DOCUMENT RESUME

ED 045 721 TM 000 297

AUTHOR Nealey, Stanley M.

TITLE The Relative Importance of Job Factors: A New Measurement Approach.

INSTITUTION Colorado State Univ., Ft. Collins. Dept. of Psychology.

SPONS AGENCY Office of Naval Research, Washington, D.C. Personnel and Training Branch.
REPORT NO TR-1
PUB DATE May 70
NOTE 68p.

EDRS PRICE EDRS Price MF-$0.50 HC-$3.50
DESCRIPTORS Data Collection, Economic Factors, *Employee Attitudes, Factor Structure, Groups, Income, *Job Satisfaction, *Measurement Techniques, Morale, Occupational Choice, *Personnel Policy, Personnel Selection, Productivity, Rating Scales, *Research Methodology, Seamen, Supervision

ABSTRACT

This paper reports on a new two-phase measurement technique that permits a direct comparison of the perceived relative importance of economic vs. non-economic factors in a job situation in accounting for personnel retention, the willingness to produce, and job satisfaction. The paired comparison method was used to measure the preferences of 91 enlisted men aboard a U.S. Navy destroyer for seven different job classifications, seven supervisors, and seven groups of co-workers. In a second phase of the study, these three job factors were combined, together with various amounts of pay, to form two-factor composites, e.g. job A and Supervisor B, or work group C and pay D. Ninety-seven enlisted men in the same setting made preference judgments among these composites. Multiple correlation was used to predict preferences for these composites from the job factor scale values obtained in phase one. Using beta weights and coefficients of determination of part correlations as criteria of importance, it appeared that type of work, followed closely by pay, was perceived as highly important in determining reenlistment, production, and job satisfaction. Co-workers and supervision, in that order, were seen as less important. Implications of the method and findings to the formation of personnel policy are considered. (Author)

DEPARTMENT OF PSYCHOLOGY
COLORADO STATE UNIVERSITY
FORT COLLINS, COLORADO

THE RELATIVE IMPORTANCE OF JOB FACTORS: A NEW MEASUREMENT APPROACH

TECHNICAL REPORT NO. 1
MAY, 1970

Importance of Job Factors:
Measurement and Application

Project Supported by the Office of Naval Research
Contract Number N00014-67-A-0299-0011
Contract Identification NR 151-317

STANLEY M. NEALEY
Principal Investigator

DD FORM 1473

DOCUMENT CONTROL DATA - R & D

1. ORIGINATING ACTIVITY

Department of Psychology
Colorado State University

2. REPORT SECURITY CLASSIFICATION

Unclassified

3. REPORT TITLE

The Relative Importance of Job Factors:
A New Measurement Approach

4. DESCRIPTIVE NOTES

Technical Report, May, 1970

5. AUTHOR(S)

Stanley M. Nealey

6. REPORT DATE

May, 1970

7a. TOTAL NUMBER OF PAGES	7b. NUMBER OF REFERENCES
75	37

8a. CONTRACT OR GRANT NUMBER	8b. PROJECT NUMBER
N00014-67-A-0299-0011	NR 151-317

9a. ORIGINATOR'S REPORT NUMBER(S)

Technical Report No. 1 (May, 1970)

10. DISTRIBUTION STATEMENT

Distribution of this document is unlimited

12. SPONSORING MILITARY ACTIVITY

Department of Navy
Office of Naval Research
Personnel and Training Research Programs

DD FORM 1473 (Continued)

13. ABSTRACT

This paper reports on a new two-phase measurement technique that permits a direct comparison of the perceived relative importance of economic vs. non-economic factors in a job situation in accounting for personnel retention, the willingness to produce, and job satisfaction. The paired comparison method was used to measure the preferences of 91 enlisted men aboard a U.S. Navy destroyer for seven different job classifications, seven supervisors, and seven groups of co-workers. In a second phase of the study, these three job factors were combined, together with various amounts of pay, to form two-factor composites, e.g. job A and supervisor B, or work group C and pay D. Ninety-seven enlisted men in the same setting made preference judgments among these composites. Multiple correlation was used to predict preferences for these composites from the job factor scale values obtained in phase one. Using beta weights and coefficients of determination of part correlations as criteria of importance, it appeared that type of work, followed closely by pay, was perceived as highly important in determining reenlistment, production, and job satisfaction. Co-workers and supervision, in that order, were seen as less important. Implications of the method and findings to the formation of personnel policy are considered.

14. KEY WORDS

Personnel retention
Productivity
Job satisfaction
Preferred type of work
Supervision
Work groups
Pay raise

THE RELATIVE IMPORTANCE OF JOB FACTORS: A NEW MEASUREMENT APPROACH

Stanley M. Nealey

Colorado State University

Abstract

This paper reports on a new two-phase measurement technique that permits a direct comparison of the perceived relative importance of economic vs. non-economic factors in a job situation in accounting for personnel retention, the willingness to produce, and job satisfaction. The paired comparison method was used to measure the preferences of 91 enlisted men aboard a U.S. Navy destroyer for seven different job classifications, seven supervisors, and seven groups of co-workers. In a second phase of the study, these three job factors were combined, together with various amounts of pay, to form two-factor composites, e.g. job A and supervisor B, or work group C and pay D. Ninety-seven enlisted men in the same setting made preference judgments among these composites. Multiple correlation was used to predict preferences for these composites from the job factor scale values obtained in phase one. Using beta weights and coefficients of determination of part correlations as criteria of importance, it appeared that type of work, followed closely by pay, was perceived as highly important in determining reenlistment, production, and job satisfaction. Co-workers and supervision, in that order, were seen as less important. Implications of the method and findings to the formation of personnel policy are considered.

THE RELATIVE IMPORTANCE OF JOB FACTORS: A NEW MEASUREMENT APPROACH[1]

Stanley M. Nealey

Colorado State University

The relative importance of job factors in accounting for job behavior has been recognized as a relatively important question for several decades. Studies designed to discover the relative importance of pay vs. security, or type of work vs. supervision have been reported in the literature since 1932 when Chant had a group of respondents from the YMCA rank 12 factors according to their importance in making a job interesting. Just for the record, "opportunity to be of public service" was seen by this group as more important than "good boss" and "high pay."

A variety of approaches have been used to reach a variety of objectives. Raube (1947), for instance, had respondents pick the five most important morale factors from a list of 71. Evans and Laseau (1950) content analyzed thousands of letters written by General Motors employees in a contest entitled: My Job and Why I Like It. The Opinion Research Corporation (1951) asked workers what the company should do to make them feel like turning out more work. Jurgenson (1947, 1948) had job applicants indicate which features of work were most important to them. So busy was this area of research, that by 1957, Herzberg, Mausner, Peterson, and Capwell were able to review 20 studies in which job factors were ranked for importance. By combining the dozens of job factors into 10 categories, these authors listed in order of importance, security, opportunity for advancement, company and management, wages, intrinsic aspects of job, supervision, social aspects of job, communication, working conditions, and benefits.

Unfortunately this large body of research has not resulted in conspicuous advances in either industrial practice or applied psychological theory. In fact, research efforts in this content area dwindled after 1950. Recognizing it as a sterile research area, social scientists turned their attention elsewhere.

Yet, the practical benefits of obtaining reliable data on the importance of job factors remained obvious. Unless the relative importance of job factors can be measured, the real possibility exists that elaborate and expensive personnel procedures will be employed to deal with factors that have little to do with job behavior while other factors of much greater importance are ignored.

Illustrative of the difficulties involved in measuring and using importance estimates is a recent study by Mikes and Hulin (1968). These authors used the Job Descriptive Index (Smith, Kendall, and Hulin, 1969) to measure employee satisfaction with work, supervision, co-workers, pay, and opportunity for promotion. They also had employees rate the importance of each of these factors. The importance estimates were then used to weight the job satisfaction scores with the aim of predicting turnover in a subsequent period. Sensible as this approach sounds, the satisfaction scores alone predicted turnover better than did job satisfaction scores weighted by importance scores. Apparently the importance scores served only to add error variance to the predictions of turnover.

Several persistent measurement problems have remained unsolved since the first attempts to measure importance. Chief among them is the necessity of relying on direct verbal report regarding the importance of tangible factors such as a specific amount of pay vs. intangible factors such as supervision and type of work.

In an attempt to bring some order, Nealey (1964b) detailed three methodological recommendations for improving research on the importance of job factors: (1) Job factors should be specific. For instance, before one can indicate that pay is more or less important than supervision, pay and supervision need to be defined. Is "pay" hourly rates, annual earnings, or a matter of fairness compared to the pay of others? (2) Job factors should be quantified. That is, my current supervisor may be more salient than my current pay, but a substantial pay raise might reverse this. In other words, the relative importance of pay and supervision can't be measured in abstract terms. (3) The referent of importance should be specified. It may be the case that my current supervisor is more important than my pay in accounting for my productivity, but my pay may be a more important determiner of my decision to seek another job. In other words, it is necessary to ask, "Important to what?"

Of course, these methodological recommendations are more easily followed if the job factors under study are limited to tangible compensation and benefit factors. In a series of studies carried out in industrial settings Nealey (1963, 1964a, and 1964b) and Nealey and Goodale (1967) measured preferences among compensation factors of known cost. These included pay, pension, life insurance, medical insurance, several types of vacation schemes, and other fringe benefits. When asked to choose among options of known value, preferences were found to be related to age, job level, marital status, and other demographic variables. The results from the first series of these studies led Haire, Ghiselli, and Porter (1963) to comment that some form of "cafeteria" compensation may be a viable alternative to current practices. In general, no single compensation package was found to be highly preferred by more than a moderate sized subset of employees. Clearly, it is naive to expect that an extra week of vacation or a 5% pay raise will uniformly

result in more effective work performance, lower turnover, or even improved job satisfaction.

Unfortunately the methodological advances represented by this work have thus far been limited only to pay and benefit factors that are reduceable to cost units. The influence of type of work, co-workers, supervision, working conditions, and other noneconomic factors could not be dealt with in the same fashion because they could not be quantified and specified in comparable scale units. Yet these noneconomic factors clearly are of major importance in determining attitudes and behavior in most work roles. (See Dubin, 1965, and Sales, 1966, for general reviews of this literature.) In fact, studies by Ewen, Smith, Hulin, and Locke (1966), Graen (1966), Graen and Hulin (1968), Hulin and Smith (1967), and Wernimont (1966) have shown that intrinsic factors account for more of the variance in job satisfaction than do extrinsic factors.

The central measurement problem then is how to specify these intangible noneconomic factors so they can be directly compared with each other and with economic compensation factors.

METHOD

Measurement Technique

A new methodology for comparing the importance of several work factors was recently devised by the author. It involves a two-phase data collection technique in which preferences are measured among several examples of each work factor (several types of work, several supervisors, etc.). Work factors are then combined to generate composite jobs, and preferences among these composite jobs are measured. Inferences about the relative importance of job factors are made by comparing the power of each factor to predict preferences for the composite jobs. In the present project, such inferences have been based primarily on multiple regression analyses.

To take a mundane example of how the method works, let us assume the problem is one of discovering whether the type of liquor or the type of mix is the more important in determining preferences for mixed drinks. Preference for liquors alone and mixes alone would be measured. Then preferences would be measured for the composites formed by pairing liquors with mixes. The final step is to compare the predictive power of the preference values of liquor versus those of mix. If mixed drinks containing highly preferred types of liquor are preferred regardless of the preference values of the mixes paired with them, then one could conclude that liquor is more important than mix in determining preferences for mixed drinks.

In the present study, four job factors -- type of work, supervision, co-workers, and pay -- were involved. The objective of the study was to determine the relative importance of these four factors as seen by Navy enlisted personnel in accounting for three types of job-related behavior -- reenlistment, productivity, and job satisfaction.

Subjects

The respondents in the present study were 188 enlisted men aboard a U.S. Navy destroyer during an extended stay in home port. They ranged in rank from unrated seaman to first class petty officer. All had been aboard the ship at least 60 days before the study was carried out. Six stratified random samples were drawn from the approximately 230 enlisted men aboard ship. These samples were stratified by rank within job classification (rating) to assure that each sample would represent all the major ratings and would have a spread of ranks within those ratings. Subsequent comparisons of these six samples showed them to be quite similar with respect to the stratification variables. In the first phase of data collection three of the six samples (N = 91) of enlisted men made preference judgments among seven types of work, seven supervisors, and seven sets of co-workers. One of these samples (N = 29) made preference judgments only from the standpoint or focus of perceived influence on reenlistment, while the second (N = 32) responded from the standpoint of perceived influence on productivity, and the third (N = 30) with the focus on job satisfaction.

Work Factors

In order to make job factors specific, seven job ratings aboard ship were chosen as target types of work. These were: Boatswain's Mate (BM), Boilerman Technician (BT), Electronics Technician (ET), Gunner's Mate (GM), Machinist's Mate (MM), Radioman (RM), and Storekeeper (SK). These seven job ratings were chosen from over 20 aboard ship because they were each represented by a number of crewmen and were therefore somewhat familiar to all, and because they involved a range of technical vs. nontechnical work and a range of physical working environments. The highest ranking (lead rated) enlisted supervisor in each of these seven job ratings comprised the

supervision factor. These supervisors held the rank of Seaman First Class or Chief Petty Officer. The seven work groups in these seven job ratings comprised the co-worker factor.

Procedure

Phase I: The paired-comparison method was used to measure preferences among the seven stimuli in each work factor. Preference judgments were then scaled by means of the Thurstone method (see Guilford, 1954) and were expressed as unit normal deviates. The pairs of stimuli were arranged on the questionnaire according to the order developed by Ross (1934). This method balances right and left appearance for each stimulus and maximizes serial separation of stimuli within the questionnaire. Appendix A displays the questionnaire used to measure preferences among types of work from the standpoint of reenlistment. Nine such questionnaires were used in the first phase of data collection (three job factors x three focuses). The fourth job factor, pay, was not subjected to preference judgments in the first phase of data collection since it seemed obvious that larger amounts of pay would be uniformly preferred to smaller amounts of pay. Proponents of pay-equity theory (see Adams, 1963) might question this assumption, but it seemed safe in the Navy setting.

Several additional questionnaires not involved with preference judgments were completed by the 91 respondents in phase one of the study. These included: (1) The Job Descriptive Index (Smith, Kendall, and Hulin, 1969) which measures satisfaction with five areas of the job (work itself, supervision, co-workers, pay, and promotional opportunities). (2) A measure of the perceived behavior of the respondent's supervisor. Twenty-four items (the 12 highest loading and purest loading items on each dimension) were used from the Leadership Behavior Description Questionnaire

(LBDQ), developed at Ohio State University (see Stogdill & Coons, 1957, pp. 108-109). This questionnaire measures the extent to which each respondent sees his supervisor displaying Consideration and Initiating Structure behavior. (3) A measure of esteem and liking for co-workers. This was a 20-item bipolar adjective scale for describing one's co-workers. It was an expanded version of Fiedler's Group Atmosphere Scale (see Fiedler, 1967, p. 269).

Phase II: The second phase of data collection occurred two weeks after the first phase. At this time the remaining three samples of enlisted men (N = 97) made preference judgments among hypothetical composite jobs formed from two work factors. For instance, Chief Petty Officer X would be paired with a 10% pay raise and compared to Chief Petty Officer Y and a 20% pay raise. Since pairing each of the seven stimuli in one factor with each of the seven in another factor would have resulted in 49 composite job stimuli for each pair of factors, the number of composites was reduced by retaining only three stimuli from the lists used in the first phase of data collection. The mean preference scale values that resulted from combining the data from the three focuses in phase one were used to select the three stimuli to be retained from each work factor for presentation in phase two. On each work factor, the stimuli ranked first, fourth, and seventh in preference were retained for formation of the composite stimuli presented in phase two. Figure 1 shows the scaled preferences from the reenlistment focus for types of work and supervisors from phase one. Stimuli from these two scales were combined as indicated by the dashed lines to generate the composite stimuli used in the phase-two questionnaire displayed in Appendix B. The six composite stimuli used in this questionnair were formed by pairing the top stimulus from the first scale with the middle

and bottom stimuli from the second scale. The middle stimulus from the first scale was paired with the top and bottom from the second, and the bottom stimulus from the first scale was paired with the top and middle stimuli from the second. As Appendix B shows, these two-factor composites of jobs and supervisors were then put into a paired comparison format for preference judgments as in phase one.

---

insert Figure 1 about here

Three levels of pay were chosen arbitrarily to equal 20% pay raise, 10% pay raise, and present pay level. There were thus four job factors, including pay, involved in phase two. These four factors taken two at a time to form composites yielded six questionnaires of the type shown in Appendix B for each of the three focuses. There were thus 18 phase-two questionnaires in all. Once again, the three separate sets of questionnaires involving the three focuses of reenlistment, production, and job satisfaction were answered by separate phase-two samples of enlisted men.

All preference judgment questionnaires were administered by the author, aboard ship, in groups ranging in size from two to fifteen. The author introduced himself to each group and made it clear he was a non-military, university-based researcher; that the responses would be seen by no one but the author and his assistant; that the results would be applied to the solution of a long-standing measurement problem; and that they would not be used to change anything in the immediate situation. In other words, every attempt was made to explain the basic nature of the research. Questions were encouraged. Respondents were asked to sign their questionnaires and were assured that participation was not manditory. Only one respondent asked to be excused. Before any data were collected the author explained

the study to the seven target supervisors and obtained their consent to go ahead.

In summary, the procedure involved: (1) scaling preferences among stimuli from each of the job factors, (2) combining stimuli from two job factors to form composites, (3) scaling preferences among these composites of job factors, (4) using the scale values obtained from step 1 to predict the scale values obtained from step 3, and (5) comparing the relative contributions of the four job factors to the predictions involved in step 4.

RESULTS AND DISCUSSION

Phase I Preferences

The scaled preference values of the stimuli presented in phase one are displayed in Figure 2. Scales 1, 2, and 3 show preferences among types of work, supervisors, and groups of co-workers respectively. These three scales represent the combined judgments of 262 respondents who made preference judgments from the reenlistment focus. Stimuli have been identified in all cases by the name of the job rating. In other words, BT on scale 2 stands for the Boilerman Technician supervisor while BT on scale 3 stands for the work group of Boilermen Technicians. Scaled preference values from the production focus are shown in scales 4, 5, and 6, while the results from the job satisfaction focus are displayed in scales 7, 8, and 9.

insert Figure 2 about here

Examination of Figure 2 suggests that considerable halo was operating from one job factor to another. That is, the job of BT (Boilerman) was least preferred just as was the BT supervisor and the BT work group. In the same vein the job of ET, the ET supervisor, and ET work group were all high in preference.

Halo across job factors in the current context is a problem similar to the confusion between jobs and job holders that often confounds merit rating and job evaluation programs. In a study of the perceptions of jobs vs. job holders, Triandis (1959) found that most repondents saw the two as completely fused.

Another feature of note in Figure 2 is the extent to which scale values from the three work factors differ in range. The range of scale values is somewhat larger in the case of work than in the case of supervisors and

co-workers. This may suggest that types of work were more distinct as stimuli than were supervisors and work groups. It may also suggest greater agreement across respondents that certain stimuli were preferable to others. Scales 3 and 6 show a rather striking pattern of preferences for work groups. In both cases the BT work groups was singled out as quite low in preference while the six other work groups were quite similar in preference.

In order to gain some perspective on the similarities across work factors within each of the three focuses and also on differences from one focus to another, the nine scales of preference shown in Figure 2 were intercorrelated. The resulting 36 correlations are shown in Table 1. Correlations have been displayed in the form of a multi-trait multi-method matrix (see Campbell and Fiske, 1959). Each correlation in Table 1 represents an N of seven, but of course the scale values that were used to calculate the correlations come from a minimum of 26 respondents. Since the three work factors were judged by three separate samples from different focuses, Table 1 might be dubbed a "multi-factor multi-focus matrix."

---

insert Table 1 about here

The correlations in the multi-factor mono-focus triangles (solid lines) involve job factor intercorrelations from a single focus. These correlations could be seen as an index of halo. It appears that type of work and work group were seen as very similar. The supervisor factor was somewhat more distinct. The correlations in the principal diagonals of the matrix can be thought of as mono-factor multi-focus values (enclosed in parentheses) These correlations show the considerable similarity in preferences across focuses. The possible reasons for this similarity across focuses will be discussed more fully in a later section.

Campbell and Fiske (1959) set forth several guidelines for separating trait variance (job factor variance) from method variance (focus variance) to infer construct validity from the multi-trait multi-method matrix. In these terms, the present three job factors appear to have at least marginal convergent as well as discriminant validity in spite of the evident halo operating among them. Not only are the correlations in the principal diagonals highly significant, but they are generally higher than those in the solid triangles and in the rows and columns of the multi-factor multi-focus triangles (dashed lines). In addition the pattern of correlations in all the triangles is nearly identical.

The scales of preference in Figure 2 reflect the mean preferences within each of the three samples in stage one of the study. Such scales of preference may be of interest as diagnostic tools much as job satisfaction surveys are often used to diagnose trouble spots in organizations. Job factor preference data can be displayed to show the preferences of selected subgroups, and thereby become a more selective diagnostic tool. As an illustration of this approach, Figure 3 shows the scales of preferences of two subgroups aboard ship -- nine Boilerman Technicians (scales 1, 2, and 3) and ten Machinists Mates (scales 4, 5, and 6). In order to obtain sufficiant numbers for these analyses, BT and MM respondents from all three of the phase one samples were pooled. Figure 3 thus reflects preferences from a mixture of the reenlistment, production, and job satisfaction focuses.

insert Figure 3 about here

The preferences of BTs and MMs shown in Figure 3 differ from those shown in Figure 2 in several rather dramatic respects. A major question concerns the way in which respondents evaluate their own type of work,

supervisor, and co-workers. It appears that BTs evaluate their own situation much more highly than do others on the ship. Scales 1, 2, and 3 in Figure 3 show that BTs see their own work as intermediate in preference, and their own supervisor as highest in preference. They see only the MM work group as more preferred than their own. Machinists Mates also evaluate their own work very highly (see scale 4), but they clearly do not show the enthusiasm for their own supervisor (see scale 5) that the whole ship does. Instead the MMs see the BT supervisor as highly preferred. By contrast the BT supervisor was lowest in mean preferences in the judgment of the whole ship (see Figure 2). Comparison of the relative standing of BTs and MMs on scales 3 and 6 shows the views held of own versus other work group. The BT respondents saw the MM work group as slightly more attractive than their own (scale 3), but this outward orientation was not reciprocated by the MM respondents (scale 6) who saw their own work group as highly attractive and the BT work group as rather unattractive. Comparisons like these, if drawn for a number of work groups, would amount to a sort of "group sociometric" analysis.

Phase II Preferences

Three stimuli each were selected from the work, supervisor, and co-worker job factors involved in phase one of the study. These stimuli, together with three levels of pay, were combined to form two-factor composites. The four job factors -- work, supervisor, co-workers, and pay -- taken two at a time resulted in six sets of composite stimuli. Each of these sets involved six composite stimuli. The six stimuli within each of the six sets of composites were arranged in a paired comparison format and submitted to preference judgments. These six sets of composites were

judged by the three phase-two samples from the focuses of reenlistment, production, and job satisfaction just as in phase one.

The scales of preference from the phase-two judgments from the reenlistment focus are shown in Figure 4. Scale 1 in Figure 4 shows that combining the Storekeeper (SK) supervisor with a 20% pay raise was seen by the 32 respondents in the reenlistment sample as having the most appeal in terms of influencing them to reenlist. The combination of the Radioman (RM) supervisor with zero pay raise was seen as having the least appeal of the six composites of supervisors and pay. The combination (RM, 10%) was next highest in preference. The perceived importance of pay is readily apparent in this scale.

insert Figure 4 about here

Careful examination of scales 1, 5, and 6 of Figure 4 will show that the difference between zero pay raise and 10% pay raise, holding constant the other factor in the composites, was always greater than the preference difference between 10% and 20% pay raise. It appears that a 10% raise compared to no raise had more appeal than a 20% raise compared to a 10% raise. This result suggests that preference scaling of the attractiveness of various amounts of pay raise might show that successive amounts of raise are seen to have decreasing marginal utility. That is, "A pay increase of size X is an improvement over my present situation, but the improvement derived from an increase of size 2X is not twice as great as X." These results are in agreement with Fechner's Law (see Guilford, 1954, Chapter 2) and should come as no great surprise.

Of course, the results from the non-pay job factors shown in Figure 4 can be subjected to interpretations comparable to those above involving pay.

Looking again at scale 1 on the extreme left, it can be seen that a 20% pay raise when paired with the SK supervisor was much preferred to a 20% raise when paired with the BT supervisor. This difference was of course also reflected in Figure 2 in the relative scale values of these two supervisors.

Considering Figure 4 as a whole, those composites that included pay showed wider preference dispersions than those composites that did not include pay. Again, this may reflect greater agreement among the respondents that more pay is beneficial. One might reasonably expect less widespread agreement among respondents that a given job or supervisor or work group is beneficial. If this interpretation is correct, it suggest that across respondents pay operates more broadly as an incentive than do the other job factors. The suggestion by Opsahl and Dunnette (1966) that money may operate as a generalized conditioned reinforcer or conditioned incentive might help to explain its broad appeal.

The phase-two preference scales from the production focus sample are shown in Figure 5, while those from the job satisfaction focus are displayed in Figure 6. These data will not be discussed in detail since they are subject to interpretations comparable to those made above of the data shown in Figure 4. Inspection of Figures 4, 5, and 6 show substantial similarities in preference ordering across the three focuses. Of course, there are differences too. For instance, the generalization that the difference between 0% and 10% pay raise is greater than that between 10% and 20% pay raise does not always hold true in Figures 5 and 6 as it does in Figure 4.

---

insert Figures 5 and 6 about here

Transitivity of Preference Judgments

In order to have confidence in the preference judgments which constitute the major results from the present approach, the data should be examined for transitivity of judgments. Torgerson (1958, pp. 27-29) cites transitivity as the only testable criterion of an ordinal scale. Circular triads of preference (the case where A > B and B > C but C > A) are an indication of lack of transitivity. Circular triads in a set of paired-comparison judgments can be calculated and compared to sampling distributions of circular triads. If the obtained number of circular triads exceeds a certain value, one looses confidence that the data have acceptable transitivity and thus ordinal scale properties. Kendall (1962) has provided distributions of circular triads appropriate to the data of phases one and two where the number of stimuli are seven and six respectively.

The obtained number of circular triads from both phase one and phase two are presented in Table 2. Each cell entry in Table 2 represents the number of circular triads committed by the sub sample that responded to the section of the questionnaire represented by that row and column. These entries can be compared to Kendall's distributions by calculating the mean number of circular triads per respondent within each cell of the table. Since no cell frequency exceeds the N of the sample, mean circular triads per respondent was in every case less than one. In fact this value reached a maximum of .687 for the data in Table 2. This value corresponds to a tabled probability of less than .02 from Kendall's Table 9. In other words, in even the least transitive set of judgments in either phase, one can reject the hypothesis that preference judgments are random with greater than 98 percent confidence. This probability value is far beyond the 99 percent level for all but a few cells of Table 2.

Insert Table 2 about here

Based on the above results it seems safe to declare the preference judgments obtained by the present method to be highly transitive and to possess at least ordinal scale properties. It also seems safe to say that the present judgmental task involves primarily unidimensional judgments.

Whether the scales of preference obtained by the present method satisfy the criteria for equal interval scales remains an open question. The critical question is whether obtained paired comparison judgments satisfy the assumptions of Thurstone's law of comparative judgment (see Guilford, 1954, Chapter 7 and Torgerson, 1962, Chapter 9). This problem was thoroughly explored by Nealey (1964b) with data similar to those of the present study with inconclusive results. Repeating such analyses did not seem justified in the present case since paired comparison preferences expressed as unit normal deviates are commonly assumed to be a fairly close approximation of equal interval scales.

The circular triads displayed in Table 2 can be used to determine whether the degree of transitivity is greater in certain focuses or with certain job factors. Since transitivity was high throughout Table 2, one would not expect startling differences, but certain patterns are evident. In both phase one and two, the greatest number of circular triads occured in the retention focus (see column totals in Table 2). The fewest circular triads occured with the job satisfaction focus in phase one and with the production focus in phase two. The differences in circular triads by focus were tested by means of Chi Square. The results of these Chi Square tests are reported in Table 3. The differences by focus were not significant at the five percent level in either phase of data collection.

insert Table 3 about here

Table 2 shows a consistent pattern of circular triads across the job factors. These differences were not significant in phase one, but were highly significant in phase two (see Table 3). The composites involving pay resulted in the fewest circular triads, followed by work, supervision, and co-workers.

In summary, the preference judgments in both phase one and phase two were highly transitive. There is strong evidence that the resulting preference scales have at least ordinal scale properties and are not markedly multidimensional. The judgments from the three focuses did not differ significantly in transitivity, but there were significant differences in the phase-two results across job factors. Pay was the most transitive job factor while co-workers was the least transitive factor.

The Relative Importance of Job Factors

The central question asked of the present data remains to be dealt with: "How can the relative importance of job factors be inferred?" This question was approached by using the unit normal scale values obtained in phase one as predictors in a multiple regression model to predict the composite scale values obtained in phase two. Figure 7 illustrates this approach applied to the prediction of the phase-two preferences for composites of jobs and supervisors. The phase-one scale values of jobs and supervisors serve as predictors. In this approach, $N = 6$, the number of phase-two composites. Therefore, six predictor scale values were also needed from each of the two job factors used as predictors. This was accomplished by using each phase-one predictor scale value twice. For instance, the phase-one scale value of the ET job was used to predict the phase-two

composite (ET, SK) and also the composite (ET, BT). The analysis shown in Figure 7 yielded a multiple correlation (R) equal to .962, $p < .01$. The standardized beta weights were 1.060[3] for type of work and .275 for supervision. The difference in size of these beta weights indicates that type of work was somewhat more important than was supervisor, in predicting preferences for composites of work and supervision. Visual inspection of Figure 7 leads to the same conclusion. The dashed lines in Figure 7 connect each phase-two composite scale value to the scale values of its components obtained in phase one. Note that the dashed lines connecting work with composites are somewhat more horizontal than those connecting supervisor with composites. In other words, the scale value of the composite was determined largely by the scale value of its work component.

insert Figure 7 about here

The relative importance of work versus supervision in predicting the composite scale values shown in Figure 7 can be inferred by several means other than the relative size of standardized beta weights. One of the most promising techniques involves part correlation. Darlington (1968) recommends this technique (see McNemar 1962, p. 167 for calculating routine). Briefly, part correlation differs from partial correlation in that the former leaves the criterion intact while removing from each predictor the variance it has in common with other predictors. Partial correlation removes the covariance of each predictor with other predictors and also the covariance of other predictors with the criterion. In the present situation, one wishes to infer the contribution to prediction of the intact criterion (phase-two scale values) by that portion of each predictor which is unique to it. Part correlation is thus the method of choice.

For the data of Figure 7 the part correlation of work with the phase-two scale values is .938, while the comparable value for supervisor is .245. One advantage of the part correlation approach is that one can square the part correlation to obtain a coefficient of determination and thereby estimate the amount of criterion variance accounted for by the various predictors. The coefficients of determination for the part correlations given above are .880 for work and .060 for supervisor. In these terms, the superiority of the work factor relative to the supervisor factor in predicting the composite scale values is even more dramatic than is the case if beta weights are compared.

Figure 7 illustrates the prediction of only one of the six scales of preferences among composites obtained from the reenlistment focus in phase two. The results for all six scales are displayed in Table 4. Column 1 of Table 4 shows the correlations between the phase-one scale values of single job factors and the phase-two scale values. The relative size of these pairs of correlations is another indication of the relative importance of the job factors in each pair in predicting phase-two scale values. In predicting preferences for the supervision-pay composite, for instance, the pay values alone correlated .792 with the composite scale values; whereas supervision by itself was correlated only .072 with the composite.

insert Table 4 about here

The correlations in column 2 of Table 4 were calculated by summing the two phase-one scale values that made up each composite stimulus and correlating the resulting six sums with the six phase-two scale values. These Pearson correlations could not be calculated for composites involving the pay factor because pay was not scaled in phase one. The "additive" correla-

tions are smaller than the multiple correlations, but not strikingly so except in the case of the composite of supervision and co-workers (r = .711, R = .961).

Column 3 of Table 4 lists the multiple correlations between the phase-one scale values and the scale values of the phase-two composites. All were above .9 and all were significant beyond the .01 level in spite of the small number (N = 6 scale values) involved. The six pairs of standardized beta weights are displayed in column 4. The work-supervision beta weights illustrated in Figure 7 differed greatly in size, while the work-pay beta weights, .923 and 1.014 respectively, were nearly the same size. The relative size of the beta weights, rather than their absolute size, is the result of interest here. Column 5 of Table 4 lists the part correlation of each job factor with the composite, and column 6 shows the coefficient of determination of each of these part correlations.

The results showing predictions of phase-two composites from the production and job satisfaction focuses are given in Tables 5 and 6 respectively. As was true generally in the present study, comparison of Tables 4, 5, and 6 will not show striking differences across focuses. The one exception to this generalization is that the supervision factor was a better predictor in the production focus (Table 5) than it was in either the reenlistment or job satisfaction focus.

---

insert Tables 5 and 6 about here

A problem with the procedure used in the current study is that it enables one to make inferences about the relative importance of pairs of factors, but not about all the factors taken together. This latter question is the one that needs answering. It would be surprising if job-relevant

behavior such as reenlistment or productivity depended on only supervision and pay, or only type of work and co-workers. In the present study, composites were restricted to three stimuli from each of two job factors to avoid the vast proliferation of composites that would occur if all the stimuli from each job factor were used to generate four-factor composites. Future research should examine multi-factor composites by employing psychophysical methods more practical with large numbers of stimuli than is the paired-comparison method. (See, for instance, Jones and Jeffrey, 1964; and Gulliksen and Tucker, 1961.)

Since multi-factor composites were not used in the present study, comparisons of all four job factors at once must be done artificially. This has been accomplished by calculating the mean beta weight of each job factor. For instance, Table 4 lists three beta weights for the supervisor factor (.536, .415, and .275). The mean of these three values (.409) can be compared to the mean of the three betas for co-workers (.887). The conclusion is that the co-worker factor is somewhat more important in predicting composites in the reenlistment sample than is the supervisor factor. Mean beta weights for all three focuses are both tabled and scaled in Figure 8. The order of importance of job factors is identical for the reenlistment and job satisfaction focuses. In both, work was the most important factor and supervisor the least important. For the production focus, pay was slightly more important than work. Supervisor, while still the least important factor, was closer to the other factors in importance than was true of the reenlistment and job satisfaction focuses.

---

insert Figure 8 about here

The coefficients of determination of part correlations from Tables 4, 5, and 6 were also combined by calculating mean values. These means are both tabled and scaled in Figure 9. The high degree of similarity between the results reported as mean beta weights and as mean coefficients of determination lead one to the conclusion that these two methods of inferring relative contribution to prediction are quite similar.

---

insert Figure 9 about here

Caution should be exercised in taking the results shown in Figures 8 and 9 as an indication of the relative influence of these four job factors in general. One difficulty with specifying and quantifying job factors is that general interpretations are then risky. As previously noted, the influence of any factor in contributing to preference for a composite is partly a function of its perceived variability within the situation in which it operates. Aboard the present destroyer, the variability in attraction among the seven job ratings picked for analysis was greater than the perceived variability of the seven supervisors in those ratings (see Figure 2). When combinations of work and supervisors were then formed into composites, work was the more important factor. Aboard another destroyer, one might or might not find a similar pattern. The arbitrarily chosen range of pay raise (0% to 20%) appears from Figures 8 and 9 to have usually been less important than the range of types of work. This does not mean that work is generally more important than pay. Increasing the range of pay involved would surely increase its contribution to the prediction of preferences for composite job situations.

One final point should be made regarding Figures 8 and 9. Adding the beta weights and coefficients of determination implies a unidimensionality

in combining these four job factors that may not in fact exist. We would not expect respondents to choose among supervisors or sets of co-workers in the same fashion they do among brands of beer or toothpaste. Specifically, money as a reward may operate differently depending on what goes with it. In other words, job factors may interact to determine response. There is some evidence in the present results that pay interacts with other factors, particularly in the reenlistment focus. Figures 8 and 9 show that for the reenlistment focus, work is more important overall than is pay. However Table 4 shows that when only these two factors were compared, pay had a higher beta weight and coefficient of determination than did work. Furthermore, pay was more important than the co-worker factor overall, but less important than co-workers when only these two factors were involved. A clinical interpretation of these patterns of choice might be that respondents would take a less preferred job for more pay, but more pay would not induce them to work with people they do not like.

The problem, of course, is to discover the way in which these factors are combined in the respondent's decision system when he actually faces the reenlistment situation, or when he responds to productivity demands. The form of combination may differ for the three focuses of the present study. The interactions noted above, of pay with work and co-workers in the reenlistment focus did not occur for the production and job satisfaction focuses.

An alternative possibility is that the individual's decision system does not combine factors at all, but rather takes them into account in a probabilistic fashion, perhaps in response to internal or environmental changes. Perhaps factor A determines the decision today, but if the decision had come up tomorrow, factor B would have been decisive. There must

surely also be individual differences in the way decision systems operate. Perhaps some people do combine factors and others usually do not.

Throughout this paper, interpretations have been based on the combined preference judgments of the whole sample in a certain cell of the design. From the standpoint of taking corrective action in the organization, however, group means give only part of the picture. If a market researcher discovers that chocolate is the most preferred flavor of ice cream, he does not recommend that future ice cream production be limited to chocolate. He must discover which segments of the market are good bets to buy the other flavors and in which amounts. Similarly, it is necessary in the context of the present data to analyze individual differences in preferences. Figures 7 and 8 indicate that a 0 to 20% range of pay raise is about as important as the difference between the job of Boilerman Technician and Electronics Technician (the lease and most preferred jobs). In order to make the Navy more attractive, certain jobs (e.g. Boilerman Technician) might be redesigned if they are seen as bad duty by everyone. On the other hand, more job transfers might be the strategy of choice if a job is seen as desirable by some but not by others. Reference again to Figure 3 shows this to be the case. Boilermen Technicians (BTs) showed a markedly different pattern of preferences from those of Machinist's Mates (MMs) and also from those typical of the whole phase-one sample. A thorough analysis of these individual differences in preferences should make more clear what corrective action -- more pay, job redesign, more training, transfers, etc. -- will be most appropriate with various subgroups of enlisted men.

Analysis of Subgroup Preferences

Since the primary objective of the present study was to try out a new measurement approach, detailed analysis of subgroup preferences is beyond its

scope. The analyses to be reported in this section represent only a start in the direction of thorough analysis of subgroup preferences. It seems important to make some tentative approaches to subgroup analyses, however, since the ultimate practical usefulness of the present measurement approach probably rests on the success with which the determinants of job preferences and patterns of job factor importance can be isolated. The identification of subgroups of respondents with distinct preference patterns would appear to be a fruitful place to start.

Figure 3 represents one approach to subgroup preference analysis. It involves examination of the preferences of groups from different job classifications. This approach is similar to that of Nealey (1963, 1964a), Jones and Jeffrey (1964), and others who have examined preferences among job factors as a function of demographic and attitudinal variables.

A somewhat different approach, the one to be employed here, involves isolating subgroups of respondents with similar preference patterns. These subgroups then must be identified or interpreted to discover the psychological meaning of the preference pattern. Once again, the objective of these analyses is to identify individual differences in patterns of preference among job factors so that personnel practices may be applied selectively.

The raw data for these analyses were the preferences among types of work, supervisors, and groups of co-workers of the phase-one sample of 91 respondents. The preferences of the samples from the three focuses of reenlistment, production, and job satisfaction were combined for the present purpose in order to increase sample size. This blurring of focus is probably not a serious handicap in these analyses, given the rather small observed differences in preference across focuses (see Figure 2). The phase-one paired-comparison preferences were expressed as vote counts for these analyses.

Vote counts are the raw preference data from each individual from which the unit normal scale values for groups are calculated.

The matrix of vote counts from over 91 respondents for the 21 stimuli (seven from each of the three job factors) of phase one was multiplied by its transpose. The resulting matrix of sums of squares and cross products was subjected to a principal axis components analysis. Sums of squares were retained in the diagonal. The eigenvalues and percent of total variance associated with the first ten of the 21 components that resulted are shown in Table 7. Six orthogonal components accounted for 82 percent of the variance in the original matrix. No more than six factors were retained because the difference in magnitude of successive pairs of eigenvalues dropped markedly beyond six factors, and remained uniformly small.

insert Table 7 about here

An Eckert-Young (1936) resolution was performed on the matrix of loadings on the components to obtain loadings for respondents on each of the six components. In other words, six "person dimensions" or "person factors" were identified. In order to give these six person factors psychological meaning, the factor loadings of the 91 respondents were correlated with 13 individual difference variables. These included the respondent's satisfaction with five aspects of his job and his total job satisfaction, the extent to which the respondent saw his supervisor as considerate and as initiating structure, his rating of the group atmosphere in his workgroup, his rank, the number of months he had been aboard the ship, the number of months until his current duty obligation ended, and his total length of Navy service. The resulting intercorrelation matrix of individual difference data by scores on the principal components was rotated to the varimax criterion of

simple structure to allow easier interpretation of the six person dimensions. Table 8 shows the varimax rotated matrix of correlations or loadings of the individual differences variables on the six person factors. The eigenvalues and the percent of total variance accounted for by each of the six varimax rotated factors is shown at the bottom of Table 8. Loadings exceeding .2 have been underlined for easier interpretation.

---

insert Table 8 about here

The person factors of Table 8 may be interpreted fairly easily. Briefly, the first person factor has high loadings on satisfaction with supervision and promotional opportunity. Also, the higher a person's loading on the first person dimension, the more he sees his own supervisor as being both structuring and considerate. Months aboard the ship also correlates with the first factor. It may be appropriate to conceptualize the first dimension as a continuum involving adaptation to the supervised aspects of the job situation. In other words, respondents who have been on the ship for a considerable time, have structuring and considerate supervisors, are satisfied with them, and take a positive view of their chances of getting ahead have in common a preference pattern characterized by high loadings on the first person factor.

The second person dimension is characterized by respondents who have achieved some rank even though they have been in the Navy a short time and have quite a few months to go before their current duty tour ends. This factor might be dubbed the "young achiever" factor and is probably characterized by respondents who have received training at a Navy technical school (which helps advance them in rank) before joining the ship. The third factor appears to be involved with satisfaction with co-workers and total job

satisfaction, while the fourth person dimension is defined by satisfaction with pay and positive group atmosphere. The fifth and sixth person factors are defined by satisfaction with work and promotion respectively.

From the preceding analyses it is evident that patterns of preferences among the 21 job factor stimuli may be used to differentiate among respondents. Preference patterns were linked to attitude and demographic variables, although the moderate size (maximum loading was only .40) of the marker variable loadings in Table 8 indicates that a large portion of the variance in the original preferences is unrelated to the 13 individual differences variables presently measured.

Examination of the phase-one preferences made it clear that a respondent's current job situation was an important determinant of his preferences among the 21 stimuli of phase one. The contrast between the preferences of BTs and MMs, shown in Figure 3, is an illustration of this. It was decided therefore to attempt to use the six person factors to discriminate among the various job classifications represented in the phase-one sample. Twenty ratings (job classifications) were identified in which at least two members of the sample held membership. Within each of these subgroups the respondents performed the same type of work in the same work group under the same supervisor. Eighty-four of the 91 phase-one respondents were involved in these 20 subgroups. The other seven respondents were scattered among seven additional ratings. The factor loadings of these 84 respondents on the six person dimensions were subjected to discriminant analysis to discover the extent to which these preference patterns could discriminate between respondents from the 20 different job ratings.

Table 9 presents the eigenvalues and percent of variance accounted for by each successive function. Four functions account for 92 percent of the

between group variance and will be retained for interpretation. Table 10 shows the loadings of the six person factors on the four discriminant functions. The first function identifies persons who load positively on the first person factor and negatively on the second person factor. The second discriminant function identifies persons who load on factor three, while the third function discriminates persons who load on factors five and six. Finally, the fourth function identifies persons with high loadings on the fourth person factor, although the fifth and sixth person factors are also represented on this same function.

---

insert Tables 9 and 10 about here

The reader will probably agree that Table 10 is not overly rich in psychological meaning. To provide an interpretative avenue it was necessary to discover the psychological meaning of the jobs being discriminated by the four discriminant functions. Then the discriminant functions can be interpreted by relating them to the characteristics of the jobs among which they are discriminating.

The first step in giving psychological meaning to the jobs was to construct a one paragraph job description of each job. The Navy's Enlisted Occupational Handbook (1966) was the major source for this brief description. Only sixteen of the 20 jobs used for the discriminant analysis were retained for this purpose, since four jobs involved general classifications such as "seaman" for which no occupational job description applied. These 16 job descriptions were then presented to the author's upper division class in industrial psychology. Each of the 16 jobs was rated by six students in this class on seven bipolar eight-point scales. These a priori scales were as follows: indoor-outdoor, skilled-unskilled, active-inactive, technical-

untechnical, much responsibility-little responsibility, mechanical-unmechanical requires much independent action-requires little independent action. As a result of these ratings each job was assigned a mean value (the mean of the six raters) on each of these seven descriptive scales. In other words, the differences among these 16 jobs were quantified by means of these seven descriptive scales.

The means of the 16 jobs on these seven descriptive scales were then correlated with the means of the 16 corresponding subgroups on the six discriminant functions. Table 11 presents the results. Each correlation represents an N of 16 groups. Correlations above .3 have been underlined for convenience. It is evident that the higher the group mean on the first discriminant function, the greater the degree to which that job was judged as unmechanical ($r = -.59$) and the greater the degree to which that job was judged as requiring independent action ($r = .31$). In other words, the first discriminant function identifies respondents who have unmechanical jobs, and jobs that require much independent action.

Group means on the second discriminant function correlated substantially with three characteristics. Jobs with high means on this second discriminant function were judged to be indoor, inactive, and characterized by little responsibility. The third discriminant function appeared to identify jobs that required little independent action. The fourth discriminant function was more complex. It identifies jobs judged to be outdoor, untechnical, and lacking in responsibility.

Once again, the need to discover the determinants of subgroup preferences among job characteristics is important as a step toward application. One might hypothesize that preferences are determined in part by environmental components and in part by personal components. The environmental components

include present job demands and characteristics (skill required, responsibili involved, etc.), while personal components include frame of reference, personality, ability, and beliefs and values which serve to shape work preferences.

The four discriminant functions that emerged from the present analyses were fairly effective in identifying the six person factors based on preferen patterns (see Tables 9 and 10). These discriminant functions also showed substantial correlations with judged job characteristics (Table 11).

insert Table 11 about here

These results taken together indicate that environmental determinants, particularly one's current job, are quite important in shaping preferences among the 21 stimuli of phase one. Further development of the subgroups analysis techniques explored in the present study could provide information of value in selectively modifying current work environments to meet expressed subgroup preferences.

Another sort of potential application involves modification of the work environment to meet preferences based on personal rather than environmental determinants. Personal characteristics should be measured at time of induction to avoid their contamination by the work environment experienced after induction. Had it been possible to measure such variables for the present sample of respondents, discriminant analysis could have been applied to discover if current preference patterns could discriminate personal characteristics that are independent of the work environment. Such information could be used to modify the present system in a selective manner, or it could be used to help select and place new personnel in locations within the system likely to satisfy their work preferences. Current research is proceeding along these lines.

SUMMARY AND CONCLUSIONS

The present method with its two-phase data collection procedure provided results that permit somewhat more direct comparisons between economic and non-economic job factors than was the case with previous approaches to measuring the relative importance of job factors. The preference results from phase-one showed that types of work aboard the present destroyer differed more widely in preference than did supervisors and groups of co-workers. Respondents from different job classifications showed markedly different patterns of preferences, indicating that current job situation was a major determinant of preferences. This conclusion was reinforced by the fact that person components based on patterns of preference were successful in discriminating among respondents from various job classifications. These person components were also related to rated characteristics of occupational classifications.

Preferences among the phase-one stimuli obtained from independent samples responding from the standpoints of reenlistment, willingness to produce, and job satisfaction were strikingly similar. This similarity across focuses may indicate that these three classes of job-related behavior are determined in common by a unitary core of attitudes about the work environment. On the other hand, even though the samples for the three focuses were given separate response sets, perhaps these sets were not made salient enough by the present methodology to insure that respondents retained their different sets as they proceeded with the preference judgments. Current research is examining this possibility.

Preferences for types of work supervisors, and co-workers showed a high degree of halo, in that stimuli from a single job classification tended to be evaluated similarly.

An analysis of circular triads in the preference judgments from both phases showed the data to be highly transitive. It appeared therefore that the judgments approximated unidimensionality.

A comparison of the relative contribution of the four job factors to the prediction of preferences for composites of job factors was used to make cautious inferences about the relative importance of these factors to the three classes of job-related behavior. It was concluded that type of work appeared most important followed closely by a 0-20% pay raise and then by co-workers. The importance of supervision appeared to be somewhat less than the other three job factors in the present sample, although supervision was somewhat more important to production than to reenlistment or job satisfaction.

In order for results from the present methodology to be of practical value in the formation of personnel practices, the determinants of individual and subgroup preferences need to be more fully explored. The present data base allowed the generalization that current work environment was an importan preference determinant. A richer set of individual difference variables needs to be obtained to discover how important personal attitudes, particularly pre-induction attitudes, are in determining preferences among work settings. The present method of measuring preferences did not allow inferenc about the relative importance of job factors for <u>individuals</u> in the sample. Current research is exploring a way to accomplish this. Such data for individuals, paired with a richer set of individual determinants of work preferences, should open the way to rather powerful personnel strategies of selection, placement, and modification of current work systems.

References

Adams, J. S. Toward an understanding of inequity. Journal of Abnormal Social Psychology, 1963, 67, 422-436.

Campbell, D. T. and Fiske, D. W. Convergent and discriminant validation by the multitrait-multimethod matrix. Psychological Bulletin, 1959, 56, 81-105.

Chant, S. M. F. Measuring the factors that make a job interesting. Personnel Journal, 1932, 11, 1-4.

Darlington, R. B. Multiple regression in psychological research and practice. Psychological Bulletin, 1968, 69, 161-182.

Dubin, R. Supervision and productivity: empirical findings and theoretical considerations. In R. Dubin, G. C. Homans, F. C. Mann, & D. C. Miller, Leadership and productivity. San Francisco: Chandler, 1965.

Eckert, C. and Young, G. The approximation of one matrix by another of lower rank. Psychometrika, 1936, 1, 211-218.

Evans, C. E. and Laseau, LaVarne N. My job contest. Personnel Psychol. Monogr., 1950, No. 1.

Ewen, R. B., Smith, P. C., Hulin, C. L., and Locke, E. E. An empirical test of the Herzberg two-factor theory. Journal of Applied Psychology, 1966, 50, 544-550.

Fiedler, F. E. A theory of leadership effectiveness. New York: McGraw-Hill, 1967.

Graen, G. B. Addendum to "An empirical test of the Herzberg" two-factor theory." Journal of Applied Psychology, 1966, 50, 551-555.

Graen, G. B. and Hulin, C. L. Addendum to Hulin and Smith. Journal of Applied Psychology, 1968, 52, 341-342.

Guilford, J. P. Psychometric methods. (2nd ed.) New York: McGraw-Hill, 1954.

Gulliksen, H. and Tucker, L. R. A general procedure for obtaining paired comparisons from multiple rank orders. Psychometrika, 1961, 26, 173-183.

Haire, M., Ghiselli, E. E., and Porter, L. W. Psychological research on pay. Industrial Relations, 1963, 3, 3-8.

Herzberg, F., Mausner, B., Peterson, R. O., and Capwell, Dora F. Job attitudes: review of research and opinion. Pittsburgh: Psychological Service of Pittsburgh, 1957.

Hulin, C. L., and Smith, P. A. An empirical investigation of two implications of the two-factor theory of job satisfaction. Journal of Applied Psychology, 1967, 51, 396-402.

Jones, L. V. and Jeffrey, T. E. A quantitative analysis of expressed preferences for compensation plans. Journal of Applied Psychology, 1964, 49, 201-210.

Jurgensen, C. E. Selected factors which influence job preferences. Journal of Applied Psychology, 1947, 31, 553-564.

Jurgensen, C. E. What job applicants look for in a company. Personnel Psychology, 1948, 1, 433-445.

Kendall, M. G. Rand correlation methods. (2nd ed.) New York: Hafner, 1962.

McNemar, Q. Psychological statistics. (3rd ed.) New York: Wiley, 1962.

Mikes, P. S. and Hulin, C. L. Use of importance as a weighting component of job satisfaction. Journal of Applied Psychology, 1968, 52, 394-398.

Nealey, S. M. Pay and benefit preference. Industrial Relations, 1963, 3 (1), 17-28.

Nealey, S. M. Determining worker preferences among employee benefit programs. Journal of Applied Psychology, 1964, 48, 7-12. (a)

Nealey, S. M. Measurement of worker preferences and the determinants of preferences for industrial compensation and benefit programs. Unpublished doctoral dissertation, University of California, Berkeley, 1964. (b)

Nealey, S. M. and Goodale, J. G. Worker preference among time-off benefits and pay. Journal of Applied Psychology, 1967, 51, 357-361.

Opinion Research Corporation. Employee cooperation on productivity. Princeton: Author, 1951.

Opsahl, R. L. and Dunnette, M. D. The role of financial compensation in industrial motivation. Psychological Bulletin, 1966, 66, 94-118.

Raube, S. A. Factors affecting employee morale. (Studies in Personnel Ploicy No. 85) New York: National Industrial Conference Board, 1947.

Ross, R. T. Optimum orders for the presentation of pairs in the method of paired comparison. Journal of Educational Psychology, 1934, 25, 375-382.

Sales, S. M. Supervisory style and productivity: review and theory. Personnel Psychology, 1966, 19, 275-286.

Smith, P. C., Kendall, L. M., and Hulin, C. L. Measurement of satisfaction in work and retirement. Chicago: Rand-McNally, 1969.

Stogdill, R. M. and Coons, A. E. Leadership behavior: Its description and measurement. Ohio Studies in Personnel, Research Monograph No. 88. Columbus: Bureau of Business Research, Ohio State University, 1957.

Torgerson, W. S. Theory and methods of scaling. New York: Wiley, 1958.

Triandis, H. C. Differential perception of certain jobs and people by managers, clerks, and workers in industry. Journal of Applied Psychology, 1959, 43, 221-225.

U. S. Navy, United States Navy Enlisted Occupational Handbook (5th Edition). Washington, D. C.: Bureau of Naval Personnel, 1966.

Wernimont, P. F. Intrinsic and extrinsic factors in job satisfaction. Journal of Applied Psychology, 1966, 50, 41-50.

FOOTNOTES

1. The author wishes to thank the officers and men of the Cruiser-Destroyer Force, Pacific Fleet (ComCruDesPac) who made this study possible by their complete cooperation. This research was supported by an Office of Naval Research contract (N00014-67-A-0302-0013), Contract Number (NR 151-317), Stanley M. Nealey, Principal Investigator. The author wishes to express his appreciation to Ledyard R. Tucker and Andres Inn for their advice and help with data analyses.
2. Three of the original 29 respondents in the reenlistment sample were excluded from these analyses because their responses contained 6 or more circular triads (see page 17 of this paper).
3. Standardized beta weights can exceed 1.0 when N is small and the predictor variables are negatively correlated. This latter condition was artificially created due to the pattern by which stimuli were paired.

Table 1

Intercorrelations of Scales of Preference from Phase One

	Retention Focus			Production Focus			Job Satisfaction Focus		
	Work	Supervisors	Co-workers	Work	Supervisors	Co-workers	Work	Supervisors	Co-workers
Retention Focus									
Work									
Supervisors	.842*								
Co-workers	.937	.781							
Production Focus									
Work	(.970)	.777	.834						
Supervisors	.800	(.948)	.649	.795					
Co-workers	.969	.772	(.840)	.996	.793				
Job Satisfaction Focus									
Work	(.946)	.817	.805	(.960)	.854	.943			
Supervisors	.734	(.821)	.511	.774	(.945)	.764	.863		
Co-workers	.932	.754	(.803)	.942	.792	(.924)	.992	.823	

* Decimal points have been omitted.

Table 2

Number of Circular Triads by Focus and Job Factor

Phase I Circular Triads

Job Factors	Focus: Reenlistment N = 29	Production N = 32	Job Satisfaction N = 30	Total N = 91
Work	14*	12	6	32
Supervisor	11	15	11	37
Co-workers	22	11	11	44
Total	47	38	28	

*Note: With 7 stimuli, maximum circular triads per S is 14. Therefore the maximum possible where N = 29 is 29 X 14 = 406.

Phase II Circular Triads

Job Factor Combinations	Focus: Reenlistment N = 32	Production N = 31	Job Satisfaction N = 33	Total N = 96
Supervision-Pay	12**	7	13	32
Supervision-Co-workers	22	11	22	55
Work-Co-workers	17	17	17	51
Work-Supervision	19	10	5	34
Co-workers-Pay	8	8	8	24
Work-Pay	4	5	4	13
Total	82	58	69	

**Note: With 6 stimuli, maximum circular triads per S is 8. Therefore the maximum possible where N = 32 is 32 X 8 = 256.

Table 3

Chi Square Tests on the Marginal Totals of Circular Triads from Table 2

Comparison	X^2	df	P
Phase I			
Focuses	5.76	2	NS
Job Factors	1.85	2	NS
Phase II			
Focuses	4.72	2	NS
Job Factors*	21.29	3	.001
Job Factor Composites	36.52	5	.001

* The frequencies on which this X^2 is based were calculated by summing the three totals of circular triads (see Table 2) associated with each job factor. These values were as follows: Work = 98, Supervision = 121, Co-workers = 130, and Pay = 69.

Table 4

Prediction of Phase-two Scale Values from Phase-one Scale Values with the Focus on Reenlistment

Column	1	2	3	4	5	6
Job Factors	r	additive r	R	standardized beta weight	part correlations	coefficients of determination
Supervision	.072	----	.925	.536	.479	.229
Pay	.792			1.033	.922	.850
Co-workers	.576	----	.988	1.024	.894	.799
Pay	.421			.920	.803	.645
Work	.419	----	.974	.923	.792	.627
Pay	.555			1.014	.869	.755
Supervision	-.117	.711	.961	.415	.362	.131
Co-workers	.890			1.093	.953	.908
Work	.931	.901	.962	1.060	.938	.880
Supervision	-.222			.275	.245	.060
Work	.850	.971	.972	1.119	.972	.945
Co-workers	-.012			.543	.472	.223

Table 5

Prediction of Phase-two Scale Values from Phase-one Scale Values with the Focus on Production

Column	1	2	3	4	5	6
Job Factors	r	additive r	R	standardized beta weight	part correlations	coefficient of determinatio
Supervision	.325	----	.926	.820	.713	.508
Pay	.592			.999	.868	.753
Co-workers	.340	----	.947	.849	.736	.542
Pay	.597			1.021	.885	.783
Work	.436	----	.886	.879	.762	.581
Pay	.452			.890	.772	.596
Supervision	.175	.927	.928	.699	.607	.368
Co-workers	.703			1.051	.911	.830
Work	.627	.871	.903	1.001	.868	.753
Supervision	.249			.750	.651	.424
Work	.717	.851	.882	1.013	.879	.773
Co-workers	.086			.592	.513	.263

Table 6

Prediction of Phase-two Scale Values from Phase-one Scale Values with the Focus on Job Satisfaction

Column	1	2	3	4	5	6
Job Factors	r	r	R	standardized beta weight	part correlations	coefficients of determination
Supervision	.203	----	.885	.697	.606	.367
Pay	.646			.993	.862	.743
Co-workers	.387	----	.975	.898	.780	.608
Pay	.586			1.031	.895	.801
Work	.582	----	.979	1.036	.897	.805
Pay	.392			.909	.787	.619
Supervision	-.014	.902	.975	.548	-.509	.259
Co-workers	.851			1.125	.976	.952
Work	.881	.960	.964	1.107	.960	.921
Supervision	-.099			.454	.394	.155
Work	.656	.927	.942	1.045	.905	.819
Co-workers	.259			.780	.676	.457

Table 7

Principal Axis Components of the Cross Products Matrix of Vote Counts from 91 Respondents

Components	Eigenvalues	Percent Total Variance	Cumulative Percen of Variance
1	2336	39	39
2	921	15	54
3	582	10	64
4	502	8	72
5	340	6	78
6	250	4	82
7	180	3	85
8	161	3	88
9	146	2	90
10	130	2	92

Table 8

Correlations Between Person Component Loadings and Individual Difference Variables for 91 Respondents

I. D. Variables	Person Components 1	2	3	4	5	6
JDI Work	-.01	.02	.09	.05	.36	.03
JDI Supervision	.25	.06	.11	.07	.03	.06
JDI Co-workers	.03	-.02	.28	-.01	.04	-.01
JDI Pay	.00	-.02	-.03	.27	.01	-.04
JDI Promotion	.21	-.06	-.01	-.16	.05	.35
JDI Total	.14	.05	.26	.10	.07	.03
LBDQ Structure	.30	-.02	-.04	.03	-.02	.06
LBDQ Consideration	.34	.12	.15	.04	.12	.08
Group Atmosphere	.07	-.03	.13	.26	.07	-.01
Rank -	-.09	.31	.09	.01	.04	.02
Months Aboard Ship	.33	-.10	.16	-.06	-.14	-.05
Months Duty Remaining	.10	.23	.01	-.05	.05	.03
Total Months of Duty	-.02	-.40	.10	.01	.07	.11
Varimax Rotation						
Eigenvalues	46	35	26	19	19	16
Percent of Variance	29	22	16	12	12	10

Table 9

Discriminant Functions of Work Preferences Applied to 20 Jobs Held by 84 Respondents

Function	Eigenvalues	Percent Variance	Cumulative Percent Variance
1	2.14	39	39
2	1.67	30	69
3	.65	12	81
4	.61	11	92
5	.32	6	98
6	.13	2	100

Table 10

Loadings of Person Components on Discriminant Functions

Person Components	Discriminant Functions 1	2	3	4
1	10.3	1.9	-3.9	- 1.2
2	-12.6	7.4	-2.8	- 3.4
3	6.2	11.9	-2.3	.6
4	- 4.4	1.2	-2.5	10.9
5	2.3	5.4	7.9	7.4
6	2.2	3.8	9.8	- 6.0

Table 11

Correlations of Discriminant Function Means of 16 Work Groups with Mean Descriptions of Jobs Held by the 16 Work Groups

Job Description Dimensions	Discriminant Function 1	2	3	4
Indoor - Outdoor	-.01	.37	-.21	-.45
Skilled - Unskilled	-.26	-.29	-.02	-.23
Active - Inactive	-.10	-.52	.09	.14
Technical - Untechnical	-.24	-.21	.14	-.49
Much Responsibility - Little Responsibility	.11	-.38	.05	-.33
Mechanical - Unmechanical	-.59	-.09	-.05	-.24
Independent Action - Little Independent Action	.31	-.10	-.46	-.21

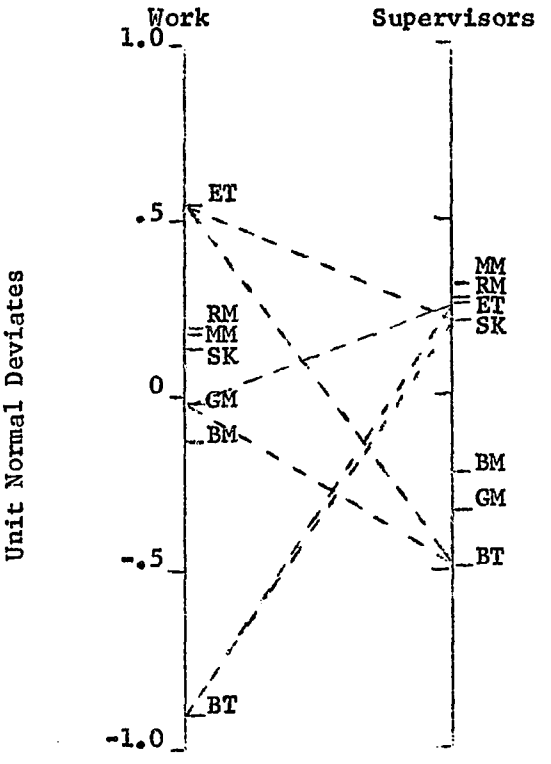

Figure 1. Illustration of the pattern by which phase-one scale values for type of work and supervision were combined to form the composites in phase two.

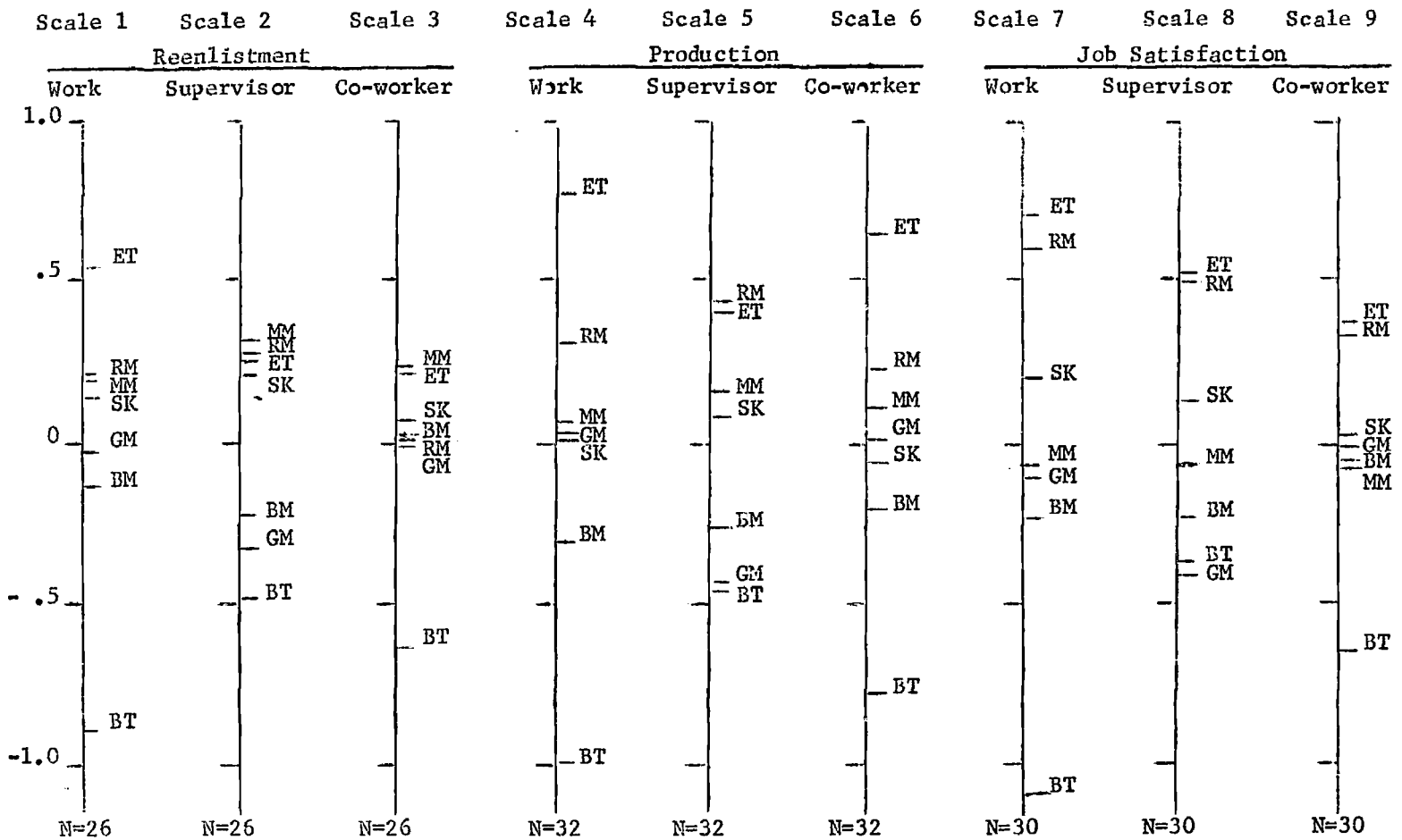

Figure 2. Preferences of enlisted personnel for types of work, supervisors, and co-workers from the focuses of reenlistment, productivity, and job satisfaction.

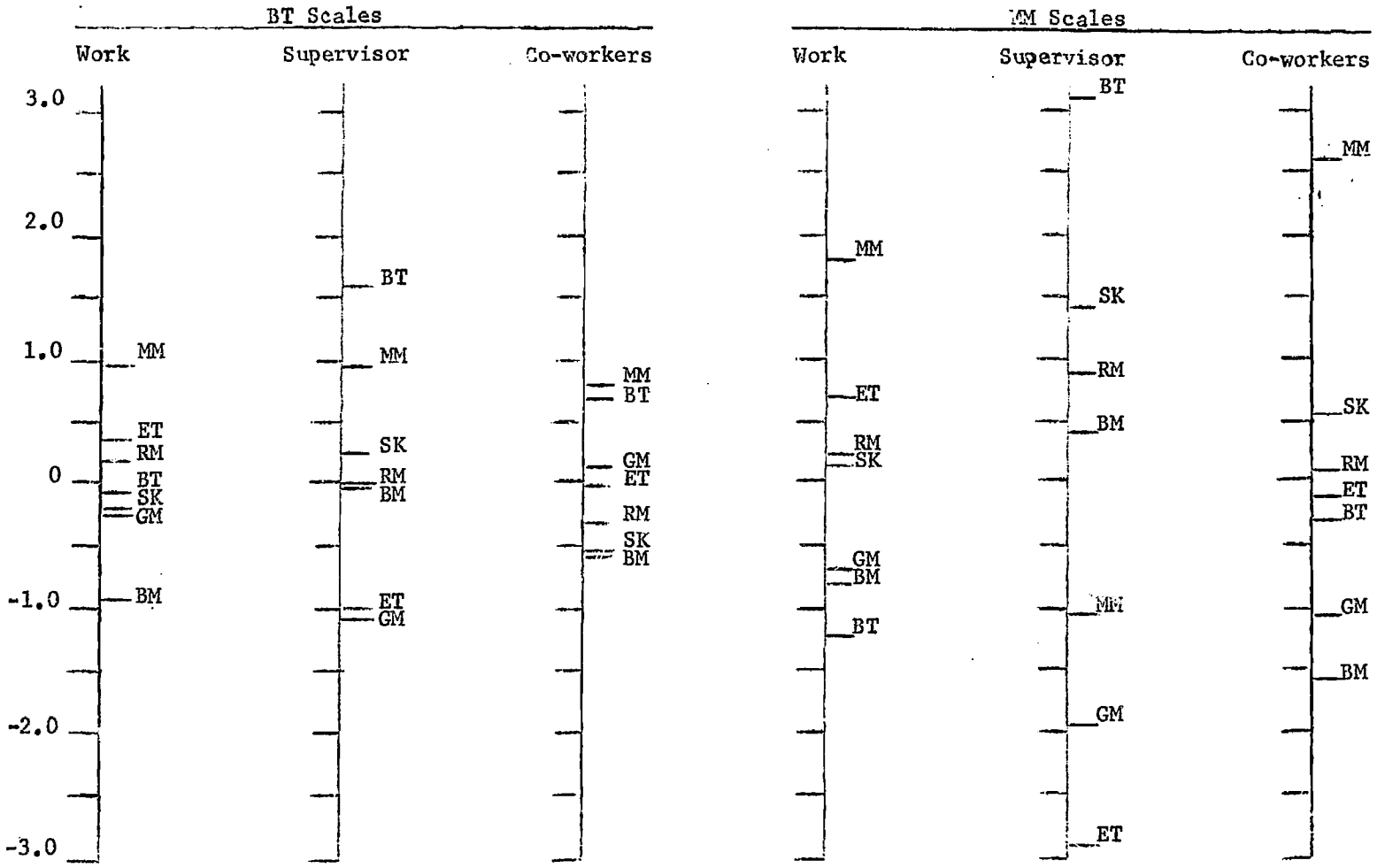

Figure 3. Preferences of nine Boilermen Technicians and ten Machinists Mates for types of work, supervisors, and co-workers.

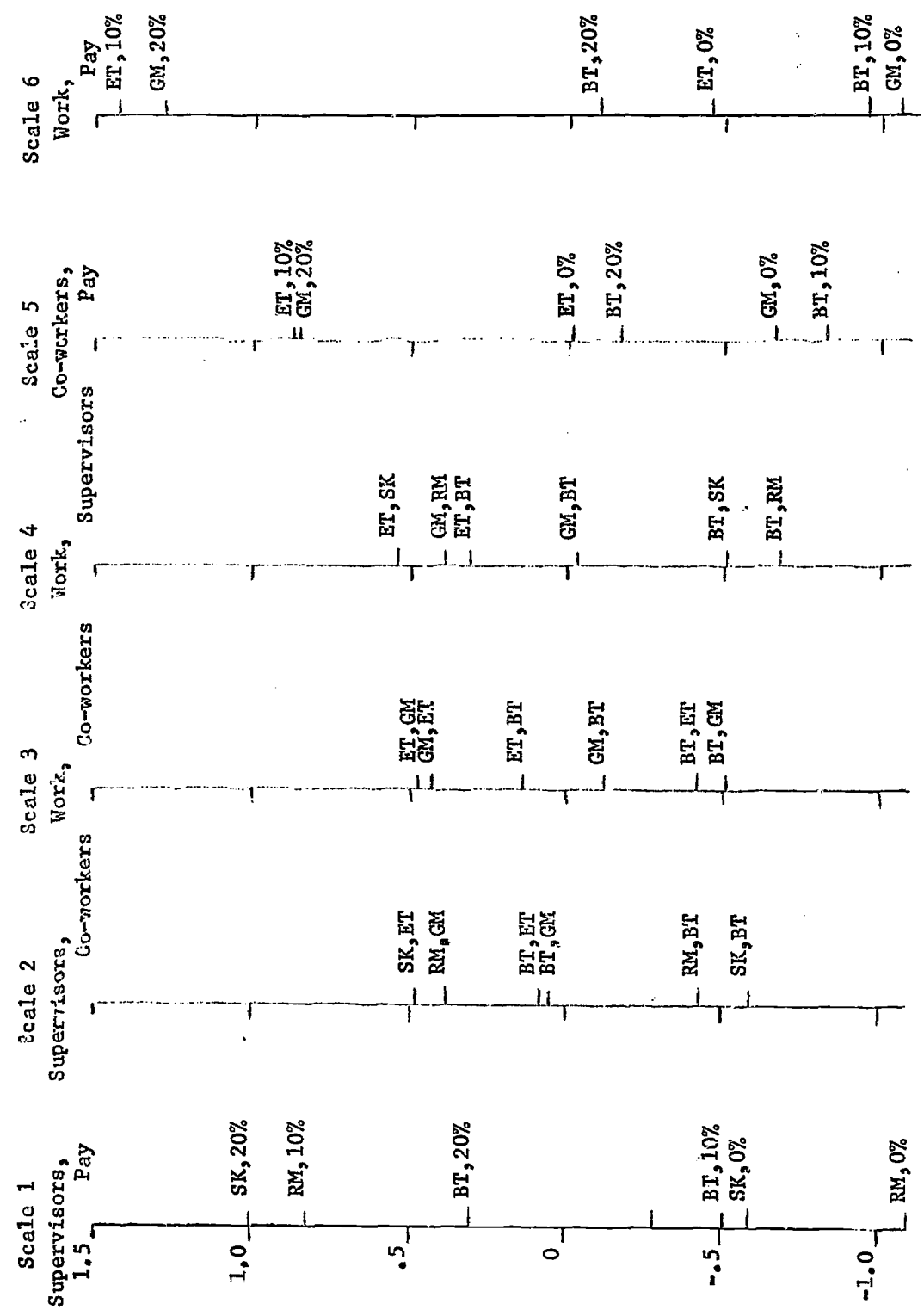

Figure 4. Preferences of 32 enlisted personnel for composites of job factors with the focus on reenlistment.

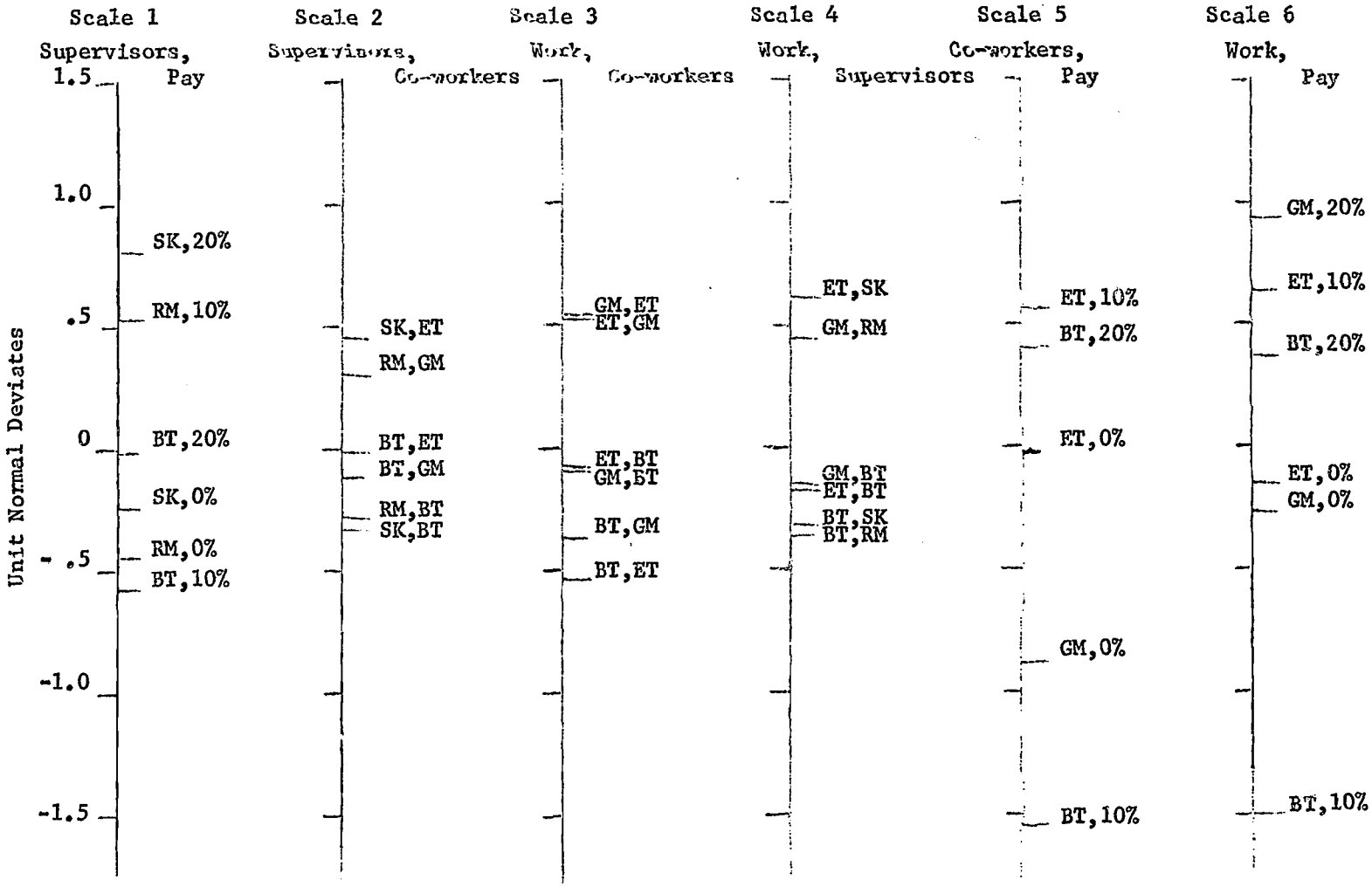

Figure 5. Preferences of 31 enlisted personnel for composites of job factors with the focus on production.

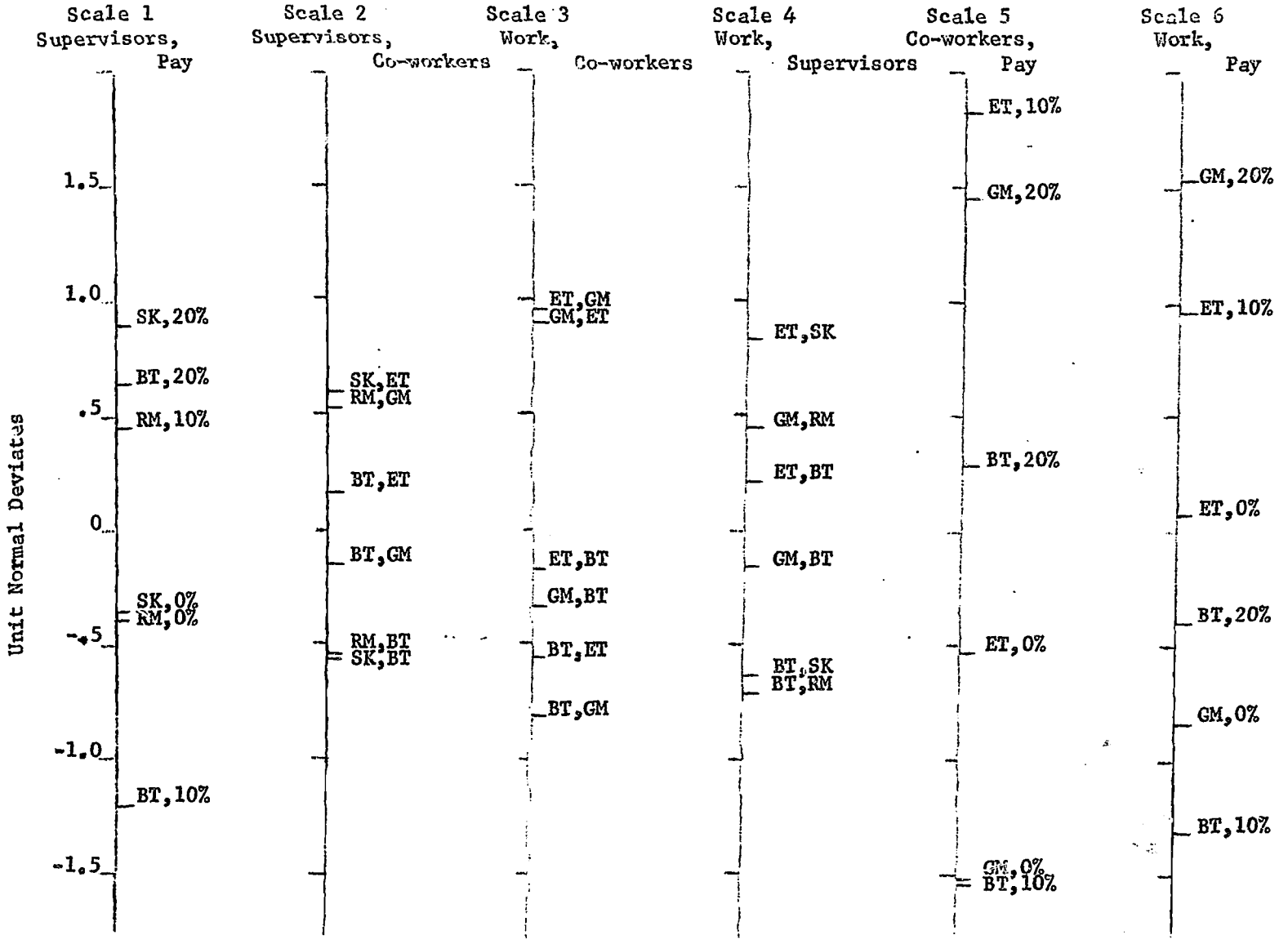

Figure 6. Preferences of 33 enlisted personnel for composites of job factors with the focus on job satisfaction.

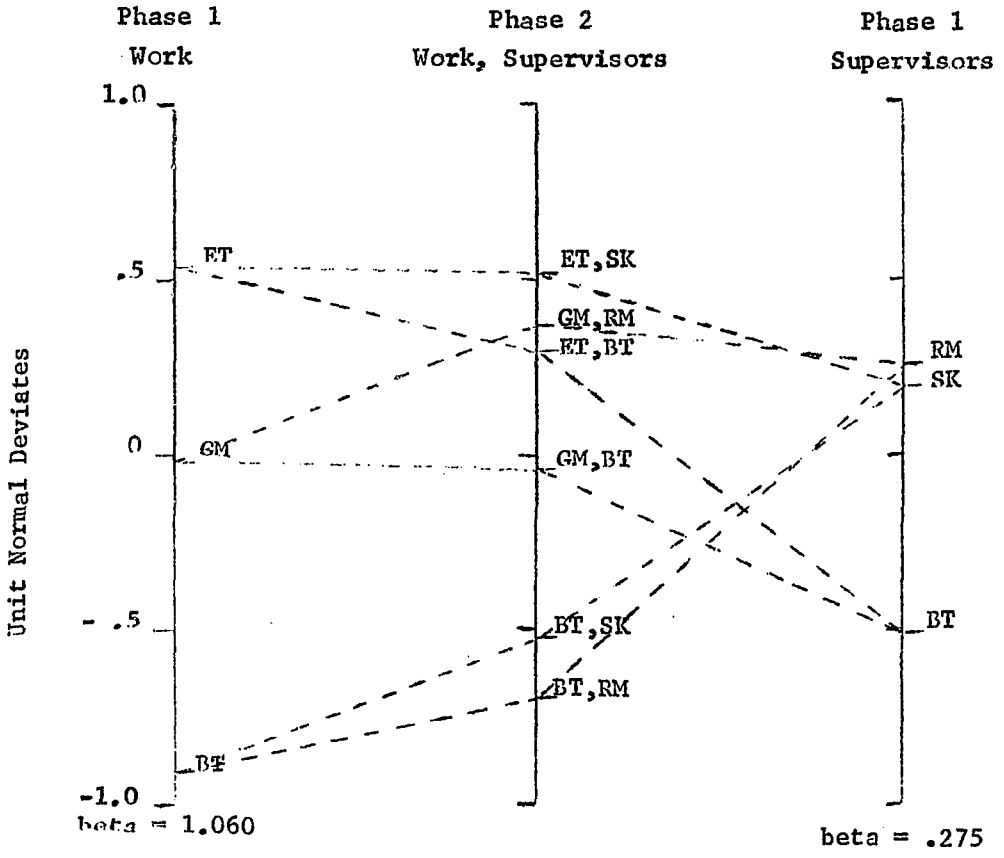

Figure 7. Illustration of the greater contribution of type of work than of supervisor to the prediction of preferences among composites of these two job factors.

Mean Beta Weights

	Reenlistment	Production	Job Satisfaction
Work	1.032	.964	1.063
Pay	.990	.970	.978
Co-workers	.887	.830	.934
Supervisor	.419	.756	.557

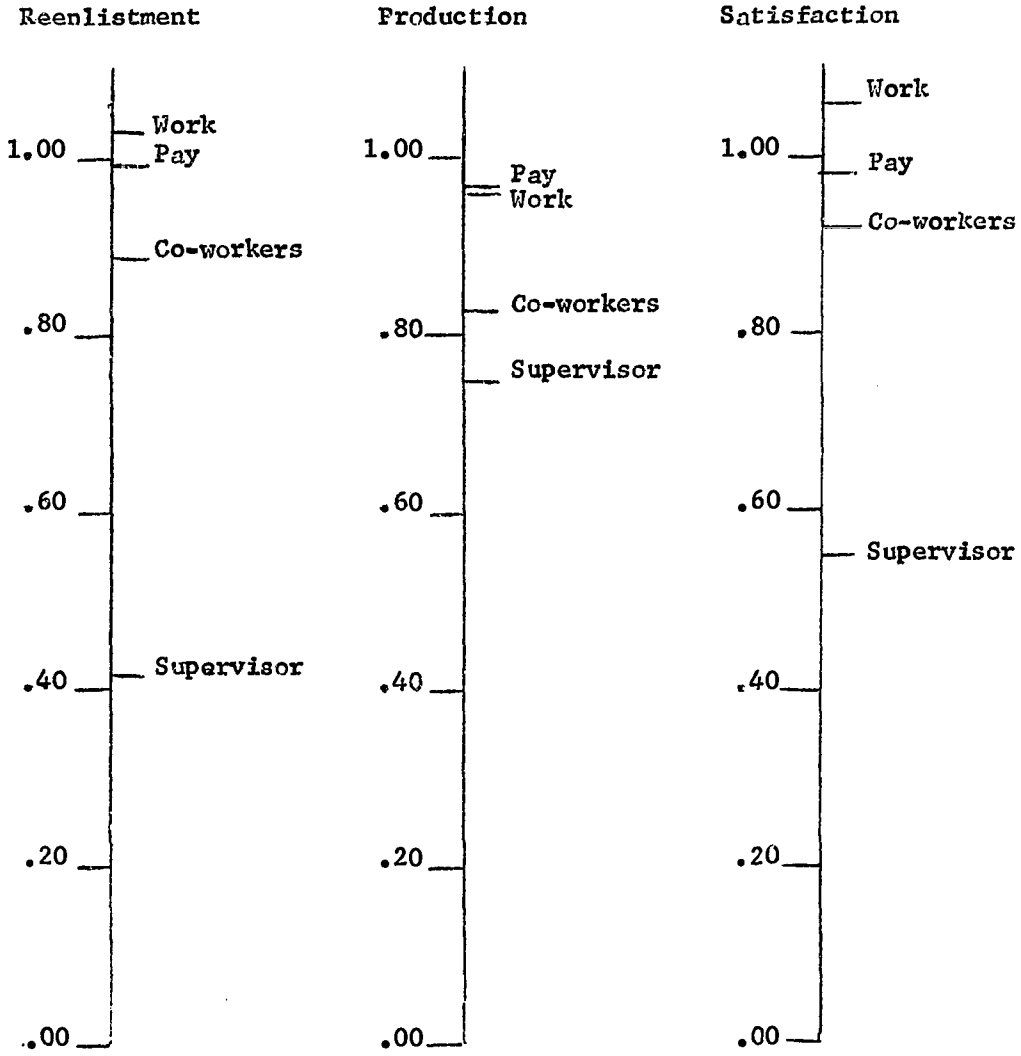

Figure 8. Mean standardized beta weights illustrating the relative importance of four job factors from three preference focuses.

Mean Coefficients of Determination

	Reenlistment	Production	Job Satisfaction
Work	.817	.702	.848
Pay	.750	.711	.721
Co-workers	.637	.545	.672
Supervisor	.140	.433	.260

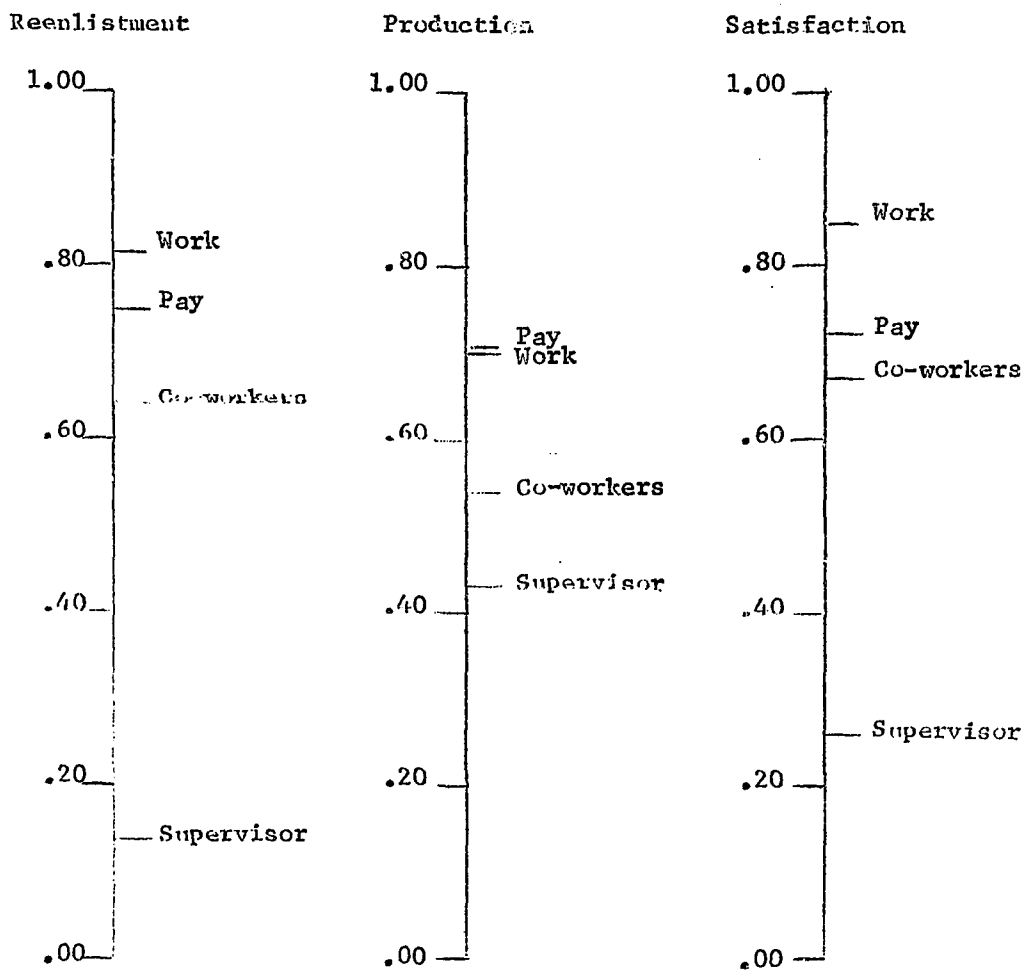

Figure 9. Mean coefficients of determination illustrating the importance of four job factors from three preference focuses.

Appendix A

On this form you are to choose among job assignments on the basis of the effect they might have on your decision to reenlist.

Listed below are seven jobs. Look this list over and think a moment about what it would be like to be assigned to each of these jobs on a permanent basis. If you were trying to decide whether or not to reenlist for another tour of duty, and if you had some choice about which job you would hold for the next several years, how would you choose?

Look at each job and ask yourself the question, "Would I want to reenlis if I would be working at this job for the next several years?"

Here are the seven jobs and a brief description of each one:

Boatswain's Mate

Performs many tasks connected with mooring, anchoring, going alongside, storing cargo, handling lines, and other deck jobs.

Boilerman

Operates, maintains and repairs marine boilers and fire-room machinery.

Electronics Technician

Maintains and repairs all types of electronics equipment.

Gunner's Mate

Operates, maintains, and repairs all gunnery equipment.

Machinist's Mate

Operates, maintains, and repairs engines, gears, refrigeration equipment and other machinery.

Radioman

Operates and maintains radio equipment.

Storekeeper

Issues and accounts for supplies of clothing, foods, spare parts, technical items, and other essential supplies.

Appendix A continued

On the page below, these jobs are listed side by side in pairs.

For each pair, check the job for which you would be more likely to reenlist if you knew that you would have that job.

Make one check for each pair of jobs:

___Boatswain's Mate	___Boilerman
___Storekeeper	___Electronics Technician
___Radioman	___Gunner's Mate
___Machinist's Mate	___Boatswain's Mate
___Electronics Technician	___Boilerman
___Gunner's Mate	___Storekeeper
___Machinist's Mate	___Radioman
___Boatswain's Mate	___Electronics Technician
___Boilerman	___Gunner's Mate
___Storekeeper	___Machinist's Mate
___Radioman	___Boatswain's Mate
___Gunner's Mate	___Electronics Technician
___Machinist's Mate	___Boilerman
___Radioman	___Storekeeper
___Boatswain's Mate	___Gunner's Mate
___Electronics Technician	___Machinist's Mate
___Boilerman	___Radioman
___Storekeeper	___Boatswain's Mate
___Gunner's Mate	___Machinist's Mate
___Electronics Technician	___Radioman
___Boilerman	___Storekeeper

Appendix B

On this form you will find job assignments and supervisors put together in six different combinations. These combinations are listed below. Look this list over and think a moment about what it would be like to be assigned to each of these combinations of jobs and supervisors on a permanent basis.

If you were trying to decide whether or not to reenlist for another tour of duty, and if you had some choice about which combination of job and supervisor you would have for the next several years, how would you choose?

Look at each combination and ask yourself the question, "Would I want to reenlist if I would have this combination of job assignment and supervisor for the next several years?"

Boilerman
SK1 Jones*

Electronics Technician
SK1 Jones

Boilerman
RMC Smith

Gunner's Mate
RMC Smith

Electronics Technician
BTCS Brown

Gunner's Mate
BTCS Brown

* Names have been changed here to protect anonymity of the target supervisors.

Appendix B continued

On the page below, combinations of job assignments and supervisors are listed side by side in pairs.

For each pair, check the combination for which you would be more likely to reenlist if you knew that you would have that combination.

Make one check for each pair of combinations.

___ Boilerman Jones	___ Electronics Technician Jones
___ Gunner's Mate Brown	___ Gunner's Mate Smith
___ Electronics Technician Brown	___ Boilerman Jones
___ Boilerman Smith	___ Electronics Technician Jones
___ Electronics Technician Brown	___ Gunner's Mate Brown
___ Boilerman Jones	___ Boilerman Smith
___ Electronics Technician Jones	___ Gunner's Mate Smith
___ Gunner's Mate Brown	___ Boilerman Jones
___ Gunner's Mate Smith	___ Boilerman Smith
___ Electronics Technician Brown	___ Electronics Technician Jones
___ Boilerman Jones	___ Gunner's Mate Smith
___ Boilerman Smith	___ Electronics Technician Brown
___ Electronics Technician Jones	___ Gunner's Mate Brown
___ Gunner's Mate Smith	___ Electronics Technician Brown
___ Boilerman Smith	___ Gunner's Mate Brown