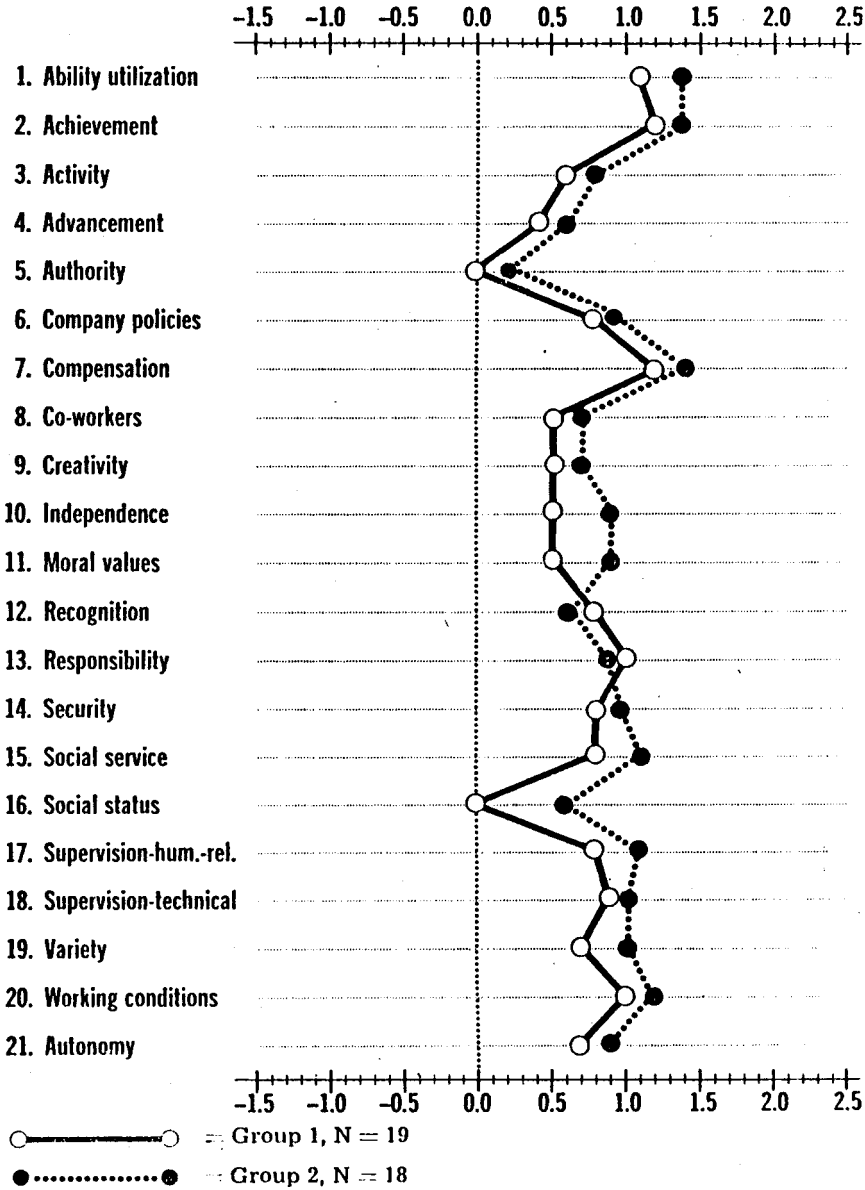


Fig. 3. Split-group ORPs for Plumbers (r = .89).

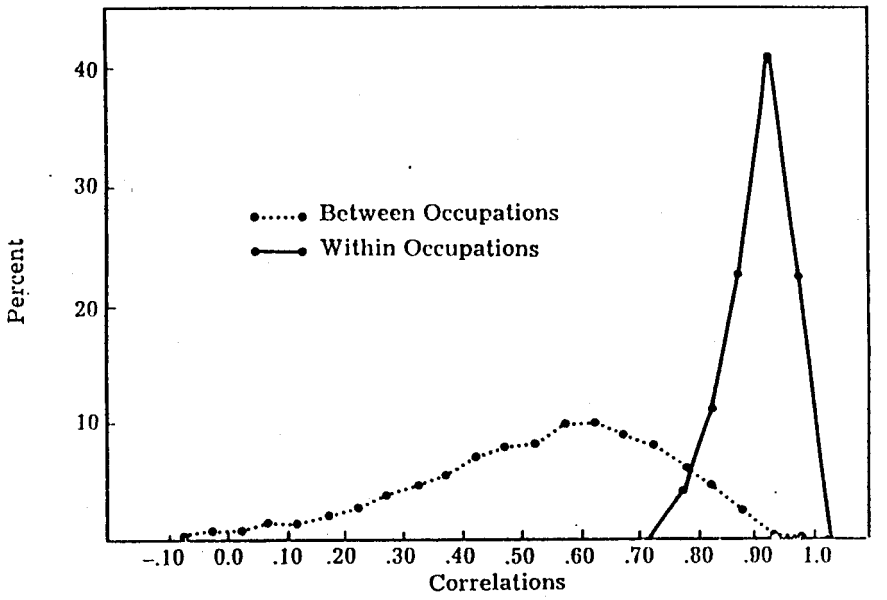


Fig. 4. Distributions of product moment correlations between different occupations and within occupations (reliabilities).

with which supervisors can perceive and/or rate occupational reinforcers. Consequently, for some occupations, a sample of 15 supervisors can provide reliable mean rankings on the 21 dimensions of the MJDQ, while for other occupations, a sample of 50 supervisors may be necessary for minimal reliability.

Validity of Occupational Reinforcer Patterns

The initial validity of the Occupational Reinforcer Patterns reported in Monograph XXIV was established by their concurrent validity, that is, by demonstrating that different ORPs were obtained for different occupations. The *Theory of Work Adjustment* states that occupations can be characterized by different sets of reinforcers and that consequently, differential prediction of employment satisfaction can be made on the basis of the differential sets of reinforcers in an occupation. If at least this type of evidence for the validity of these ORPs cannot be demonstrated, they will find little use in vocational counseling.

There are two basic levels at which the validity of the ORPs can be investigated. First, one may examine each of the 21 scales of the MJDQ individually to see how scale scores separate the 81 occupations. (A *scale score* is the number of votes given by each supervisor for each MJDQ scale.) Secondly, one may examine the extent to which patterns of scale values on the MJDQ can be used to differentiate *groups* of occupations.

Occupational Differences in Mean Scale Scores. At the single scale level, validity was demonstrated by the extent to which each scale of the MJDQ could be used to differentiate occupations. For each scale, were the differences *between* supervisors from different occupations greater than the differences among supervisors *within* the same occupations? This was studied as a one-way analysis of variance problem, with scale score as the dependent variable, and occupation being rated as the independent variable. These mean scale scores for each of the occupations and for each of the 21 MJDQ scales are in Section III of Monogragh XXIV (Tables 2 through 22). Mean scale scores for the neutral point are in Appendix E of the present volume. The F-tests for each of these 22 analyses are summarized in Table 8. It will be seen that they are all highly statistically significant ($p < .00001$), strongly supporting the conclusion that for each scale the 81 occupations were seen as having different amounts of relative reinforcement. In other words, the F-tests indicate that it is very unlikely that the differences across occupations on each scale of the ORPs were due to random differences.

Merely to establish that mean differences in responses to the MJDQ were related to the occupation being rated was not sufficient. Further questions needed exploring. First, how *strong* was the association between the rating given to the MJDQ reinforcer dimension and the occupation being rated? Did it have any practical relevance? Following Hays (1963, pp. 381-384), a measure of strength of association, omega-squared, was calculated for each of the analyses of variance summarized in Table 8. The index, omega-squared, can be interpreted as the proportion of variance in the supervisors' responses to the MJDQ which is related to variance in the occupations being rated. Values of omega-squared for the 21 MJDQ scales and the neutral point are shown in Table 8. Although all scales showed significant mean differences across occupations, the use of omega-squared demonstrated that the scales differed greatly in the *extent*

Table 8

One-way analysis of variance results comparing means for 81 occupations for each of the MJDQ scales

Scale	Total Group Mean	Total Group S.D.	F[1]	Omega-squared
1. Ability utilization	14.42	4.83	14.6	.27
2. Achievement	14.28	4.34	7.1	.14
3. Activity	11.12	6.06	8.7	.17
4. Advancement	10.02	5.83	9.5	.19
5. Authority	3.56	4.08	10.9	.21
6. Company policies and practices	11.27	5.02	8.2	.16
7. Compensation	9.87	5.94	17.6	.31
8. Co-workers	11.32	4.81	7.6	.15
9. Creativity	10.09	5.56	23.2	.37
10. Independence	9.00	6.13	7.6	.15
11. Moral values	10.68	6.33	3.8	.07
12. Recognition	11.90	4.75	3.9	.07
13. Responsibility	10.80	5.63	15.3	.28
14. Security	14.99	5.39	12.4	.23
15. Social service	12.78	6.34	22.4	.37
16. Social status	5.29	4.77	6.2	.12
17. Supervision-human relations	10.61	4.60	4.7	.09
18. Supervision-technical	10.22	4.92	9.7	.19
19. Variety	10.00	5.58	7.7	.15
20. Working conditions	12.96	5.00	7.4	.15
21. Autonomy	10.67	5.65	8.4	.17
22. Neutral Point	5.09	2.56	6.9	.14

Note. — All F's are highly significant ($p < .00001$).

[1] Value of the F-statistic with 80 and 2,895 degrees of freedom.

to which they separated occupations. (It should be recalled that the square of a correlation coefficient can be interpreted as the proportion of "variance accounted for." Thus, in one sense, an omega-squared value of .37 is comparable to a correlation coefficient of .61.)

For five of the MJDQ scales, the omega-squared values were greater than .25, indicating that knowledge of occupation allowed more than 25 percent reduction of the variance in responses to these MJDQ scales. The Creativity and Social Service scales emerged as the best single scales for separating these 81 occupations, each with omega-squared values of .37. Compensation had an omega-squared value of .31, followed by Responsibility with .28 and Ability Utilization with .27. The poorest scales for separating occupations were Moral Values, Recognition, and Supervision-

Human Relations, with omega-squared values of .07, .07, and .09 respectively.

After examining the strength of association between response to the MJDQ and occupation, the next question was to ascertain *how* the MJDQ responses were associated with occupational membership. In other words, what were the occupations which ranked high and low on each MJDQ reinforcement dimension, and were these rankings meaningful? This information is also presented in Tables 2 through 22 (Section III) of Monograph XXIV, and Appendix E in this volume, where for each scale, occupations have been ranked on the scale values given to each MJDQ reinforcer statement. The mean and standard deviation are shown for each occupation, and in addition, an index is included to show the number of standard deviation units the mean for each occupation departs from the grand mean for all 81 occupations. In nearly all cases this index is a conservative estimate of the separation between any two extreme occupations on a scale, since the standard deviation used in this calculation was derived from the combined group of all supervisors, and this value was in most cases greater than the standard deviation within a specific occupation. The index is equivalent to a standard score conversion of means for each of the occupations with respect to the grand mean and standard deviation for all the occupations.

Much information can be extracted from Tables 2-22 of Monograph XXIV and Appendix E in this volume. Some suggestions can be made to guide the interested reader. First, and foremost, a distinction must be made between the absolute and normative interpretations of these results. This distinction is readily illustrated by Table 9, which shows the rankings obtained on the Authority scale.

The combined mean for all jobs on the Authority scale is 3.56, a very low value when one considers that the average number of votes for all 21 statements on the MJDQ is 10.5. This low mean implies that, in general, the statement "Tell other workers what to do" was not considered very descriptive of the job environments when ranked with respect to the other 20 statements of the MJDQ. This is also shown by the scale value (adjusted) of –.24 for the total group. After occupations were ranked by the adjusted scale values on the Authority scale, the occupations highest on Authority were found to be dietitian, registered nurse, mechanical engineer, civil engineer, claim examiner, and physical therapist. This ranking does

Table 9

Occupations listed according to reinforcement scale value for Authority

Occupation	Scale Value	Raw Score Mean	Raw Score S.D.	S.D. Units
High				
None				
Moderate				
None				
Neutral				
Dietitian	.93	11.61	5.40	1.97
Nurse, Professional	.73	9.94	5.84	1.56
Engineer, Mechanical	.64	9.55	5.67	1.47
Engineer, Civil	.58	8.27	6.30	1.15
Claim Examiner	.47	7.09	5.74	.87
Physical Therapist	.33	6.46	4.43	.71
Engineer, Time-Study	.31	6.17	6.17	.64
Librarian	.28	5.73	5.89	.53
Low				
Pharmacist	.22	5.36	4.29	.44
Statistician, Applied	.19	5.91	4.41	.58
Occupational Therapist	.17	5.19	3.81	.40
Cook (Hotel-Restaurant)	.15	6.13	3.96	.63
Accountant, Cost	.14	5.97	4.32	.59
Plumber	.07	5.03	4.30	.36
Instructor, Vocational School	.02	3.34	4.28	−.05
Bartender	.01	5.96	5.04	.59
Absent				
Carpenter	−.01	5.15	3.92	.39
Production Helper (Food)	−.05	5.59	4.99	.50
Sheet Metal Worker	−.08	4.34	5.04	.19
Accounting Clerk, Civil Service	−.10	4.44	4.84	.22
Salesperson, General (Dept. Store)	−.10	4.11	4.16	.14
Writer, Technical Publications	−.14	3.32	3.05	−.06
Electrical Technician	−.14	3.00	2.99	−.14
Office-Machine Serviceman	−.15	2.64	3.85	−.22
Machinist	−.15	4.00	3.65	.11
Radiologic Technologist	−.18	4.51	4.43	.23
Pipefitter	−.19	4.50	4.11	.23
Heavy Equipment Operator	−.20	4.93	3.97	.34
Screw-Machine Operator, Production	−.21	3.30	2.95	−.06
Landscape Gardener	−.21	5.73	3.77	.53
Baker	−.21	4.70	4.99	.28
Welder, Combination	−.22	3.68	3.72	.03
— Scale Value for all jobs combined —	−.24	3.56	4.08	0.00
Assembler, Small Parts	−.24	3.97	3.83	.10
Maintenance Man, Factory or Mill	−.24	3.19	4.10	−.09
Electronics Mechanic	−.26	3.31	3.93	−.06

Note. — This table, which is presented for illustrative purposes, duplicates a portion of Table 6 in Monograph XXIV of this series.

not seem to make much sense, since these are not occupations which are generally thought to reflect much authority. The explanation is that the rankings represent only authority in relation to the occupations in this study. In absolute terms, none of these jobs were rated as being "high" on Authority, as is evidenced by the low adjusted scale values for these occupations. In Section II of Monograph XXIV, where descriptive characteristics are listed for each occupation, no occupation was characterized as having "high" authority. For example, cooks received a mean scale score of 6.13, clearly indicating that authority is not a prominent feature of the occupation of cook. Yet, in normative terms, the results might be interpreted as implying that cooks are more likely to "tell other workers what to do" than would salesmen-drivers, who received an average scale score of only .61 on Authority.

A few of the MJDQ dimensions, like the Authority scale, have average group values which differ widely from 10.5. These dimensions are:

Scale	Mean for all jobs
Ability Utilization	14.4
Achievement	14.3
Authority	3.6
Security	15.0
Social Status	5.3

On these scales, particularly, the data in Tables 2 through 22 in Monograph XXIV have to be interpreted carefully. Because of the general trend for the scale means to be either high or low, the rankings of occupations on these scales will have different implications when considered either normatively or absolutely. An occupation which provides high reinforcement for Authority and Social Status relative to other occupations may, in fact, actually provide little reinforcement on an absolute level. Or conversely, an occupation providing lower relative reinforcement for Ability Utilization, Achievement, and Security, may in an absolute sense provide a substantial amount of reinforcement for these needs.

On the remaining 16 dimensions of the ORPs, the grand means for all occupations tend to be about 10.5. Interpretation of mean scale scores for these dimensions either normatively or in terms of absolute level will generally lead to the same conclusions.

The reader is encouraged to study Tables 2 through 22 in Monograph XXIV (and Appendix E in this volume) to see if the scales

separate occupations in meaningful ways. He is also encouraged to consider the results in terms of the *actual* item content making up the scales. Thus, for example, when he examines occupations ranked on the basis of Authority, he should remember that these occupations are ranked on the basis of the extent to which workers "tell other *workers* what to do."

The rankings of occupations obtained in this study suggest that supervisors have responded very specifically, and meaningfully, to the MJDQ item content. The authors find that these results provide some support for the validity of the ORPs for these 81 jobs.

Cluster Analysis of ORPs. One of the purposes for studying the differential reinforcement characteristics of jobs is to contribute to the development of an empirical taxonomy of occupations. Such a taxonomy should reflect the different ability requirements of occupations and — the immediate interest of this monograph — the differential reinforcer conditions which occupations have to offer workers. Some initial taxonomies have been proposed, e.g., the work of Roe (1956), Holland (1966), and the Department of Labor (United States Department of Labor, 1956; United States Department of Labor, 1965). These approaches provide useful structures, but all will undoubtedly need modification as research findings accumulate.

One aspect of the present study is relevant to the issue of taxonomy of occupations. A cluster analysis was performed to determine if families of occupations could be differentiated empirically so that occupations within a given family would have similar reinforcer characteristics, and also have characteristics different from occupations outside the family. This required taking the 81 ORPs in Monograph XXIV and sorting them into several groups so that similar profiles would be found within each group. Statistically, this was approached as a cluster analysis problem, which required determining a similarity index for each profile with every other, and then grouping the profiles so that the average intra-cluster similarity index would be greater than the average extra-cluster similarity index.

Product moment correlations were calculated between the ORPs for each pair of the 81 occupations. Although this measure of profile relationship accounts only for pattern and not level, this was not a problem since these data were partially ipsative and therefore near-

ly completely equated for level. The 81 by 81 matrix of pairwise profile correlations (See Table 1, pages 201-203 in Monograph XXIV) was analyzed using an adaptation of Tryon's (1939) method of cluster analysis. A peculiarity of this matrix was that the average profile correlation was .55, due to the trend for certain reinforcers to be ranked either high or low for all occupations. An earlier attempt using Tryon's original method resulted in two large nondescript clusters and two small meaningful clusters. By using a more stringent criterion for clustering, the large general clusters were broken up into smaller clusters, but then the two small clusters were lost. Consequently, a stepwise cluster analysis was performed, with the most meaningful clusters being removed from the matrix, and succeeding analyses performed on the remaining ORPs. Thus, Stage I of the cluster analysis identified two clusters, each with ORPs for nine occupations (Service Occupations, Social-Educational; and Manual Occupations, Manufacturing). These eighteen ORPs were removed from the matrix, and Stage II of the cluster analysis used the matrix for the remaining 63 ORPs. The Stage II analysis identified five clusters: Technical Occupations, Professional; Technical Occupations, Semi-Professional; Sales Occupations, Service; Service Occupations, Personal; and Manual Occupations, Building Trades. These clusters contained ORPs for three, four, three, seven, and five occupations respectively. All of these ORPs were removed from the matrix, and the final stage of cluster analysis involved 41 ORPs. This final stage identified two clusters: Service Occupations, Business Detail, consisting of ORPs for five occupations; and Manual Occupations, Service-Maintenance, consisting of ORPs for fourteen occupations.

Thus, of the original 81 ORPs, 59 were assigned to nine clusters or families of occupational reinforcer patterns. Twenty-two ORPs did not fit clearly into any cluster. These were treated together in later data analyses as "nonclustered ORPs." Average ORP profiles for the nine clusters, and associated descriptive phrases and summary statistics for each cluster, are shown in Monograph XXIV, pages 182-199.

How meaningful are the occupational families identified on the basis of similarity of ORPs? First of all, it must be recognized that identification of these families represents only a first exploratory step — the dimensions of the MJDQ certainly do not represent all

the potential reinforcer differences among occupational environments; the sample of 81 occupations does not represent the entire range of occupational diversity; the clustering method is a relatively imprecise one; and finally, the results represent occupational differences as perceived by immediate supervisors only. With all these limits on generalization, the results of the cluster analysis can still be informative.

The nine clusters form an occupational hierarchy. Thus, the first two clusters contain ORPs for technical professional and technical semi-professional occupations. The third cluster, which contains ORPs for occupations involving both sales and service, is followed by three different clusters of ORPs for service occupations. The final three clusters contain ORPs for different manual occupations. The authors recognize that the naming and hierarchial arrangement of these clusters reflect a substantial element of subjectivity; other investigators might easily have chosen to label these clusters differently. However, it is believed that the clusters which emerged are generally meaningful and that the assignment of names to clusters will enhance the utility of the cluster profiles. It is expected that future research, using additional occupations and additional dimensions of reinforcement, will increase the comprehensiveness and precision of these ORP clusters.

The method used here for grouping ORPs by cluster analysis can be expected to group together occupations with similar profiles. However, further analysis is necessary to be able to characterize meaningfully the profiles associated with each cluster. To help describe the clusters, the mean ORP was calculated for each cluster. Mean scale scores for each cluster are shown in Table 10. For each of the 21 scales, a one-way analysis of variance was performed to test whether the ten cluster means were significantly different. The F-statistics summarizing these analysis of variance results are also shown in Table 10. In all cases F's are highly significant ($p < .00001$), indicating that mean scores on each of the MJDQ scales vary with cluster membership.

For each of the analyses of variance an omega-squared value was calculated (Table 10) to estimate the proportion of variance in MJDQ scale scores that is associated with cluster membership. The omega-squared values indicate that the *strength* of association with cluster membership varies for the different scales, even though such

Table 10

Mean number of votes for each scale by supervisors within each cluster

Scale	Total Group		Cluster										F[1]	Omega-Squared
	Mean	S.D.	1	2	3	4	5	6	7	8	9	10		
1. Ability utilization	14.42	4.83	16.52	17.44	16.90	17.46	11.91	12.41	15.18	12.49	16.08	13.03	69.4	.17
2. Achievement	14.28	4.34	14.14	16.38	15.47	15.60	12.54	15.82	15.22	12.70	14.97	13.25	30.1	.08
3. Activity	11.12	6.06	9.28	10.40	6.13	10.97	13.97	10.97	11.86	14.17	11.30	10.23	26.4	.07
4. Advancement	10.02	5.83	13.25	13.52	8.92	8.60	11.87	5.68	9.64	10.53	10.56	10.03	34.5	.09
5. Authority	3.56	4.08	8.06	4.55	1.40	2.69	3.26	3.06	4.46	3.40	2.97	3.80	24.5	.07
6. Company policies	11.27	5.02	9.80	7.58	9.89	9.11	10.63	11.28	12.58	13.86	10.71	12.45	37.9	.10
7. Compensation	9.87	5.94	8.20	10.88	12.81	5.92	7.60	7.69	14.67	12.77	10.32	10.07	55.3	.14
8. Co-workers	11.32	4.81	8.97	8.30	8.76	10.78	13.54	13.84	10.96	12.00	10.17	11.83	34.4	.09
9. Creativity	10.09	5.56	15.16	14.05	14.10	14.92	6.84	7.68	9.14	7.23	11.38	8.48	113.7	.25
10. Independence	9.00	6.13	7.52	8.81	10.96	7.73	10.29	7.87	7.97	8.65	9.81	9.34	7.4	.02
11. Moral values	10.68	6.33	9.84	7.60	11.54	10.45	12.43	13.76	9.78	11.41	9.16	10.80	18.0	.05
12. Recognition	11.90	4.75	12.47	13.21	12.82	10.75	11.69	11.38	12.68	12.81	12.37	11.42	7.7	.02
13. Responsibility	10.81	5.63	14.76	13.50	13.49	14.41	7.84	8.33	10.06	6.78	11.32	10.83	66.6	.17
14. Security	14.99	5.39	11.98	13.16	10.25	12.86	17.06	17.28	10.49	16.67	16.05	15.60	56.4	.14
15. Social service	12.78	6.33	9.42	11.75	14.29	16.74	14.93	17.86	9.38	8.13	9.82	13.51	95.3	.22
16. Social status	5.29	4.77	4.62	4.63	7.54	6.44	4.16	5.26	5.11	4.44	4.45	5.87	10.8	.03
17. Supervision-human relations	10.61	4.60	9.93	9.29	9.08	8.36	10.40	10.34	12.12	12.30	10.55	11.24	20.8	.06
18. Supervision-technical	10.22	4.92	7.96	8.23	8.46	6.35	11.01	10.66	11.38	12.98	10.31	10.98	48.8	.13
19. Variety	10.00	5.58	9.59	8.12	10.95	12.59	9.47	9.34	11.15	8.17	11.33	9.31	20.5	.06
20. Working conditions	12.96	5.00	10.27	11.56	12.21	11.14	12.98	14.53	13.05	15.22	12.76	13.22	20.3	.06
21. Autonomy	10.67	5.65	15.09	13.46	11.30	13.25	10.54	9.62	8.61	8.16	9.90	10.60	32.5	.09
22. Neutral point	5.09	2.56	4.17	4.61	3.72	3.89	6.04	6.33	5.51	6.13	4.70	5.08	32.7	.09

Note. — All F's are highly significant ($p < .00001$).

[1] Value of the F-statistic with 9 and 2,966 degrees of freedom.

association is statistically significant in all cases. Results for this comparison of mean MJDQ scale scores across clusters are similar to those for the comparison across all 81 occupations reported in an earlier section (pages 40-42). In both analyses there was a tendency for the same MJDQ scales to have the highest omega-squared values. However, probably because the clusters were more heterogeneous than individual occupations, the omega-squared values for the cluster comparisons generally tended to be lower.

The Creativity scale was the scale most strongly associated with cluster membership, having an omega-squared value of .25. The clusters with the highest scores on the Creativity scale were clusters 1 and 4, with means of 15.16 and 14.92, respectively. Cluster 5 had the lowest Creativity scores, with a mean of 6.84. Seven other scales had omega-squared values of .10 or greater; these were Social Service, Responsibility, Ability Utilization, Compensation, Security, Supervision-Technical, and Company Policies. It is therefore on these eight scales that differences among clusters may be expected to be most meaningful. Scales having no practical association with cluster membership, i.e., omega-squared values of .05 or less, were Independence, Recognition, Social Status, and Moral Values.

It was also felt desirable to determine which reinforcers were characteristic of each cluster. Table 11 shows the scales on which each cluster differed markedly from the occupations in all other clusters. Scales have been listed as characterizing a cluster when the t-test for mean score difference between individuals in the cluster and individuals in all other occupations was equal to or greater than 6.0 (a difference of 6 standard errors). These results summarize the reinforcer characteristics which are prominent for each cluster of occupations.

One might wish to compare the clusters obtained in this study with the occupational taxonomies which are well known in vocational psychology. However, there is no compelling reason why these clusters must fit any previously established taxonomy of occupations. The results are based on supervisors' perceptions of the reinforcers available in occupations. The dimensions on which occupations have been compared in this study are not equivalent (although they certainly may have some relationship) to the dimensions usually discussed in the literature of vocational psychology.

Some brief comments can be made about the differences and similarities among clusters. (The reader is urged to examine Tables

Table 11

Cluster membership of 59 occupations and scales defining clusters.

Cluster	N[1]	Occupations	Scales with large differences between cluster and all other jobs: High	t[2]	Low	t
1. Technical Occupations, Professional	105	Engineer, Civil Engineer, Mechanical Engineer, Time Study	Creativity Autonomy Responsibility Authority Advancement	12.37 10.17 8.88 7.74 6.55		
2. Technical Occupations, Semi-Professional	162	Accountant, Cost Programmer (Business, Eng., and Sci.) Statistician, Applied Writer, Technical Publications	Ability Utilization Creativity Advancement Autonomy Achievement Responsibility	11.30 10.16 9.94 7.15 6.52 6.32	Company Policies Co-Workers Moral Values Supervision-technical	-10.72 -8.58 -6.45 -6.23
3. Sales Occupations, Service	99	Beauty Operator Salesman, Real Estate Salesman, Securities	Creativity Ability Utilization Responsibility	9.07 7.28 6.15	Activity Security Authority	-10.15 -9.41 -7.67
4. Service Occupations, Social-Educational	318	Caseworker Counselor, School Counselor, Vocational Rehabilitation Instructor, Vocational School Librarian Occupational Therapist Physical Therapist Teacher, Elementary School Teacher, Secondary School	Creativity Ability Utilization Social Service Responsibility Variety Autonomy Achievement	21.49 16.97 14.87 14.76 11.18 9.26 6.08	Supervision-Technical Compensation Supervision-Human Relations Company Policies Security Working Conditions	-18.05 -16.08 -10.61 -9.41 -7.95 -7.13

(continued on next page)

Table 11 (continued)

Cluster	N[1]	Occupations	Scales with large differences between cluster and all other jobs: High	t[2]	Low	t
5. Service Occupations, Business Detail	221	Accounting Clerk, Civil Service Automobile Service Station Attendant Clerk, General Office Civil Service Stenographer, Technical, Civil Service Typist, Civil Service	Activity	7.86	Creativity	-11.35
			Security	7.48	Responsibility	-9.16
			Co-Workers	7.38	Ability Utilization	-8.14
					Compensation	-6.73
					Achievement	-6.32
6. Service Occupations, Personal	253	Embalmer Medical Technologist Nurse Aid Nurse, Licensed Practical Orderly Radiologic Technologist Waiter-Waitress	Social Service	20.75	Advancement	-14.04
			Co-Workers	10.60	Creativity	-8.75
			Security	9.53	Responsibility	-7.82
			Moral Values	9.05	Ability Utilization	-7.16
			Achievement	6.32	Compensation	-6.30
			Working Conditions	6.04		
7. Manual Occupations, Building Trades	175	Carpenter Heavy Equipment Operator (Construction) Painter/Paperhanger Pipefitter Plumber	Compensation	13.30	Security	-9.25
					Social Service	-8.30

(continued on next page)

Table 11 (continued)

Cluster	N[1]	Occupations	Scales with large differences between cluster and all other jobs			
			High	t[2]	Low	t
8. Manual Occupations, Manufacturing	277	Accounting Clerk, Manufacturing Assembler (Electrical Equipment) Assembler, Small Parts Baker Marker Meat Cutter Production Helper (Food) Punch-Press Operator Sewing-Machine Operator, Automatic	Supervision-technical Activity Compensation Company Policies Working Conditions Supervision-Human Relation	10.83 9.96 9.62 9.49 8.55 6.72	Responsibility Social Service Creativity Autonomy Ability Utilization Achievement	−14.45 −14.37 −10.41 −8.15 −7.27 −6.61
9. Manual Occupations, Service-Maintenance	478	Automobile-Body Repairman Automobile Mechanic Draftsman, Architectural Electrical Technician Electrician Electronics Mechanic Machinist Maintenance Man Office-Machine Serviceman Photoengraver (Stripper) Screw-Machine Operator Sheet Metal Worker TV Service-and-Repairman Welder, Combination	Ability Utilization Creativity	9.90 6.09	Social Service	−11.86

[1] Total number of MJDQ's (combined across job titles) in the cluster.
[2] Value of the t-statistic with 2,974 degrees of freedom.

10, 11 and 12 to test any specific questions or expectations he may have.)

Cluster 1, which is identified as a cluster of Technical Occupations, Professional, has a reinforcement pattern which is very similar to that of cluster 2, Technical Occupations, Semi-Professional. The notable discrepancy seems to be that greater Authority is associated with Technical Occupations, Professional.

Technical Occupations, Professional share with cluster 4, Service Occupations, Social-Educational, a relatively greater likelihood of reinforcement for Ability Utilization, Creativity, Responsibility, and Autonomy. These two clusters differ most sharply on Social Service, which is distinctly — and reassuringly — higher for Service Occupations, Social-Educational than for Technical Occupations, Professional.

The composition of Sales Occupations, Service, cluster 3, is somewhat surprising. It seems to encompass both sales activity and personal service. Its distinctive reinforcement pattern indicates that workers in the cluster are likely to be able to try out their own ideas (high Creativity) and not likely to be busy all the time (low Activity).

The similarity of cluster 6 (Service Occupations, Personal) and cluster 4 (Service Occupations, Social-Educational) is that both are high on Social Service and low on Compensation. The cluster, Service Occupations, Personal, is much lower on Ability Utilization, Advancement, Creativity, Responsibility, Variety, and Autonomy.

Cluster 5 (Service Occupations, Business Detail) and cluster 6 (Service Occupations, Personal) are similar in that both are high on Social Service and Security, and both are low on Creativity. They differ on Achievement, where cluster 6 is higher, and on the Advancement scale where it is lower. In other words, Service Occupations, Personal are more likely to give a worker a feeling of accomplishment, but less likely to provide opportunities for advancement than Service Occupations, Business Detail.

Clusters 7, 8, and 9 are all Manual Occupations, but have been differentiated as Building Trades, Manufacturing, and Service-Maintenance, respectively. All have low Social Service in common, that is, workers on these jobs are less likely to "do things for other people." Cluster 8, Manual Occupations, Manufacturing, tends to be lower than the other two clusters on the intrinsic reinforcement

dimensions of Ability Utilization, Achievement, Creativity, Responsibility, and Variety.

As a final comment on the clusters, special attention is called to the striking differences between cluster 4, Service Occupations, Social-Educational, and cluster 8, Manual Occupations, Manufacturing. ORP profiles for these two clusters are shown in Figure 5, and comparison of their mean scale scores is shown in Table 12. The profile for Service Occupations, Social-Educational is markedly high on the MJDQ dimensions that measure intrinsic occupational

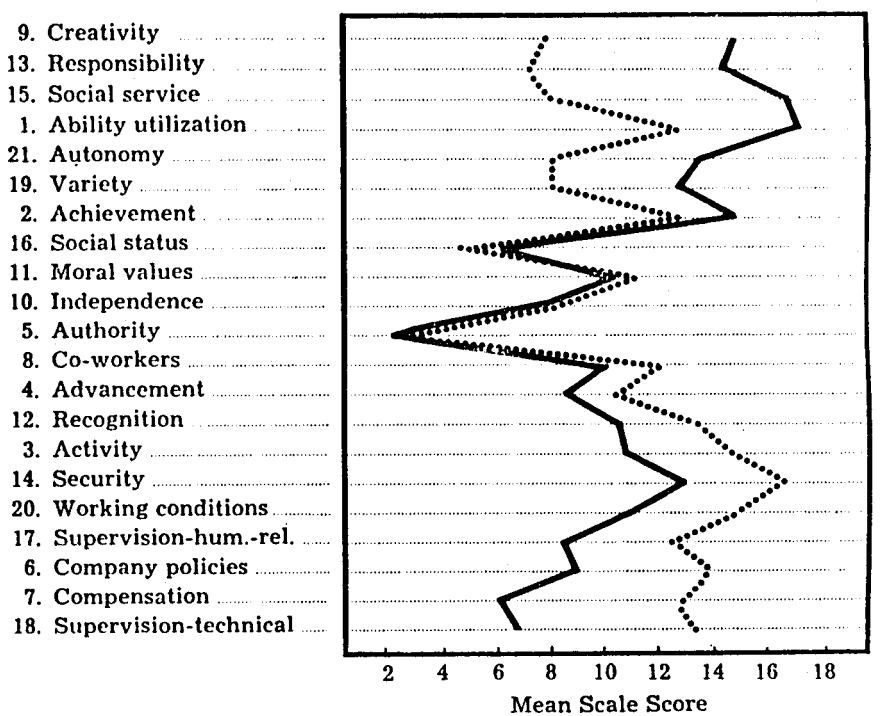


Fig. 5. Comparison of Occupational Reinforcer Patterns for Cluster 4 and Cluster 8

Table 12

Comparison of Occupational Reinforcer Patterns for Cluster 4 and Cluster 8

Scale	Cluster 4 Mean	Cluster 4 S.D.	Cluster 8 Mean	Cluster 8 S.D.	t'	P	Over-lap	Omega-Squared
9. Creativity	14.93	4.08	7.24	4.72	21.12	.001	39%	.43
13. Responsibility	14.41	4.47	6.78	4.80	19.97	.001	42%	.40
15. Social service	16.74	4.84	8.13	5.59	19.92	.001	41%	.40
1. Ability utilization	17.46	3.14	12.49	4.63	15.07	.001	52%	.29
21. Autonomy	13.26	5.21	8.16	5.37	11.70	.001	63%	.19
19. Variety	12.59	4.20	8.17	5.44	10.98	.001	65%	.17
2. Achievement	15.60	4.04	12.70	4.16	8.57	.001	72%	.11
16. Social status	6.44	4.72	4.44	4.24	5.42	.001	83%	.04
11. Moral values	10.45	6.36	11.41	6.12	–1.88	.058	94%	.00
10. Independence	7.73	5.80	8.65	5.66	–1.96	.048	94%	.00
5. Authority	2.69	3.87	3.40	3.76	–2.28	.021	93%	.01
8. Co-workers	10.78	4.01	12.00	4.58	–3.41	.001	89%	.02
4. Advancement	8.60	4.52	10.53	5.67	–4.53	.001	85%	.03
12. Recognition	10.75	4.87	12.81	4.28	–5.50	.001	83%	.05
3. Activity	10.97	5.32	14.17	5.27	–7.36	.001	72%	.08
14. Security	12.86	5.02	16.67	4.86	–9.40	.001	70%	.13
20. Working conditions	11.14	4.81	15.22	4.56	–10.60	.001	67%	.16
17. Supervision-human relations	8.37	3.92	12.30	4.38	–11.49	.001	64%	.18
6. Company policies and practices	9.11	4.25	13.86	4.73	–12.79	.001	60%	.22
7. Compensation	5.92	4.46	12.77	5.19	–17.14	.001	48%	.33
18. Supervision-technical	6.35	3.95	12.98	4.41	–19.22	.001	43%	.39

[1] Value of the t-statistic with 593 degrees of freedom.

reinforcement and low on the dimensions of extrinsic reinforcement. An opposite, nearly mirror image, profile is shown for Manual Occupations, Manufacturing — extrinsic reinforcers are most prominent and intrinsic reinforcers are least descriptive of the work environment. In both the tabular results and the profiles, the MJDQ scales have been reordered so that the first seven scales are intrinsic reinforcement dimensions, and the last six scales are extrinsic dimensions. These thirteen dimensions separate the clusters substantially, with an average overlap of 56%. The scale that best separates these clusters is the Creativity scale, with an overlap of 39% and an omega-squared value of .43. It should be recalled that this scale

measures the extent to which workers on the job "try out their own ideas." Four other scales show overlaps between clusters of less than 50%; these are Social Service and Responsibility (intrinsic reinforcers), and Compensation and Supervision — Technical (extrinsic reinforcers).

Summary

The reliability of each ORP was determined by correlating the profiles developed from the split-half subgroups of supervisors for each occupation. These reliability correlations ranged from .78 to .98 with a median of .91 for samples ranging in size from 11 to 48 supervisors. These results, compared with a median between-occupation correlation of .55, indicated that the relatively small samples of supervisors used to develop ORPs in this study yielded results generally representative of larger groups.

Evidence for the validity of ORPs was derived from two analyses. Mean scale scores for each of the 81 occupational groups on each of the 22 scales were compared, using one-way analysis of variance. Results of this analysis indicated that occupational differences in mean scale scores were highly significant for all 22 MJDQ scales. Rank-ordering of scale score means on each scale revealed a pattern of means consistent with the expectation that supervisors were responding meaningfully to the item content of the MJDQ. Mean scale score rank-orders were also consistent with expectations about the comparative reinforcement values for occupations.

Results of the cluster analysis of the 81 occupational profiles were also interpreted as evidence for the validity of MJDQ rankings. This analysis, unlike the previous scale-by-scale analysis, was concerned with the similarities and differences among the *total* profiles for the 81 occupations. The analysis yielded nine clusters, accounting for 59 of the 81 jobs. Differences among mean scale scores for the clusters were all highly significant. The nine clusters differed considerably in pattern of scores. Examination of the high and low scales defining the clusters, and of the occupations composing the clusters, led to the following tentative identification of the clusters: 1. Technical Occupations, Professional; 2. Technical Occupations, Semi-Professional; 3. Sales Occupations, Service; 4. Service Occupations, Social-Educational; 5. Service Occupations, Business Detail; 6. Service Occupations, Personal; 7. Manual Occu-

pations, Building Trades; 8. Manual Occupations, Manufacturing; and 9. Manual Occupations, Service-Maintenance. Since these clusters appear to represent meaningful occupational groupings, these data were interpreted as further evidence of the validity of the ORPs.

Future Research on ORPs

Data in this monograph suggest that the method of multiple rank orders, as utilized in the MJDQ, can yield meaningful ORPs when the rankings are supplied by supervisors of specific occupations. The method appears to require relatively small samples of supervisors for reliable ORPs. The survey mailing approach permits the collection of relatively large amounts of data on many occupations in a short period of time. An instrument such as the MJDQ seems to be suitable for the development of a large number of ORPs in a short period of time and at relatively low cost. It is therefore a promising methodology. Yet much remains to be done to perfect the MJDQ, as well as the methodology in this study, prior to large scale application in the development of ORPs.

Prediction of Job Satisfaction

Before the ORPs developed through the MJDQ methodology can be used with the same confidence that we now have for ability test batteries, it must be shown that they can meet the test of predictive validity. Studies are now in progress to determine whether ORPs obtained with the MJDQ, in conjunction with vocational need data obtained with the MIQ, can differentially predict employment satisfaction as measured by the Minnesota Satisfaction Questionnaire (MSQ). Various methods of measuring correspondence between needs (MIQ data) and reinforcer systems (ORPs) are being evaluated to determine which method best predicts job satisfaction. Should these studies yield positive results, more evidence of validity will have been obtained for the MJDQ as a measure of ORPs, for the MIQ as a measure of vocational needs, and for the MSQ as a measure of job satisfaction. Since some validity has been shown for the MIQ and MSQ (Weiss, *et al.*, 1964, 1965, 1966, 1967), these studies are primarily of importance in determining the validity of MJDQ ratings from supervisors as measures of ORPs.

Initially, the MJDQ, MIQ and MSQ measurements will be taken at concurrent points in time. If such data contribute to the prediction of job satisfaction, only tentative support is gained for the MJDQ as an estimator of ORPs. Ultimately, it must be shown that MIQ data and MJDQ-derived ORPs facilitate the *longitudinal* prediction of job satisfaction and of voluntary job tenure. Such a study would require the administration of MIQs to individuals prior to

their selection of an occupation. The MIQ data would not be used in vocational counseling of these individuals, but filed for future analysis. After a lapse of several years, MIQ data for these individuals would be compared with MJDQ-derived ORPs for all jobs in an individual's work history, and a measure of correspondence obtained between MIQ and ORP data for each job of each individual. For jobs in which the individual voluntarily terminated, MIQ-ORP correspondence is expected to be related to length of time employed. For the individual's current job, MIQ-ORP correspondence should be related to occupational satisfaction. Such a study would provide definitive confirmation of the *Theory of Work Adjustment* and of the validity of the MIQ, MSQ and MJDQ as measures of vocational needs, job satisfaction, and Occupational Reinforcer Patterns respectively.

Sampling of Occupations

While the basic usefulness of MJDQ-derived ORPs depends on their utility in the prediction of job satisfaction, ORPs can still be of use to vocational counselors as occupational information. To be useful as occupational information, however, ORPs for more occupations are needed, since the 81 occupations included in the present pilot study cannot be considered to be representative of the range of occupations. Further sampling of occupations is planned and will be based on such considerations as: frequency of the occupation in the labor market; availability of data for the prediction of satisfactoriness; and preciseness of definition of the work environment.

An additional consideration for future studies relates to the finding in the present study that some scales (Authority, Social Status) yielded uniformly low rankings across all occupations. To determine whether these scales are measuring validly, or whether response to these scales is determined by extraneous factors (such as the perceived social desirability of the statements), it would be desirable to study occupations which are commonly known to exhibit high levels of reinforcement along these dimensions. Thus, executives or foremen would be evaluated to find out if the Authority scale registers the presumed high level of Authority in these occupations. Similar studies could be made for Social Status (the other scale with a generally low mean), as well as for those scales with generally high means (Ability Utilization, Achievement, Security). In each case, one or more occupations known to be high (or

low) on the given dimension could be rated, thus providing an important test of the MJDQ as a measure of ORPs.

Use of Other Raters

In the present study, supervisors served as the raters. The use of other relevant raters should be studied, including the employees themselves, personnel managers, job analysts, vocational psychologists and vocational counselors. Comparison of the ORPs obtained from different kinds of raters would yield important data on which to base future selection of raters. Such data would include agreement between groups (kinds of raters), agreement among raters of a given group, and within-rater agreement for raters of a given group (circular triad scores). In addition, ORPs derived from different groups of raters should be compared in terms of their predictive efficiency when used in conjunction with MIQ scores of employees.

A problem closely related to the use of other raters (and which also can be studied at the same time), is the relationship of rater characteristics to the obtained ratings. Such questions may be raised as: Is sex of the rater related to his ratings? Is predominant sex of employees in the occupation being rated a factor? Is rater's age, education, experience, tenure on the job related to his ratings? Does a rater's familiarity with the job relate to his ratings? Are ratings correlated with the rater's own job satisfaction? These questions are currently being investigated.

Such questions also raise the possibility of several ORPs for a given occupation. Is there, for instance, more than one ORP for policeman, fireman, truck driver, social worker, or for that matter, any occupation? Such a possibility will be investigated by means of cluster analysis of ratings *within* an occupation. In addition, more specific occupational titles will be used, such as Policeman, Traffic; Policeman, Morals Squad; Policeman, Detective. Differentiation of ORPs derived for such specific occupations will indicate the precision of the MJDQ as a measure of ORPs.

Obtaining Maximally Reliable Profiles

The analysis of reliability data for the ORPs in this study showed that reliability of profiles varied for different occupations. This finding is supported by the data on circular triads which indicated that

supervisors of different occupations differed in terms of average number of circular triads in their rankings. These data indicate that differing numbers of supervisors are required for different occupations to obtain profiles of a given standard of reliability.

An efficient sampling scheme could be developed which continually assessed reliability of the profile as returns were accumulated for an occupation. Such a method would require that the number of MJDQs to be solicited for an occupation be dictated by the reliability of the accumulated profile, and that data collection for an occupation be continued until a given level of reliability was reached. This criterion could then be used to terminate data collection for a given occupation, in place of the current arbitrary criterion of a certain minimum number of supervisors.

Technical Modifications of the MJDQ

It is obvious that the current 21 reinforcement dimensions do not by any means cover the domain of reinforcers for all occupations. In addition, many of the present dimensions are defined rather narrowly and in overly specific terms. It is therefore desirable that the number of items scaled in the MJDQ be increased to better represent the domain of reinforcers. In addition, it might be desirable to increase the number of items for *each* dimension. The current MJDQ uses only one item per dimension, repeating this item five times throughout the questionnaire. This repetition has evoked some negative reactions from some respondents, thus decreasing the percentage of usable returns from mailed or group-administered questionnaires.

Should the number of unique statements in the MJDQ be increased for either of these reasons, alternative revisions of the questionnaire might include, 1) simply increasing the number of ranking blocks to accommodate the new items; 2) increasing the size of the ranking blocks to some number greater than five; 3) developing several forms of the MJDQ, each containing a subset of the total number of reinforcers, to yield, by appropriate design, a complete pair comparison matrix, in which, however, no one rater would rate all possible pairs of stimuli.

Other technical problems remain to be investigated. Such problems might include the role of response sets and of fatigue factors. For example, on the present MJDQ, the neutral point data are obtained from the last page of the questionnaire. It is possible that

responses to this absolute judgment section, as presented, are partly the result of an individual's fatigue or boredom in responding to the questionnaire. Placement of the absolute judgment section at the beginning of the questionnaire might yield a more valid estimate of the neutral point.

A related technical problem is the possibility of response set in determining responses to the absolute judgment section. It is possible that a "yea-saying" tendency exists for some people simply because the "yes" category is presented before the "no" category. A simple experimental reversal of the "yes" and "no" categories could test for the presence of such response sets.

These studies are being planned to enhance the reliability and validity of the measurement of Occupational Reinforcer Patterns.

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Appendixes

Appendix A

THE MINNESOTA JOB DESCRIPTION QUESTIONNAIRE

Code Number

Confidential
For Research Purposes Only

job description questionnaire

On the following pages you are asked to rank statements on the basis of how well they describe the job of:

Statements about this job are in groups of five. You are asked to consider *each group* of five *individually* and rank the five statements in terms of *how well they describe the job*, using the numbers "1" to "5." Then go to the next group of five statements and make the same kind of ranking.

For example, your answers on a group of statements might look like this:

Workers on this job . . .

4	get full credit for the work they do.
3	are of service to other people.
1	have freedom to use their own judgment.
5	do new and original things on their own.
2	have the chance to get ahead.

This means that, of the five statements, you consider "have freedom to use their own judgment" as most descriptive of the job; "have the chance to get ahead" as the next most descriptive statement; and so on.

You will find some of these comparisons more difficult to make than others, but it is *important* that you rank *every statement* in each group.

All information will be held in strictest confidence.

work adjustment project
industrial relations center
university of minnesota

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Please rank the five statements in each *group on the basis of* how well *they* describe *the job mentioned on the front page. Write a "1" by the statement which* best *describes the job; write a "2" by the statement which provides the* next best *description; continue ranking* all *five statements, using a "5" for the statement which describes the job* least well.

Workers on this job . . .

_____ are busy all the time.

_____ have work where they do things for other people.

_____ try out their own ideas.

_____ are paid well in comparison with other workers.

_____ have opportunities for advancement.

Workers on this job . . .

_____ have work where they do things for other people.

_____ have something different to do every day.

_____ get a feeling of accomplishment.

_____ have bosses who train their men well.

_____ have a company which administers its policies fairly.

Workers on this job . . .

_____ do work without feeling that it is morally wrong.

_____ have bosses who back up their men (with top management).

_____ have something different to do every day.

_____ make use of their individual abilities.

_____ are busy all the time.

Workers on this job . . .

_____ have a company which administers its policies fairly.

_____ try out their own ideas.

_____ make use of their individual abilities.

_____ have co-workers who are easy to make friends with.

_____ have the position of "somebody" in the community.

Please rank the five statements in each *group on the basis of* how well *they* describe *the job mentioned on the front page. Write a "1" by the statement which* best *describes the job; write a "2" by the statement which provides the* next best *description; continue ranking* all *five statements, using a "5" for the statement which describes the job* least well.

Workers on this job . . .

_____have bosses who train their men well.

_____plan their work with little supervision.

_____have bosses who back up their men (with top management).

_____try out their own ideas.

_____have good working conditions.

Workers on this job . . .

_____receive recognition for the work they do.

_____do work without feeling that it is morally wrong.

_____plan their work with little supervision.

_____have work where they do things for other people.

_____have co-workers who are easy to make friends with.

Workers on this job . . .

_____have bosses who back up their men (with top management).

_____have a company which administers its policies fairly.

_____are paid well in comparison with other workers.

_____receive recognition for the work they do.

_____tell other workers what to do.

Workers on this job . . .

_____have something different to do every day.

_____have co-workers who are easy to make friends with.

_____make decisions on their own.

_____have good working conditions.

_____are paid well in comparison with other workers.

Please rank the five statements in each *group on the basis of* how well *they* describe *the job mentioned on the front page. Write a "1" by the statement which* best *describes the job; write a "2" by the statement which provides the* next best *description; continue ranking* all *five statements, using a "5" for the statement which describes the job* least well.

Workers on this job . . .

_____make use of their individual abilities.

_____tell other workers what to do.

_____have good working conditions.

_____have steady employment.

_____have work where they do things for other people.

Workers on this job . . .

_____make decisions on their own.

_____are busy all the time.

_____have steady employment.

_____have a company which administers its policies fairly.

_____plan their work with little supervision.

Workers on this job . . .

_____get a feeling of accomplishment.

_____make decisions on their own.

_____tell other workers what to do.

_____do work without feeling that it is morally wrong.

_____try out their own ideas.

Workers on this job . . .

_____have co-workers who are easy to make friends with.

_____have steady employment.

_____have opportunities for advancement.

_____have bosses who back up their men (with top management).

_____get a feeling of accomplishment.

Please rank the five statements in each *group on the basis of* how well *they* describe *the job mentioned on the front page. Write a "1" by the statement which* best *describes the job; write a "2" by the statement which provides the* next best *description; continue ranking* all *five statements, using a "5" for the statement which describes the job* least well.

Workers on this job . . .

_____plan their work with little supervision.

_____have opportunities for advancement.

_____have the position of "somebody" in the community.

_____tell other workers what to do.

_____have something different to do every day.

Workers on this job . . .

_____are paid well in comparison with other workers.

_____get a feeling of accomplishment.

_____do their work alone.

_____plan their work with little supervision.

_____make use of their individual abilities

Workers on this job . . .

_____tell other workers what to do.

_____have bosses who train their men well.

_____have co-workers who are easy to make friends with.

_____are busy all the time.

_____do their work alone.

Workers on this job . . .

_____have steady employment.

_____are paid well in comparison with other workers.

_____have bosses who train their men well.

_____have the position of "somebody" in the community.

_____do work without feeling that it is morally wrong.

***Please rank the five statements in* each *group on the basis of* how well *they* describe *the job mentioned on the front page. Write a "1" by the statement which* best *describes the job; write a "2" by the statement which provides the* next best *description; continue ranking* all *five statements, using a "5" for the statement which describes the job* least well.**

Workers on this job . . .

_____do their work alone.

_____have the position of "somebody" in the community.

_____have work where they do things for other people.

_____have bosses who back up their men (with top management).

_____make decisions on their own.

Workers on this job . . .

_____try out their own ideas.

_____receive recognition for the work they do.

_____have something different to do every day.

_____do their work alone.

_____have steady employment.

Workers on this job . . .

_____have opportunities for advancement.

_____make use of their individual abilities.

_____receive recognition for the work they do.

_____make decisions on their own.

_____have bosses who train their men well.

Workers on this job . . .

_____have good working conditions.

_____do their work alone.

_____have a company which administers its policies fairly.

_____have opportunities for advancement.

_____do work without feeling that it is morally wrong.

Please rank these five statements.

Workers on this job . . .

_____have the position of "somebody" in the community.

_____have good working conditions.

_____are busy all the time.

_____get a feeling of accomplishment.

_____receive recognition for the work they do.

On the rest of this page we are asking you to do something different. ***This time, consider each statement*** individually ***and decide*** whether or not ***it describes the job.***

— If you think that the statement describes the job, circle "Yes."

— If you think that the statement does not describe the job, circle "No."

Workers on this job . . .	*Circle your answer for each statement*	
1. make use of their individual abilities	*Yes*	*No*
2. get a feeling of accomplishment	*Yes*	*No*
3. are busy all the time	*Yes*	*No*
4. have opportunities for advancement	*Yes*	*No*
5. tell other workers what to do	*Yes*	*No*
6. have a company which administers its policies fairly	*Yes*	*No*
7. are paid well in comparison with other workers	*Yes*	*No*
8. have co-workers who are easy to make friends with	*Yes*	*No*
9. try out their own ideas	*Yes*	*No*
10. do their work alone	*Yes*	*No*
11. do work without feeling that it is morally wrong	*Yes*	*No*
12. receive recognition for the work they do	*Yes*	*No*
13. make decisions on their own	*Yes*	*No*
14. have steady employment	*Yes*	*No*
15. have work where they do things for other people	*Yes*	*No*
16. have the position of "somebody" in the community	*Yes*	*No*
17. have bosses who back up their men (with top management)	*Yes*	*No*
18. have bosses who train their men well	*Yes*	*No*
19. have something different to do every day	*Yes*	*No*
20. have good working conditions	*Yes*	*No*
21. plan their work with little supervision	*Yes*	*No*

Please answer these questions as a supervisor of people working on the job of_____.

1. How long have you been a supervisor of people working on this job?
   _____years _____months

2. How many workers do you usually supervise on this job? (not including yourself)?_____
   How many are men?_____ How many are women?_____

3. Have you ever been a worker on this job? (check one)
   ☐ No
   ☐ Yes — how long did you work on this job?
   _____years _____months

   Are you now a worker on this job, in addition to being a supervisor? (check one)
   ☐ Yes ☐ No

4. Compared with other supervisors of people working on this job, how well would you say you are acquainted with this job? (check one)
   ☐ *Not as well acquainted* as most supervisors on this job
   ☐ *About as well acquainted* as most supervisors on this job
   ☐ *Better acquainted* than most supervisors on this job

5. Please answer the following questions about yourself.
   Sex ☐ Male ☐ Female Age_____
   Circle the number of years of schooling completed in each category.

Grade and High School	Business or Trade School	College (including graduate and professional school)
7 8 9 10 11 12	0 1 2 3 4 5	0 1 2 3 4 5 6 7

Your job title_____

Approximately how many employees are there in your organization?

☐ 0-9	☐ 500-999
☐ 10-24	☐ 1,000-4,999
☐ 25-49	☐ 5,000-9,999
☐ 50-99	☐ 10,000-29,999
☐ 100-499	☐ 30,000 or over

How long have you been with your present organization?_____years

Thank you very much for your assistance.

Appendix B

Occupations sampled in this study, their Twin Cities Skill Survey frequency, OAP Code, and 1965 DOT code

Job Title	Frequency	OAP	D.O.T.
1. Accountant, Cost	5489	2	160.188
2. Accounting Clerk, Civil Service	7146'	7	219.488
3. Accounting Clerk, Manufacturing		7	219.488
4. Accounting Clerk, Retail		7	219.488
5. Airplane Stewardess	381		352.878
6. Assembler (Electrical Equipment)		27	827.884
7. Assembler, Small Parts		27	706.884
8. Automobile-Body Repairman	638		807.381
9. Automobile Mechanic	2583	11	620.281
10. Automobile Service Station Attendant	2152		915.867
11. Baker	1302		526.781
12. Bartender	1627		312.878
13. Beauty Operator	1888	21	332.271
14. Bookkeeping Machine Operator, Civil Service	1911'	23	215.388
15. Bookkeeping Machine Operator, Manufacturing		23	215.388
16. Bookkeeping Machine Operator, Retail		23	215.388
17. Bricklayer	1196	14	861.381
18. Bus Driver	2823		913.463
19. Calculating Machine Operator, Civil Service	1156'	23	216.488
20. Calculating Machine Operator, Manufacturing		23	216.488
21. Calculating Machine Operator, Retail		23	216.488
22. Candy Wrapping			
23. Carpenter	3129	25	860.381
24. Caseworker	916	3	195.108
25. Cashier-Checker	4326	9	299.468
26. Claim Adjuster	897	6	241.168
27. Claim Examiner		6	168.288
28. Clerk, General Office, Civil Service	9831'	13	219.388
29. Clerk, General Office, Manufacturing		13	219.388
30. Clerk, General Office, Retail		13	219.388
31. Commercial Artist, Illustrating	872		141.081
32. Comptometer Operator, Civil Service		23	216.488
33. Comptometer Operator, Manufacturing		23	216.488
34. Comptometer Operator, Retail		23	216.488
35. Console Operator	172	7	213.382
36. Cook (Hotel-Restaurant)	5018	10	313.381

Job Title	Frequency	OAP	D.O.T.
37. Counselor, School	532		045.108
38. Counselor, Vocational Rehabilitation			045.108
39. Detective, Store			376.868
40. Dietitian	211	3	077.168
41. Draftsman, Architectural	825		001.281
42. Draftsman, Electrical	687		003.281
43. Draftsman, Mechanical	1618		001.281
44. Draftsman, Refrigeration	736		017.281
45. Electrical Technician	1024	3	003.181
46. Electrician	1693	24	824.281
47. Electronics Mechanic	1059	5	828.281
48. Embalmer		3	338.381
49. Engineer, Civil	1488	1	005.081
50. Engineer, Mechanical	1699	1	007.081
51. Engineer, Stationary	2452		950.782
52. Engineer, Time Study			012.188
53. Fire Fighter		10	373.884
54. Heavy-Equipment Operator (Construction)	1287		859.883
55. Instructor, Vocational School	566		097.228
56. Key Punch Operator, Civil Service	1943[1]	9	213.582
57. Key Punch Operator, Manufacturing		9	213.582
58. Key Punch Operator, Retail		9	213.582
59. Landscape Gardener			407.181
60. Librarian	610	4	100.168
61. Machinist	1904	25	600.280
62. Maintenance Man, Factory or Mill	2568		899.281
63. Marker		35	920.887
64. Meat Cutter	1124	11	316.884
65. Medical Technologist	491		078.381
66. Nurse Aid	4099		355.878
67. Nurse, Licensed Practical			079.378
68. Nurse, Practical			354.878
69. Nurse, Professional	6519		075.378
70. Occupational Therapist	113		079.128
71. Office-Machine Serviceman		31	633.281
72. Orderly	1038		355.878
73. Packer/Labeller		35	920.884
74. Painter/Paperhanger	907		840.781
75. Patternmaker, Metal			600.280
76. Personnel Clerk, Civil Service			205.368
77. Personnel Clerk, Manufacturing			205.368
78. Personnel Clerk, Retail			205.368
79. Pharmacist	997	2	074.181
80. Photoengraver (Stripper)		16	971.381
81. Physical Therapist	114	8	079.378
82. Pipefitter	997	20	862.381

Job Title	Frequency	OAP	D.O.T.
83. Plumber	928	20	862.381
84. Policeman	1809		375.268
85. Pressman (Cylinder)	1704	32	652.782
86. Production Helper (Food)			529.886
87. Production Line Assembler		35	809.884
88. Programmer (Business, Engineering & Science)	1005	1	020.188
89. Punch-Press Operator	1547	32	615.782
90. Radiologic Technologist	385	8	078.368
91. Receptionist, Civil Service		9	237.368
92. Receptionist, Manufacturing		9	237.368
93. Receptionist, Retail		9	237.368
94. Route Supervisor			292.358
95. Salesman, Automobile			280.358
96. Salesman, Automobile Parts		9	280.358
97. Salesman-Driver	3561		292.358
98. Salesman, Real Estate			250.358
99. Salesman, Securities			251.258
100. Salesperson, General (Dept. Store)	25147	9	289.458
101. Salesperson, Shoe			263.358
102. Screw-Machine Operator, Production	281		604.885
103. Secretary, Technical, Civil Service	1485[1]	12	201.368
104. Secretary, Technical, Manufacturing		12	201.368
105. Secretary, Technical, Retail		12	201.368
106. Sewing-Machine Operator, Automatic	3339	32	787.885
107. Sheet Metal Worker	1807	16	804.281
108. Statistical Machine Serviceman		31	633.281
109. Statistician, Applied		2	020.188
110. Stenographer, Technical, Civil Service	1083[1]	36	202.388
111. Stenographer, Technical, Manufacturing		12	202.388
112. Stenographer, Technical, Retail		12	202.388
113. Teacher, Elementary School	21891[2]	3	092.228
114. Teacher, Secondary School		3	091.228
115. Television Service-and-Repairman	409		720.281
116. Teller (Banking)	1188		212.368
117. Truck Driver	12076	19	906.883
118. Turret Lathe Set-Up Operator	727	28	609.885
119. Typist, Civil Service	7093[1]	36	203.588
120. Typist, Manufacturing		36	203.588
121. Typist, Retail		36	203.588
122. Waiter-Waitress	12452	14	311.878
123. Welder, Combination	1523	27	812.884
124. Welder, Gas	146	27	811.884
125. Writer, Technical Publications	254		139.288

[1] Frequency given is for total number employed in that job in the Minneapolis-St. Paul Metropolitan area, regardless of whether employed by a civil service, manufacturing, or retail employer.

[2] Frequency given is the total number of elementary and secondary school teachers.

Appendix C

Number and percentage of MJDQs returned by supervisors, for each of the 81 occupations

Occupations	Number sent	Number returned	Percent returned	Number non-usable returns	Number of usable returns	Percent usable returns
Accountant, Cost	62	53	85.5	14	39	62.9
Accounting Clerk, Civil Service	70	54	77.1	9	45	64.3
Accounting Clerk, Manufacturing	47	38	80.9	8	30	63.8
Airplane Stewardess	77	70	90.9	3	67	87.0
Assembler (Electrical Equipment)	38	32	84.2	2	30	78.9
Assembler, Small Parts	48	36	75.0	5	31	64.6
Automobile-Body Repairman	92	70	76.1	14	56	60.9
Automobile Mechanic	59	42	71.2	7	35	59.3
Automobile Service Station Attendant	53	36	67.9	4	32	60.4
Baker	40	29	72.5	6	23	57.5
Bartender	75	38	50.7	10	28	37.3
Beauty Operator	66	47	71.2	10	37	56.1
Bus Driver	46	37	80.4	2	35	76.1
Carpenter	79	56	70.9	17	39	49.4
Caseworker	50	46	92.0	4	42	84.0
Cashier-Checker	70	52	74.3	6	46	65.7
Claim Adjuster	44	36	81.8	4	32	72.7
Claim Examiner	48	38	79.2	5	33	68.8
Clerk, General Office, Civil Service	149	114	76.5	29	85	57.0
Commercial Artist, Illustrating	58	40	69.0	10	30	51.7
Cook (Hotel and Restaurant)	82	47	57.3	15	32	39.0
Counselor, School	53	47	88.7	2	45	84.9
Counselor, Vocational Rehabilitation	50	48	96.0	2	46	92.0
Dietitian	40	34	85.0	6	28	70.0

Appendix C (continued)

Occupations	Number sent	Number returned	Percent returned	Number non-usable returns	Number of usable returns	Percent usable returns
Draftsman, Architectural	42	37	88.1	3	34	81.0
Electrical Technician	61	45	73.8	5	40	65.6
Electrician	74	43	58.1	12	31	41.9
Electronics Mechanic	50	38	76.0	2	36	72.0
Embalmer	46	38	82.6	8	30	65.2
Engineer, Civil	48	34	70.8	4	30	62.5
Engineer, Mechanical	66	51	77.3	11	40	60.6
Engineer, Stationary	71	55	77.5	13	42	59.2
Engineer, Time-Study	55	52	94.5	17	35	63.6
Fire Fighter	54	51	94.4	2	49	90.7
Heavy-Equipment Operator (Construction)	80	43	53.8	13	30	37.5
Instructor, Vocational School	51	44	86.3	6	38	74.5
Landscape Gardener	39	27	69.2	5	22	56.4
Librarian	49	38	77.6	16	22	44.9
Machinist	46	37	80.4	7	30	65.2
Maintenance Man, Factory or Mill	42	33	78.6	7	26	61.9
Marker	42	36	85.7	9	27	64.3
Meat Cutter	73	54	74.0	7	47	64.4
Medical Technologist	38	37	97.4	6	31	81.6
Nurse Aid	57	49	86.0	5	44	77.2
Nurse, Licensed Practical	42	38	90.5	4	34	81.0
Nurse, Professional	52	39	75.0	7	32	61.5
Occupational Therapist	33	32	97.0	0	32	97.0
Office-Machine Serviceman	56	35	62.5	2	33	58.9
Orderly	38	34	89.5	3	31	81.6
Painter/Paperhanger	55	42	76.4	7	35	63.6
Pharmacist	50	36	72.0	3	33	66.0
Photoengraver (Stripper)	31	31	100.0	2	29	93.5

Appendix C (continued)

Occupations	Number sent	Number returned	Percent returned	Number non-usable returns	Number of usable returns	Percent usable returns
Physical Therapist	30	28	93.3	4	24	80.0
Pipefitter	101	70	69.3	36	34	33.7
Plumber	95	57	60.0	20	37	38.9
Policeman	83	68	81.9	2	66	79.5
Production Helper (Food)	70	39	55.7	12	27	38.6
Programmer (Business, Engineering, & Science)	73	61	83.6	13	48	65.8
Punch-Press Operator	51	36	70.6	4	32	62.7
Radiologic Technologist	60	54	90.0	5	49	81.7
Receptionist, Civil Service	51	40	78.4	9	31	60.8
Salesman, Automobile	45	38	84.4	1	37	82.2
Salesman-Driver	57	38	66.7	5	33	57.9
Salesman-Real Estate	62	44	71.0	11	33	53.2
Salesman, Securities	37	31	83.8	2	29	78.4
Salesperson, General (Dept. Store)	120	103	85.8	8	95	79.2
Salesperson, Shoe	69	52	75.4	11	41	59.4
Screw-Machine Operator, Production	42	32	76.2	2	30	71.4
Sewing Machine Operator, Automatic	47	32	68.1	2	30	63.8
Sheet Metal Worker	79	50	63.3	9	41	51.9
Statistician, Applied	177	135	76.3	91	44	24.9
Stenographer, Technical, Civil Service	48	40	83.3	16	24	50.0
Teacher, Elementary School	53	41	77.4	4	37	69.8
Teacher, Secondary School	36	32	88.9	0	32	88.9
Television Service-and-Repairman	38	27	71.1	4	23	60.5
Teller (Banking)	34	33	97.0	2	31	91.2
Truck Driver	63	51	81.0	6	45	71.4
Typist, Civil Service	62	44	71.0	9	35	56.5
Waiter-Waitress	81	46	56.8	12	34	42.0
Welder, Combination	111	77	69.4	43	34	30.6
Writer, Technical Publications	38	36	94.7	5	31	81.6

Appendix D

Sources of supervisors' names and descriptive characteristics of supervisors in each of the 81 occupations

Occupation	Source[1]	Proportion Male	Median years			Median Number of Employees Supervised
			Age	Tenure as Supervisor	Tenure with Company	
Accountant, Cost	g	1.00	36	3	4	4
Accounting Clerk, Civil Service	c,d	.44	48	5	12	3
Accounting Clerk, Manufacturing	g	.58	35	3	9	8
Airplane Stewardess	a	.00	29	1	7	35
Assembler (Electrical Equipment)	e,a	1.00	34	3	6	25
Assembler, Small Parts	a	.83	38	10	11	25
Automobile-Body Repairman	a	.89	40	8	7	7
Automobile Mechanic	a	.93	45	10	8	22
Automobile Service Station Attendant	a	.97	34	7	5	17
Baker	a	.89	38	6	11	11
Bartender	b	.94	40	6	8	6
Beauty Operator	a	.24	29	4	4	8
Bus Driver	a	.97	45	7	17	160
Carpenter	b	.96	42	9	11	18
Caseworker	f	.71	43	5	14	7
Cashier-Checker	e	.43	38	4	5	16
Claim Adjuster	a	1.00	42	9	12	9
Claim Examiner	a	.97	41	4	10	6

Appendix D (continued)

Occupation	Source[1]	Proportion Male	Median years			Median Number of Employees Supervised
			Age	Tenure as Supervisor	Tenure with Company	
Clerk, General Office, Civil Service	c,d	.21	45	5	10	9
Commercial Artist, Illustrating	a	.94	42	9	10	6
Cook (Hotel-Restaurant)	b	.82	46	10	7	10
Counselor, School	f	.80	49	8	13	6
Counselor, Vocational Rehabilitation	d	.90	38	2	7	7
Dietitian	g,a	.00	41	6	2	14
Draftsman, Architectural	a	.97	38	9	7	6
Electrical Technician	e,a	.98	35	5	8	6
Electrician	f	1.00	47	12	14	7
Electronics Mechanic	a	1.00	37	5	9	6
Embalmer	g	.97	45	10	16	3
Engineer, Civil	f	.91	46	7	17	17
Engineer, Mechanical	f	.95	42	6	10	6
Engineer, Stationary	b	.98	48	7	15	5
Engineer, Time-Study	e	1.00	36	2	10	6
Fire Fighter	e	.98	46	10	19	5
Heavy-Equipment Operator (Construction)	a,b	.97	44	7	8	15
Instructor, Vocational School	f	.98	45	5	2	22
Landscape Gardener	a	.92	34	5	7	6
Librarian	g	.28	46	6	6	3
Machinist	a	1.00	39	6	9	10
Maintenance Man, Factory or Mill	a	.93	44	4	12	11

Appendix D (continued)

Occupation	Source[1]	Proportion Male	Median years			Median Number of Employees Supervised
			Age	Tenure as Supervisor	Tenure with Company	
Marker	a	.93	36	2	5	25
Meat Cutter	a,b	.98	45	11	16	25
Medical Technologist	g	.36	37	4	7	16
Nurse Aid	a	.02	40	5	10	12
Nurse, Licensed Practical	a	1.00	30	3	5	12
Nurse, Professional	a	1.00	40	3	5	29
Occupational Therapist	e	.16	35	4	5	4
Office-Machine Serviceman	a	.97	39	5	14	6
Orderly	e,a	1.00	32	3	5	6
Painter/Paperhanger	a,b	.95	40	6	8	10
Pharmacist	g	.94	34	5	5	5
Photoengraver (Stripper)	b	.89	39	7	9	6
Physical Therapist	e,a	.41	41	6	8	5
Pipefitter	f	.92	50	14	15	10
Plumber	f	.95	41	10	11	9
Policeman	a	.91	42	5	17	18
Production Helper (Food)	a	.84	38	4	14	11
Programmer (Business, Engineering, & Science)	g	.94	36	3	5	5
Punch-Press Operator	a	1.00	44	8	13	16
Radiologic Technologist	g	.45	35	7	7	8
Receptionist, Civil Service	c	.00	40	5	7	2
Salesman, Automobile	a	.95	41	9	6	13

Appendix D (continued)

Occupation	Source[1]	Proportion Male	Median years			Median Number of Employees Supervised
			Age	Tenure as Supervisor	Tenure with Company	
Salesman-Driver	a,b	.97	44	9	18	10
Salesman, Real Estate	a	.88	42	7	8	10
Salesman, Securities	a	.93	40	5	7	7
Salesperson, General (Dept. Store)	e	.69	31	1	3	7
Salesperson, Shoe	a	.90	37	10	8	7
Screw-Machine Operator, Production	a	.97	35	4	9	9
Sewing-Machine Operator, Automatic	b	.29	45	7	9	40
Sheet Metal Worker	a	.91	44	7	9	20
Statistician, Applied	g	.88	38	5	6	5
Stenographer, Technical, Civil Service	c,d	.25	35	3	4	2
Teacher, Elementary School	f	.56	46	10	16	26
Teacher, Secondary School	f	.94	53	13	20	59
Television Service-and-Repairman	a	.84	40	10	11	4
Teller (Banking)	a	.69	34	4	5	13
Truck Driver	a	.79	42	11	11	40
Typist, Civil Service	c	.03	27	3	4	4
Waiter-Waitress	a,b	.59	43	7	6	20
Welder, Combination	f	.95	43	6	9	6
Writer, Technical Publications	g	1.00	37	2	7	6

[1] Sources are listed, for each occupation, according to frequency of use, in the following code:

a = Phone book
b = Labor organization
c = University of Minnesota Civil Service
d = Minnesota State Civil Service
e = One major Twin Cities employer
f = State Licensing or Regulatory Agency Membership Directory
g = Professional Association

Appendix E

Occupations listed according to reinforcement scale value for unadjusted neutral point

Occupation	Scale Value	Raw Score		
		Mean	S.D.	S.D. Units
Orderly	–.27	8.19	2.84	1.21
Landscape Gardener	–.36	7.41	2.94	.91
Nurse Aid	–.41	6.98	2.09	.74
Waiter-Waitress	–.41	6.97	2.37	.73
Sewing-Machine Operator, Automatic	–.41	6.97	2.06	.73
Fire Fighter	–.42	6.92	2.14	.71
Clerk, General Office, Civil Service	–.48	6.46	2.39	.54
Automobile Service Station Attendant	–.49	6.41	3.24	.52
Heavy Equipment Operator	–.49	6.40	5.14	.51
Punch-Press Operator	–.49	6.38	2.27	.50
Stenographer, Technical, Civil Service	–.50	6.33	2.75	.48
Baker	–.50	6.26	3.05	.46
Assembler (Electrical Equipment)	–.51	6.23	6.67	.45
Truck Driver	–.51	6.20	2.56	.43
Meat Cutter	–.52	6.17	2.57	.42
Accounting Clerk, Manufacturing	–.52	6.13	1.98	.41
Cashier-Checker	–.54	6.00	3.03	.36
Production Helper (Food)	–.55	5.93	2.39	.33
Receptionist, Civil Service	–.55	5.90	2.53	.32
Bartender	–.55	5.89	2.20	.31
Painter/Paperhanger	–.56	5.83	2.20	.29
Nurse, Licensed Practical	–.56	5.82	2.42	.29
Pipefitter	–.56	5.82	2.78	.29
Radiologic Technologist	–.57	5.76	2.44	.26
Typist, Civil Service	–.58	5.66	2.63	.22
Assembler, Small Parts	–.59	5.61	2.50	.20
Teller (Banking)	–.60	5.55	2.06	.18
Draftsman, Architectural	–.60	5.53	2.23	.17
Medical Technologist	–.61	5.48	2.51	.15
Marker	–.61	5.44	2.66	.14
Bus Driver	–.61	5.43	2.30	.13
Policeman	–.62	5.42	2.20	.13
Carpenter	–.65	5.21	2.17	.05
Salesperson, Shoe	–.66	5.12	2.22	.01
Accounting Clerk, Civil Service	–.66	5.11	2.58	.01
Embalmer	–.66	5.10	2.44	.00
— Scale Value for all jobs combined —	–.66	5.09	2.56	.00
Welder, Combination	–.66	5.09	2.22	.00

Appendix E (continued)

Occupation	Scale Value	Raw Score Mean	Raw Score S.D.	S.D. Units
Automobile-Body Repairman	–.67	5.05	2.34	–.01
Cook (Hotel-Restaurant)	–.67	5.03	2.33	–.02
Automobile Mechanic	–.67	5.00	6.86	–.03
Machinist	–.67	5.00	2.46	–.03
Accountant, Cost	–.68	4.97	2.99	–.05
Electronics Mechanic	–.68	4.94	2.37	–.06
Sheet Metal Worker	–.69	4.90	2.62	–.07
Photoengraver (Stripper)	–.69	4.86	2.30	–.09
Salesperson, General (Dept. Store)	–.70	4.80	2.33	–.11
Programmer (Business, Eng., and Sci.)	–.72	4.69	3.00	–.16
Maintenance Man, Factory or Mill	–.72	4.69	4.93	–.16
Teacher, Secondary School	–.72	4.69	1.45	–.16
Salesman, Automobile	–.72	4.68	2.20	–.16
Airplane Stewardess	–.72	4.66	1.93	–.17
Screw-Machine Operator, Production	–.73	4.60	2.17	–.19
Statistician, Applied	–.74	4.55	2.59	–.21
Plumber	–.74	4.54	2.85	–.21
Engineer, Mechanical	–.74	4.52	2.64	–.22
Salesman-Driver	–.76	4.39	2.42	–.27
Electrician	–.77	4.39	2.64	–.27
Commercial Artist, Illustrating	–.78	4.27	2.49	–.32
Nurse, Professional	–.79	4.22	1.91	–.34
Engineer, Stationary	–.79	4.21	2.34	–.34
Television Service-and-Repairman	–.80	4.17	6.10	–.36
Writer, Technical Publications	–.80	4.13	2.40	–.37
Physical Therapist	–.81	4.13	2.19	–.37
Beauty Operator	–.81	4.11	2.21	–.38
Dietitian	–.81	4.11	2.85	–.38
Occupational Therapist	–.82	4.06	1.72	–.40
Counselor, School	–.82	4.04	2.04	–.41
Engineer, Time-Study	–.83	3.97	2.29	–.44
Engineer, Civil	–.84	3.93	2.74	–.45
Pharmacist	–.84	3.91	2.85	–.46
Salesman, Real Estate	–.85	3.85	1.87	–.48
Caseworker	–.85	3.83	1.69	–.49
Librarian	–.86	3.82	2.42	–.49
Electrical Technician	–.86	3.80	2.11	–.50
Claim Examiner	–.87	3.76	2.61	–.52
Teacher, Elementary School	–.87	3.73	1.73	–.53
Claim Adjuster	–.88	3.69	2.15	–.55
Counselor, Vocational Rehabilitation	–.88	3.67	2.02	–.55
Office-Machine Serviceman	–.92	3.42	2.21	–.65
Instructor, Vocational School	–.96	3.24	1.78	–.72
Salesman, Securities	–.99	3.07	1.73	–.79