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The Measurement of Occupational Reinforcer Patterns

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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.

Contents

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.

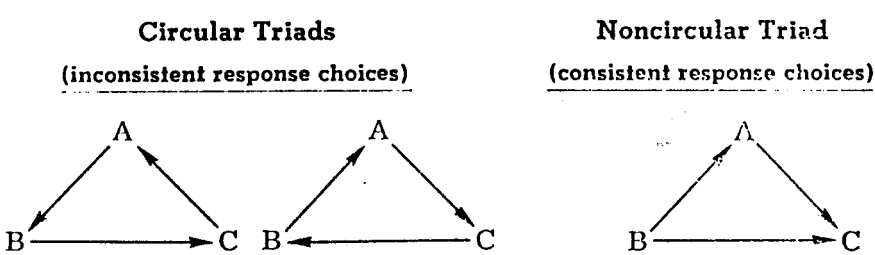

Fig. 1. Illustration of judgments in circular and noncircular triads

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-