A COMPARISON OF THE RELATIVE UTILITY OF SEVERAL RATIONAL AND EMPIRICAL STRATEGIES FOR FORMING BIODATA DIMENSIONS

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CHAPTER I

INTRODUCTION

The basis of many selection strategies is appropriately summarized through the oft quoted adage, "The best single predictor of future performance is past behavior." Efforts to collect and utilize samples of past behavior have often employed sources such as the case study, interview, and application blank. While valuable, Schmuckler (1966) pointed out that each suffers from the same weakness--the level of quantification possible with the obtained material. Thus, they have imposed serious limitations on any endeavor to relate past and future behavior, to say nothing of the obstacles created for systematic attempts to establish cohesiveness and psychological meaningfulness within the background information.

However, out of this same tradition has come a data collection technique which has become increasingly useful as an evaluator of past behavior. Since its initial development the biographical information inventory has been used in a wide variety of studies and practical operational situations. E. R. Henry (1966) has noted that, with few exceptions, it has been found to be the best single predictor of future behavior where the predicted behavior is of a total or complex nature. In addition, the biographical inventory has been of special interest to psychologists because 1) it surveys experience more economically than the interview;

2) the method is more acceptable than personality tests to applicants and employers in selection; and 3) perhaps most importantly, it lends itself to quantifiable treatment (Super, 1960).

Traditionally, biodata has been used to predict some criterion measure through empirically derived keys. Long and Sandiford (1935) described some twenty-three methods of empirical keying, most of which establish a direct relationship between specific items and the criterion. But, in addition to practical criticism of these empirical keying techniques, much of the current literature reflects an increasing dissatisfaction with the fact that such atheoretical research has failed to make any truly significant contribution to our understanding of human behavior. In response to such criticisms there have been various attempts to group biodata items into more general dimensions. These include the use of rational sorts, with or without iterations (Laurent, 1950; Siegal, 1956), the expansion of clusters to maximum saturation (DuBois, Loevinger and Gleser, 1952; Berkeley, 1953; Pickrel, 1954; Matteson, Osburn, and Sparks, 1969), and the use of factor analysis (Thompson and Owens, 1964; Baehr and Williams, 1967; Schmuckler, 1966). However, a search of the literature fails to reveal any studies that compare the relative utility of the various strategies for combining biodata items into homogeneous dimensions. The present research will concern itself with a comparison of several selected methodologies which varied in the degree

to which they employed rational, as opposed to statistical, assumptions and techniques for constructing the biodata dimensions.

CHAPTER II

REVIEW OF THE LITERATURE

Relative to other psychological predictors, the biographical information blank has a long and varied history of application. Bibliographies by Owens and Champagne (1965) and Brodie, Owens, and Britt (1968) list 190 and 157 studies respectively. England (1961) cited 91 studies in a monograph where he summarized the standard procedures for developing a weighted application blank. Owens and Henry (1966) reviewed 60 studies dealing with non-academic or industrial criteria and found that biographical information had been used to predict sales success, turnover or management potential, advancement and trainability, career choices and creativity. Empirical keys have been cross-validated for occupations ranging from seasonal employees (Dunnette and Maetzold, 1955) to production supervisors (Lockwood and Parsons, 1960). This same generality was supported by Ghiselli (1966) who concluded that when validities were averaged across a number of occupations, personal data predictors led all the rest. He found the average correlations with criteria of trainability and proficiency to be .44 and .41, respectively.

In addition, the popularity of biodata may be traced to some of the advantages--"real and fancied"--listed by Owens (1974) in his recent review. These include the fact that biodata:

1) represents an extension of the application blank
2) is another format for the selection interview, with the advantages of standardization
3) has an impressive accuracy record for verifiable items
4) is useful in appraising significant, non-cognitive characteristics
5) represents an appealing exploratory device
6) can encompass both predictors and criteria
7) capitalizes on the axiom that what a man <u>will</u> <u>do</u> in the future is best predicted by what he <u>has</u> <u>done</u> in the past
8) makes it possible to achieve real understanding beyond empirical prediction
9) using empirical derivation, assures that only job related questions will be asked
10) is at least as good a criterion predictor as cognitive measures and less highly correlated with race
11) may well enjoy better acceptance, if not validity, than other traditional tests
12) is useful in differential prediction or classification
13) lends itself to conceptual modeling and the evaluation of developmental theory
14) can be related to other measuring instruments for drawing "causal-type inference"

15) "is an efficient, robust, highly valid predictor of a broad spectrum of very practical criteria (p. 7)."

One of the earliest uses of biographical information was for the prediction of success of salesmen. In 1915, Woods attempted to differentiate between good and poor salesmen through their application blank responses (see Ferguson, 1961). By 1922 Goldsmith (1922) had published an article on "The Use of the Personal History Blank as a Salesmanship Test" in which she developed the procedures of empirical item analysis and its use for weighting items. The biodata form continued to be prominent in the selection of salesmen (Manson, 1925; Kurtz, 1941; Kornhauser, 1941; Appel and Feinberg, 1969), although it also came to be used for such diverse purposes as predicting college entrance (Bittner, 1945) and the detection and treatment of accident-prone drivers (Johnson, 1946).

Just prior to Pearl Harbor, the Civil Aeronautics Administration sponsored several studies to determine the usefulness of biographical information as a means of predicting success in training (Lecznar, 1951). Guilford and Lacey (1947) reported average validities of .35 to .40 in predicting success of Air Force student pilots in training and comparable r's for navigators of .25 to .30. More recently, in a study of aquanaut performance in the Navy's project Sealab II, life history items were most successful in predicting performance, especially in contrast with

personality and interest inventory data (Radloff and Helmeich, 1968).

Thus, since its early uses in the selection of salesmen, biodata has frequently enjoyed admirable initial success when keyed against some external criterion. However, there remains the practical problem that many questions asked in the biographical inventory may quickly lose their meaning and relevance. Dunnette, Kirchner, Erickson, and Banas (1960) developed a weighted application blank to predict turnover among female office workers. The tetrachoric validity coefficients for three consecutive years were .74, 61, and .38, demonstrating loss in validity of the keys over time. Hughes, Dunn, and Baxter (1956) presented data which showed a similar decreasing trend in the validity of a weighted application blank designed for the selection of life insurance agents. Other authors (DuBois, Loevinger, and Gleser, 1952) have pointed out that not only does the validity of empirical keys shrink greatly in the cross-validation sample, but for each new criterion the keying procedure must begin anew. Owens (1968) went on to suggest the dangers of organizational rigidity resulting from the "institutionalization of the standards, norms and values of the past being embedded in the instruments used today to predict behavior in the future (p. 783)."

In a somewhat more theoretical vein, Dunnette (1962) has commented that most users of the weighted application blank have been more intent on achieving statistical

prediction than on gaining understanding of the dynamics of job success. Likewise, Matteson's (1969) review of the literature led him to conclude that most of the reported biodata research centered around the prediction of some external criterion, with little concern for the underlying dimensions that were being tapped. According to Henry (1966), the reasons so little has been done in these areas are not difficult to understand:

1) Biodata forms work.
2) Since biodata forms are an extension of the interview, they are assumed to be measuring the same thing but doing a better job of it.
3) While the tools for analysis were available, until recently they appeared formidable and costly.
4) Aside from theoretical, academic interest, there were no very persuasive reasons for tackling such a program until a "prediction plateau" developed.

However, Cronbach (1957) made it quite clear that the student of measurement normally lacks real knowledge of the antecedents of what he measures. Lacking such knowledge diminishes understanding and virtually precludes the drawing of causal inferences. An example can be seen in Berkeley's (1953) work in which only about one-third of the items in a set of empirical keys could be indirectly related to desirable traits of superior officers, as set forth by command judgment.

In addition, Guilford and Lacey (1948) pointed out that

empirical procedures merely result in an extension of our ignorance to new valid territory, rather than increase our knowledge of why tests are valid and therefore improve our control over validity already achieved. Buel (1966) noted that while the "tailor-made" (empirical) scoring keys are of decided value to the sponsoring institutions, they will be of limited scientific and general utility until their complex factorial structure is better understood and their generality and cross-validity demonstrated. To this same point Thompson and Owens (1964) summarized by saying that "only when psychologists understand what it is that a parsimonious number of predicted variables are measuring will they be able to explore intelligently the growth and development of interest. When factors from different studies have proved congruent, it will also be possible to compare criteria describing one group to criteria describing an entirely different group."

As was pointed out in the introduction, the major attempts to derive a "parsimonious number of predicted variables" have involved various strategies for constructing homogeneous keys. When Berkeley (1953) compared empirical and rational approaches for keying a heterogeneous test, he found the homogeneous to be "psychologically meaningful" while the empirical keys were not. The homogeneous keys were "relatively easy" to define, and the part each played in explaining the criterion was indicated by its beta weight in the multiple regression equation. Thus, there were

additional cues as to how the multiple correlation could be increased by the addition of any missing homogeneous tests, and by increasing the breadth of the more relevant scales. Matteson (1969) indicated that another advantage of homogeneous keys is that, at least theoretically, they avoid the problem of re-keying, since they measure stable psychological dimensions, rather than strictly item-criterion relationships. As a consequence, where there are either revisions of the criteria or additions of new criteria, the same homogeneous keys can be used to obtain new series of significant beta weights. This involves nothing more than re-validating each key on each new criterion and computing the new multiple regression coefficient. And, as Berkeley (1953) pointed out, where additional homogeneous tests are to be devised to measure inadequately covered areas of the criterion, the old homogeneous categories can be retained, and the statistical labor of category evolvement and refinement need only be concerned with the new categories.

A third advantage of homogeneous keys cited by Matteson (1969)is that they should be more reliable than heterogeneous keys, since each key consists of individual items which overlap one another and thereby reduce chance errors. For this same reason, one would expect the validities to shrink less on cross validation. These assumptions were supported by Berkeley's (1953) work where the empirical keys experienced significantly more shrinkage than the homogeneous keys.

If one therefore proceeds on the assumption that

homogeneous keys are, at least potentially, more psychologically meaningful and practically useful than their empirical counterparts, it becomes important to investigate some of the methodologies used to construct homogeneous dimensions. Levine and Zachert (1951) attempted to form meaningful categories with the subjective classification of items in terms of content. The validity of each item was then determined, and if an acceptably large number of items showed a significant relationship with the criterion, the content category was retained and the items differentially weighted. A second rational strategy was that used by Moore (1968) in which he categorized biographical items into content areas which were selected from those proposed by Laurent (1951). Moore and three committee members coded 67 continuous items into eight areas, and then computed the total percentage agreement and the agreement within each content area. Since the total percentage was high (89.3), Moore concluded that the item classification was sufficiently stable to be used in the analysis of ethnic differences. In a study conducted by Chaney and Owens (1964), 170 biodata items were item analyzed and the significant options placed in one of the following six content categories: Academic, Family and Community, Interpersonal Relations, Occupational, Recreation and Activities, and Self-Perception. The concurrent validity coefficients between the composite life history scores and three interest criteria were .51, .57, and .42 for general, sales, and research engineering

interest, respectively.

While the Chaney and Owens (1964) study employed an item analysis in the selection of items, the technique for grouping items into content areas was still strictly rational. Zubin (1934) was perhaps the first to apply different methods of computing item-total relationships in an attempt to develop a homogeneous test. He noted that with the lack of suitable external criteria, proceeding by means of the internal consistency of the test is the next best approach. Flanagan (1936) suggested a method of item selection in which a nucleus of the most valid items is first selected, and items added to or subtracted from the nucleus by comparing the item-nucleus correlation of each item with the item-criterion correlation. The items having a higher correlation with the criterion than the nucleus are retained, while the others are dropped. DuBois, Loevinger, and Gleser (1952) developed a method very similar to that of Flanagan. However, they utilized the item-test correlations to compute an index for each item of the form. They summarized their approach by saying that:

> Each key is constructed by adding items one at a time to a nucleus of three items. Each key is constructed so as to maximize the saturation with respect to the matrix of items from which it is drawn. The saturation of the test is defined as the proportion of the total test variance due to inter-item covariances. A cycling process involving elimination and addition of items is followed to insure an adequate degree of independence to the keys (p. 18).

The methodology used by Siegal (1956) was quite similar

to that of DuBois, et al., in that both started with a priori groups of items and made subsequent modifications as to group contents on the basis of iterative item analyses. The primary difference was that the latter emphasized the maintaining of homogeneity by maximizing saturation throughout the cycling process, while Siegal merely observed the item-key correlations.

Matteson (1969) went one step further in the cluster analysis approach and developed a computer-based methodology for developing homogeneous dimensions. He perceived the major advantage of his program as being the fact that it utilizes the complete inter-item covariance matrix, and avoids a priori judgments concerning item content and groupings. Thus, while the results differ, the level of objectivity approaches that which is usually achieved through factor analysis.

In recent years, however, it has been factor analysis which has experienced the most frequent utilization as a technique for establishing biodata dimensions. Owens (1968, 1974) has developed a methodology for subgrouping Ss according to patterns of prior experience in which he identifies dimensions through a principal axis factor analysis. A second study which used "criterion-free" items was the one conducted by Baehr and Williams (1967). They factor analyzed 150 items and derived 15 primary factors which accounted for 67% of the variance. It is noteworthy that even their oblique factors were largely uncorrelated.

While the advent of high speed computers has made factor analysis much more common and a much less laborious procedure, most programs still have severe limitations in terms of the number of items which they are capable of handling. As a consequence, many factor-analytic studies have restricted themselves to criterion-keyed items. Schmuckler (1966) factored 62 continuous items of the 151 in the Biographical Information Blank developed by Henry and Laurent (1961), and found similar factor structures for three different age groups. Using the same item sample, Cassens (1966) found a similar factor structure for three cultural groups, which included Americans, Americans abroad, and Latin Americans in their own country. Thompson and Owens (1964) chose 90 of the items used in the Chaney and Owens (1964) study and compared their factor structure with that obtained by Gilmer (1963) who used senior citizens. They found similar factors in all three studies. Morrison, Owens, Glennon, and Albright (1962) factored 75 discriminating items for petroleum research scientists. They included the three criteria (performance rating, creativity rating, and patent disclosures) in the matrix, and found that while the pattern of loadings for ratings were similar, both were distinctly different from the loadings on patent disclosure. Moore (1968) attempted to compare the factor structures of a White and Black sample, but found "little factorial similarity" across ethnic groups.

A preliminary examination would indicate that there is

a great deal of similarity between the technique and results of these factor analytic studies and an objective clustering program such as Matteson's (1969). However, there are several differences worth noting. On a very basic point, Horst (1965) indicated that there are "special problems" in using factor analysis with binary variables, which is the form many biodata items ultimately take. On the other hand, Loevinger (1948) found the technique of homogeneous tests to "rest upon fewer, more plausible, and testable assumptions (p. 525)" than does factor analysis. In addition, while factor analysis attempts to account for the maximum amount of variance with as few dimensions as possible, clustering techniques seek to maximize the number of independent, homogeneous dimensions. Several authors (Fruchter, 1954; DuBois, Loevinger, and Gleser, 1953) have pointed out that factor analysis may assign different portions of item variance to different factors, while in cluster analysis each item is assigned on an all or none basis. These and other differences led Loevinger (1948) to conclude that factor analysis may be more appropriate for analyzing batteries of homogeneous tests, while the "technique of homogeneous tests" is suitable for items within a single measuring instrument. It is for these reasons that the current research disregarded the more popular factor analytic techniques, and based its empirical models upon Matteson's (1969) clustering approach.

On a somewhat more microanalytic level, the literature provides many hints for the individual who sets out to

measure the underlying factors in biographical information. Berkeley (1953) noted that even without suitable criteria, certain rational hypotheses about the behavior to be predicted might be agreed upon by experts, and items then written to measure such behavior. Williams (1961) found that, before administering a questionnaire he had constructed, he was able to enunciate specific hypotheses for 35 of his 98 items. Of the 35 items, 16 or 45% ultimately validated. Of the remaining 63 items where a specific hypotheses was either vague or non-existent, he found that only 8 items, or 12%, validated. This would lead one to conclude that biodata items which are aimed at a specific target are much more likely to validate.

Another consideration is the results stemming from Lecznar's (1951) investigation of the "pattern of response" method of scoring items. He found that, when items were correlated with a criterion, scoring only those which yielded a continuum of correlations across distractors resulted in less shrinkage and greater validity than did the method of scoring significant alternatives. Owens (1974) summarized his experience by saying that continuum items, in which the responses lay along either an apparent or demonstrated continuum, proved to be preferable to non-continuum items in terms of both their validation probability and adaptability to subsequent statistical analysis. Similarly, he found single choice items to be superior to multiple choice items, since the latter often give rise to the "thin-splits"

problem in analysis. In addition, he pointed out that dichotomous items often involve so coarse a grouping as to result in a loss of information.

Unfortunately, most research efforts which are concerned with establishing biodata dimensions do not profit from these findings or recommendations, since they are quite frequently using pre-existing forms. Items are not written to measure specific rational or empirical factors, but are presented and scored in their original questionnaires, or are borrowed from general item pools. It has been pointed out that the major employment of biodata has been in a strictly empirical sense, where each item has been keyed based upon its relation to the criterion measure. Thus, it has been of little concern that biodata forms contained both continuous and non-continuous types of items. The non-continuous items are typically either discreet, requiring only one response, or multiple-response in which the subject can either respond or not respond to each alternative. Both must eventually be analyzed in the form of item dichotomies.

As mentioned in the introduction, it is these dichotomized variables which stretch the assumptions of factor analysis, both in terms of their intrinsic properties and the problems they generate when presented in a common matrix with continuous items. A somewhat more mechanical problem is that when multiple-response item distractors are dichotomized, the number of resulting variables normally far exceeds the capacity of available factor analysis programs. In the

past, these problems have been circumvented through the use of continuous items only (Cassens, 1966; Schmuckler, 1966) or the use of criterion-keyed items only (Morrison, et al., 1962; Thompson and Owens, 1964). However, it is the current author's intuitive assumption that factoring only the continuous items from a questionnaire containing both continuous and non-continuous items would result in a non-representative selection of items from that particular form, to say nothing of the total biodata domain. Owens (1974) found the same problem to be true in factoring only criterion valid items, and Matteson (1969) pointed out that the internal analysis of items, uncontaminated by external criteria, results in dimensions which are of greater validity and reliability. It is fortunate that Matteson's cluster analysis program does not suffer from the same severity of limitations in terms of input variables, and therefore is not restricted to the use of continuous or keyed items.

However, a more pressing problem revolves around the inability of any empirical grouping technique to deal with a mixed matrix of continuous and binary variables. A commonly used strategy (Berkeley, 1953; Matteson, 1969) has been the dichotomization of all continuous and discreet items on the basis of response frequencies and "logical considerations." But it seemed that such an approach would frequently result in ambiguous items, and detract from the original goal of finding greater meaning in biographical information. It was the author's position that, given the limitations of biodata

forms containing both continuous and non-continuous items, it might well be the rational grouping techniques which could most meaningfully deal with the item content to form homogeneous dimensions. Rather than dichotomizing continuous variables, rational strategies could be used to reinterpret discreet and multiple-response items as continuous variables. Rational approaches had the additional advantage of being able to reinterpret and score both continuous and non-continuous items such as to optimally focus on specific dimensions.

In order to evaluate the relative gains which might be obtained through these hypothesized advantages, the current research sought to compare various forms of the rational and empirical techniques of forming homogeneous dimensions. The first approach consisted of a rational grouping of items, followed by a rational scoring and modification of all items into continuum form such as to maximize contribution to the perceived dimensions. This was succeeded by a second approach in which the item continuums formed during the first analysis were subjected to evaluation and modification on the basis of an item analysis. The third approach developed homogeneous keys through Matteson's clustering program, but subjected the resulting clusters to an item deletion strategy according to a criterion of rational fit. The fourth course accepted the cluster analysis keys in a straightforward manner, while a fifth attempt evaluated the same clusters according to an item deletion strategy based upon empirical validity data as

ascertained through item analysis results. Comparisons were then made across methods in the areas of internal consistency of dimensions, independence of dimensions, and predictive utility.

CHAPTER III

PROCEDURES

Subjects

The subjects for this study were employees of a large petrochemical firm who at the time of testing were considered to be managerial candidates or occupied lower management positions. The primary sample represented a large portion of the current employees who were evaluated in 1966 through the firm's managerial test battery. Although the group was heterogeneous in terms of age and education, a large majority of its members were Caucasian males who were under 35 and college-educated. This reflected the fact that many individuals were tested shortly after they were recruited at college and joined the firm. However, there was no organization-wide policy concerning when an individual was to be tested, and there were wide variations in the amount of service individuals had at that time. In addition, there were other subjects who had worked their way up through the organization in the classic sense, and had less education and more service than the college recruits. Because a large section of the biodata form asked questions about college experiences, it was necessary to eliminate 74 individuals out of the original sample of 901 who had never attended college or otherwise had excessive missing data. An additional 74 cases were dropped because of missing criterion information, leaving a total of 753 cases.

A secondary sample was based upon all individuals who were tested in 1973 and 1974. This group lost 134 of its original 795 members as a function of missing criterion information. Of the remaining 661 individuals, 52 were females and 77 were minorities.

A final sample was composed of 209 subjects who were administered the test battery in 1963. In terms of race and sex composition, it was very similar to the 1966 group. Only six cases were dropped from the initial 215 as a result of missing data.

Measuring Instrument

The biodata form which was used is a 151 item inventory developed in a cooperative effort between Richardson, Bellows, and Henry and the petrochemical firm. While some of the items contain both continuous and discreet characteristics, it may be said that there are approximately 82 continuous items, 37 discreet items, and 32 multiple-response items. The questionnaire is routinely administered as part of the previously mentioned managerial test battery, and although it follows three timed tests, it is itself untimed. It should be noted that, while all subjects were administered the questionnaire in this same standardized form, item characteristics were modified as a function of the grouping technique being used.

Design

The first approach to constructing biodata dimensions

was a modification of the "expert judges" theme (Berkeley, 1953; Moore, 1968; Siegal, 1956) and was referred to as the "rational" technique. The author made a preliminary pass through the entire group of 151 items, and sorted them according to his subjective impressions of common elements which appeared to be involved. Those items for which the author could not hypothesize a relation to the resultant groups were discarded. However, many of the items were ambiguous in terms of what they appeared to be measuring, and in fact might have been measuring any number of different factors. Therefore, all items were redefined and rescored so as to maximize their hypothesized contribution to their respective dimensions.

It has already been noted that continuous items are preferable to non-continuous items in terms of their potential validity and amenability to analysis. Since this first grouping technique was intended to depend primarily upon rational, rather than empirical, considerations, all items were rationally rescored such as to approximate a continuous variable in terms of the dimension to which they were assigned. This was accomplished by assigning a value to each distractor. The values ranged from one to five, with one representing an extremely negative connotation for the dimension to which the item had been assigned, three the neutral point, and five being extremely positive (see Appendix C). Multiple-response items were handled somewhat differently in that all alternatives of hypothesized relevance were summed, and then values

assigned to the possible sum scores.

The role of the "expert judges" came in at this point. It seemed possible to evaluate the reliability of the resulting rational dimensions by having four judges, who, in this instance, were industrial-organizational graduate students, resort the now continuous items under the author's dimension names. To make the task less onerous and time consuming, each judge performed the sorting task in two parts, with each half containing the items and dimension titles which had been randomly assigned to that judge for that half. The directions for this task can be found in Appendix A.

Rather than being strictly a static check on the reliability of the keys, the outcome of the judging task was used to modify the rational groupings according to the following rules:

1) If an item was re-classified correctly at least 75% of the time, it was left with the original dimension.
2) If two dimensions showed strong and frequent interchange of items, the two were combined to form a new dimension.
3) For any item classified into a dimension other than the one originally selected by the author with at least 75% consistency among judges, the item was scored with the newly selected category. Where possible, the distractor relevant to the original category was retained and scored in that dimension.

4) Where there was a 50-50 split in the judges' decisions as to where an item belonged, the item was evaluated in terms of the appropriateness of scoring it with both dimensions.
5) Any item which did not fall under one of the above rules was discarded.

In addition to the rational assumptions concerning the range of values for distractors, there were also implicit assumptions concerning the differential contributions of individual items to their respective dimensions. Consequently, it was necessary to rationally assign weights to items in terms of their relative contribution to their categories. This was done on the basis of a total of 100 points which were distributed across the items within each content area. The resulting dimensions, items, item weights and distractor values are presented in Appendix C.

The second major approach to forming biodata dimensions, hereafter referred to as the "rational-empirical" technique, took the categories and distractor values which were rationally assigned in the first procedure and subjected them to an empirical evaluation in the form of an item analysis. A unique subject sample was drawn from the petrochemical firm's data bank and their biodata responses correlated with a standard appraisal criterion. The following steps and rules were then applied in revising the rational keys:

1) The general trend (positive or negative biserial correlations) between the items in a given dimension and the criterion measure was established.

2) If the trend across a majority of the items was negative, the item analysis data were reversed.
3) The initial distractor values were revised in accord with the item analysis table (see Appendix B). However, if fewer than 5% of the sample responded to the distractor, the item analysis results were ignored.
4) If an item continuum was violated in the revision, the discrepancy was resolved by changing the alternatives toward the neutral point.
5) If the above method could not be used to resolve a discrepancy, or in so doing the original rational continuum was violated, the item was discarded.
6) If items which had been eliminated from dimensions appeared to measure a common factor, they were regrouped into a new dimension.

After items had been rescored, regrouped, or dropped by the above decisions rules, new item weights were assigned to reestablish the 100 point totals for all dimensions. The resulting modifications to the rational dimensions are also presented in Appendix C.

The first two approaches had a common basis in the rational formation of dimensions and the rational definition of items. The last three techniques had parallel structures in the utilization of an item analysis to define items, and a cluster analysis to form categories. It has already been noted that cluster analysis experiences the problem of

ambiguities which result from mixing binary and continuum type items. To avoid this, an approach similar to that used by Matteson (1969) was employed. In his methodology for developing homogeneous keys through the clustering program employed by this study, he indicated that discreet and continuous items were dichotomized

> through logical considerations of item content and with the object of approximating a 50-50 split in terms of the distribution of responses. Point biserial relationships between these items and certain criterion information were also used to aid in the decision process (p. 20).

In a similar fashion, the current research sought to dichotomize continuous items such as to most closely approximate a 50-50 distribution of responses. However, the point biserial correlations across distractors, which were derived from the item analysis, were also evaluated to determine if more empirical dichotomies with acceptable splits existed. Discreet items were dichotomized by comparing the most frequently chosen distractor with all of the rest. The exception was once again those instances in which the point biserials indicated a more empirical dichotomy. Multiple-response distractors were treated as natural dichotomies, with each alternative evaluated as an independent variable. This procedure resulted in 474 dichotomized variables. However, practical limitations in terms of available computer space and the low probability of inclusion in any cluster suggested that variables with a response split more severe than 90-10 be dropped. This resulted in the deletion of

146 variables, retaining a total of 328. The responses of all individuals in the 1966 sample were recoded to form these variables, and then run through the cluster analysis program to form the basic empirical keys. It was at this point that the empirically-based strategies diverged.

The first of the clustering approaches was called the "empirical-rational" technique. The keys produced by the cluster analysis program were evaluated in terms of their rational cohesiveness. Any item or items which could not be logically related to the rest of the items in the same dimension were deleted. The second clustering approach, called the "empirical" method, maintained the item groupings precisely as presented in the cluster analysis output. The third strategy, referred to as the "empirical-empirical" technique, reviewed all items presented in a cluster in light of item-criterion correlations. Steps one and two from the rational-empirical revision procedure were repeated, and the items having a point biserial correlation with the criterion of less than .05, or a relationship opposite that of the majority of the cluster items were dropped. The empirically-based keys and the items included in each of the modifications are presented in Appendix D.

Perhaps it should be noted here that at least one basic procedural modification was added to Matteson's (1969) cluster analysis program. As originally written, items could be added to clusters only if the item-cluster correlation exceeded a specified threshold value in a positive

direction. Unfortunately, many items might be highly related to a cluster, but in a negative direction, and therefore never added. This negative relationship might be due to nothing more than the arbitrary assignment of 0's and 1's to the dichotomized halves of many items. As a partial remedy, the author reviewed the final matrix of item-cluster biserials, and noted those items which were not included in a cluster but would have been if certain of their correlations had been positive rather than negative. The dichotomies were reversed on these items, and the cluster analysis re-run. Cluster scores were then generated for all individuals across all techniques based upon unitary item weights.

Data analysis took the form of comparisons across dimension scores produced by the rational, rational-empirical, empirical-rational, empirical, and empirical-empirical approaches to grouping biodata. The first evaluation called for computation of the degree of internal consistency demonstrated by the individual dimensions within each grouping technique. Since independence is normally considered to be a desirable characteristic of homogeneous keys, another comparison was the intercorrelations among the factors produced by the five methodologies. In addition, Laurent (1951) felt that "each background area on the Biographical Information Blank should be studied to determine its contribution to the total effectiveness of the instrument (p. 36)." Both to determine relative contributions of each dimension and to maximize predictive validity, a multiple regression was done

across dimension scores resulting from each of the grouping techniques. The criterion used in these regressions was the first factor scores derived from a principal components factor analysis of age, service, job grade, a performance appraisal, and an estimate of career potential (see Appendix E). The initial sample was split in half such that the above procedures could be applied in a double cross-validation fashion. That is, B-weights derived from the even numbered cases were applied to the dimension scores of the odd numbered cases, and vice versa. Thus, it was possible to obtain an average cross-validated multiple correlation for each of the five grouping procedures. It was assumed that the best estimate of shrinkage would be reflected in the multiple correlations resulting after applying the average B-weights from the two halves of the 1966 sample to the 1973 sample. Although subsequent regressions were also done on that sample, the 1966 group provided the basis for most of the tables and summaries to be presented.

CHAPTER IV

RESULTS

Table 1 presents a summary of much of the data which may be found in full in Tables 2 and 3. In terms of the first point of comparison, it should be readily apparent that the rationally based strategies produced dimensions which were significantly less homogeneous than those obtained from the cluster analysis approach. Some of the earlier research in grouping procedures (DuBois, et al., 1952; Berkeley, 1953; Matteson, 1969) employed the concept of a "saturation coefficient" as an index of internal consistency. DuBois, et al. (1952, p. 3) presented the coefficient as the ratio of the inter-item covariances to the total test variance. Their developmental work yielded an average value of .60, while Matteson's (1969) later application resulted in an average coefficient of .53, with a range of .33 to .73. As can be seen in Table 2, the rational dimensions from the present research resulted in a range of .19 to .71, with a mean of .42. The empirical revision of these dimensions improved the saturation of only one factor (Achievement) and produced an overall range of .07 to .64 with a mean of .36.

The empirically based dimensions, on the other hand, yielded saturation indices which were much closer to the standards set in the early work. When the homogeneous keys from the cluster analysis program were rationally revised,

TABLE 1

Summary Statistics

for Five Grouping Procedures

(N=753)

	Rational	Rational-Empirical	Empirical-Rational	Empirical	Empirical-Empirical
Number of Dimensions	15	16	13	13	13
Number of Items Used/Total Items	113/151	112/151	119/328	125/328	86/328
Average Saturation	.42	.36	.62	.63	.51
Average KR-20	.50	.44	.71	.72	.62
Reliability per Item	.130	.140	.248	.240	.225
Average Intercorrelation	.14	.14	.10	.10	.09
Average Non-Cross-Validated Multiple Correlation (1966)	.49	.47	.48	.48	.49
Average Cross-Validated Multiple Correlation (1966)	.39	.34	.43	.44	.44
Correlation from Average 1966 B-Weights Applied to 1973-74 Sample	.50	.49	.40	.41	.43
Average Non-Cross-Validated Multiple Correlation (1973-74)	.57	.58	.47	.47	.49
Average Cross-Validated Multiple Correlation (1973-74)	.50	.49	.37	.38	.41
Correlation from Average 1973-74 B-Weights Applied to 1963 Sample	.43	.40	.39	.41	.44

TABLE 2

Means, Standard Deviations, Measures of Internal Consistency,

and Average Beta Weights for Rational and Rational-Empirical Dimensions

(N=753)

	Rational							Rational-Empirical						
Dimension	Number of Items	Mean	Standard Deviation	Saturation	KR-20	Reliability per Item	Average Beta	Number of Items	Mean	Standard Deviation	Saturation	KR-20	Reliability per Item	Average Beta
Socio-economic Background	8	291.23	63.97	.55	.63	.176	-.047	8	309.23	49.14	.44	.50	.112	-.070
Leadership	5	373.27	45.67	.24	.30	.063	-.090	5	341.35	36.40	.27	.34	.093	-.100
Part-time Work Experience	8	357.80	69.80	.51	.58	.147	-.050	7	349.09	60.09	.40	.47	.112	-.048
Need for Achievement	4	329.85	56.09	.41	.55	.234	.121	4	309.48	52.10	.35	.47	.181	.188
Self-Concept	7	386.08	46.80	.52	.61	.182	.128	7	345.83	47.78	.41	.48	.117	.036
Sociability	9	318.56	38.56	.47	.53	.112	.044	6	335.98	42.33	.31	.37	.083	.081
Close Friends								3	284.54	78.06	.34	.51	.258	-.084
Athletic Orientation	5	383.61	65.05	.52	.65	.196	.030	5	369.54	59.82	.48	.60	.231	-.017
Health	4	374.27	38.35	.19	.25	.077	-.008	4	351.12	48.51	.07	.09	.024	.007
Aggressive Acting-Out	3	230.49	98.42	.31	.47	.226	.003	3	230.49	98.42	.31	.47	.226	-.012
Family Relations	20	349.53	38.81	.56	.59	.067	-.031	20	318.56	25.57	.50	.53	.054	.033
Academic Background and Achievement	15	348.38	38.75	.71	.76	.175	.346	15	339.42	31.16	.54	.58	.085	.185
Independence	13	300.86	41.80	.20	.22	.021	.051	13	316.29	35.47	.16	.17	.016	.100
Breadth of Experience	6	355.88	40.06	.32	.38	.092	-.098	6	332.97	25.10	.19	.23	.047	.013
Achievement (non-academic)	6	370.48	43.15	.45	.54	.164	.082	6	351.22	45.13	.64	.77	.359	.221
Hedge Factor	3	.67	.98	.33	.50	.248	.010	3	.67	.98	.33	.50	.248	-.001

TABLE 3

Means, Standard Deviations, Measures of Internal Consistency,

and Average Beta Weights for Empirical-Rational, Empirical, and Empirical-Empirical Dimensions

(N=753)

Dimension	Empirical-Rational							Empirical							Empirical-Empirical						
	Number of Items	Mean	Standard Deviation	Saturation	KR-20	Reliability per Item	Average Beta	Number of Items	Mean	Standard Deviation	Saturation	KR-20	Reliability per Item	Average Beta	Number of Items	Mean	Standard Deviation	Saturation	KR-20	Reliability per Item	Average Beta
Maternal Presence in Home	9	6.07	2.82	.78	.88	.450	-.063	10	6.70	2.92	.77	.85	.362	.088	4	2.38	1.20	.35	.47	.182	-.120
Domestic Stability and Intimacy	15	9.17	2.92	.65	.70	.135	.021	15	9.17	2.92	.65	.70	.135	.016	7	4.41	1.70	.49	.58	.165	.035
Economic Independence and Aggressiveness	7	2.45	1.73	.41	.48	.117	-.136	10	3.17	1.99	.56	.62	.140	-.135	6	1.50	1.25	.42	.50	.142	-.106
Musical Participation	6	1.24	1.57	.63	.76	.346	-.044	6	1.24	1.57	.63	.76	.346	-.044	3	.90	1.03	.42	.56	.296	-.007
Scientific Interest	8	4.19	2.24	.64	.73	.252	.270	8	4.19	2.24	.64	.73	.252	.261	8	4.19	2.24	.64	.73	.252	.254
Mechanical-Realistic Inclination	6	2.32	1.42	.44	.53	.159	-.032	6	2.32	1.42	.44	.53	.159	-.030	2	1.06	.67	.12	.24	.136	-.017
High School Academic Achievement	5	2.12	1.27	.48	.60	.231	-.042	5	2.11	1.27	.48	.60	.231	-.036	5	2.11	1.27	.48	.60	.231	-.037
Collegiate Academic Success	11	4.52	2.85	.76	.84	.322	.190	11	4.52	2.85	.76	.84	.322	.196	11	4.52	2.85	.76	.84	.322	.187
Athletic Involvement	15	7.07	3.97	.81	.87	.309	.067	15	7.07	3.97	.81	.87	.309	.069	11	4.45	2.79	.72	.80	.267	.084
College Leadership Activities	7	1.04	1.46	.66	.77	.324	.063	7	1.04	1.46	.66	.77	.324	.059	7	1.04	1.46	.66	.77	.324	.064
Part-time Work History	6	3.22	1.50	.53	.64	.229	.057	6	3.22	1.50	.53	.64	.229	.057	4	2.01	1.29	.51	.68	.347	.045
Outdoor Recreational Interests	10	3.36	2.24	.60	.67	.169	-.064	11	3.82	2.41	.61	.67	.141	-.056	5	1.24	1.21	.39	.49	.161	-.090
Assertiveness	14	6.84	3.00	.70	.75	.178	.116	15	7.00	3.11	.70	.75	.167	.110	13	6.08	2.81	.70	.76	.194	.075

the range was from .41 to .81, with a mean of .62. These values were very similar to the average of .63 and range of .44 to .81 found with the empirical technique. Somewhat more variation was introduced as a result of the empirical deletion strategy on the empirical keys, although the mean saturation of .51 and range of .12 to .76 might cast doubt upon the value of the changes.

One problem in dealing with these data was that there did not appear to be any way to make a rigorous statistical test of the relative magnitude of the mean saturation coefficients across the five grouping methods. Not only were there different numbers of items involved in each of the grouping approaches, but the items themselves were defined differently. As one consequence, the author decided to present the same information in the form of the more familiar KR-20. This incorporated a slight correction factor in that a KR-20 equals the saturation times n/n-1, where n is the number of items in the factor. An extension of this same correction logic resulted in a reverse application of the Spearman-Brown prophecy formula. That is, rather than making an estimate of the reliability for a larger number of items, the KR-20 of each dimension was used to estimate the reliability per item. This was to deal with the possible hypothesis that the rationally-based dimensions were less reliable because they tended to contain somewhat fewer items than the empirically-based clusters. Both the KR-20's and the reliabilities per item are presented in Table 1. Unfortunately

for the author's rationally-based keys, the conclusion was the same: the empirically-based approaches appeared to be far superior in terms of internal consistency, with the empirical-empirical somewhat lower than the empirical-rational and the empirical.

The rational and rational-empirical schemes fared somewhat better in terms of the independence of their component dimensions. Table 1 indicates that both of the rationally-based techniques had an average intercorrelation among dimensions of .14. It is questionable whether this differs significantly the values of .10, .10, and .09 found in the empirical-rational, empirical, and empirical-empirical approaches, respectively. In addition, these values compared favorably with the average intercorrelation of .15 obtained by the DuBois group (1952) and Matteson's (1969) average of .10.

The matter of evaluating the relative predictive efficiency of each of the five grouping techniques proved to be a somewhat more complicated affair. Primarily, there was the continuing problem of attempting to compare mean values (from the two halves of the double cross-validation) for the five methods whose dimension scores were based upon the same samples. As can be seen in Table 1, there was little difference across the five approaches in the average non-cross-validated multiple correlation for the 1966 sample. Cross-validation within the same 1966 sample resulted in multiple correlations which were only slightly lower for the empirical

techniques, with somewhat greater shrinkage for the rationally-based methods. However, it appeared that a better estimate of shrinkage, or the true correlations to be expected, would call for averaging the B-weights from the two halves of the 1966 sample and applying these average B-weights to a new sample. Table 1 shows the correlations between predicted and actual criterion scores when the average 1966 B-weights from each of the five methodologies were applied to the 1973-74 sample.

As might be expected, there was little difference for the rational approaches between the cross-validated multiple correlation from 1966 and the 1973-74 correlations based upon average B-weights. But it came as no small surprise when the rationally based procedures produced correlations in this new sample which were equivalent to their non-cross-validated multiple correlations from 1966. This led to various hypotheses concerning the basis of such a finding. When a double cross-validation was performed on the 1973-74 dimension scores, the non-cross-validated multiple correlations from the empirical techniques approximated those obtained with the 1966 group. On the other hand, those from the rational procedures were noticeably higher. This seemed to preclude the possibility that the 1973-74 sample was merely more predictable across the board, even if this had not been reflected in the correlations for the empirically-based dimensions when first using the average B-weights.

The next hypothesis was that the rationally-based

dimensions were less reliable than the empirically-based dimensions only on the sample (1966) on which the latter were developed, while on a new sample (1973-74) the rational dimensions were more reliable. However, Table 4 indicates that there were no significant changes across samples in the average saturation coefficient for any of the grouping methods. In addition, it can be seen from Table 5 that there were only very minor changes across samples in terms of the average dimension-criterion correlations. And, to complicate matters further, when the average B-weights from the 1973-74 sample were applied first to the 1966 group and then to those individuals who were tested in 1963, the differences between techniques once again disappeared.

One last hypothesis turned on the fact that the 1973-73 sample contained significantly more females and minorities than the earlier samples. On the possibility that the addition of these new subsets differentially improved the predictive accuracy of the rationally and rational-empirical dimensions, females and minorities were individually and jointly removed from the total sample and the correlations computed again. There were no differences between the total group and any of the sub-samples in the correlations between the predicted and actual criterion.

On the basis of the evidence from all samples, then, it seemed reasonable to conclude that there was essentially no difference in the predictive efficiency of the five grouping methods. While there were consistent elevations in the

TABLE 4

Average Saturation Coefficients Across Samples for Five Grouping Techniques

Grouping Technique	Sample		
	1966 (N=753)	1963 (N=209)	1973-74 (N=661)
Rational	.42	.38	.41
Rational-Empirical	.36	.32	.34
Empirical-Rational	.62	.63	.62
Empirical	.63	.62	.62
Empirical-Empirical	.51	.48	.49

TABLE 5

Average Dimension-Criterion Correlation Across Samples for Five Grouping Techniques

Grouping Technique	Sample		
	1966 (N=753)	1963 (N=209)	1973-74 (N=661)
Rational	.11	.13	.15
Rational-Empirical	.13	.13	.16
Empirical-Rational	.13	.13	.13
Empirical	.13	.13	.13
Empirical-Empirical	.15	.15	.14

predicted-actual criterion correlations of the rationally-evolved factors for the 1973-74 sample, this could not be traced to either variations in dimension characteristics or fluctuations in sample composition and norms. A conservative position would call for additional samples of recent test takers before assuming significance or durability in that particular finding.

CHAPTER V

CONCLUSIONS, SUMMARY AND RECOMMENDATIONS

Conclusions

By this time it should be apparent that even though this paper proposed to compare the "relative utility" of several grouping procedures, the author has fastidiously avoided operationally defining that particular term. This was not so much a methodological oversight as a recognition of at least two basic definitions of that criterion which are not easily combined. As was mentioned in Chapter II, biodata research has a long history of empiricism in which the ultimate criterion of usefulness has been an instrument's predictive accuracy. However, it was also noted that the trend in the field, and the author's personal commitment, is toward the search for biographical dimensions which have greater psychological meaningfulness and potential. In the current research there was always the possibility that the grouping technique which produced the highest multiple correlations would have levels of internal consistency significantly below some other method, or vice versa. In that situation, the utility dilemma could have proved very troublesome. The pressures of selection and self-justification would tend to favor the approach resulting in the highest multiple correlations. Concerns for stable psychological dimensions, subgrouping individuals on the basis of dimension profiles, or an emphasis on job matching and placement strategies would call for more weight on internal consistency.

Fortunately, with the data from this study, the author could have chosen to emphasize either of the two basic criteria, and quite possibly would have come to the same conclusion. The summaries of Table 1 demonstrated that, whether in terms of saturation coefficients, KR-20's, or reliabilities per item, the empirically-based formats were clearly superior in producing homogeneous keys. In part, this had to be expected from the nature of the cluster analysis program employed. Not only did the construction of the keys turn upon the saturation coefficient, but there were at least two points at which keys were subjectly selected or eliminated on the basis of their saturation coefficients and intercorrelations with other keys. The only wonder is that there was not more of a difference between the rationally and empirically-based dimensions in terms of their average intercorrelations.

Selecting a grouping technique on the basis of predictive efficiency would have presented a somewhat more difficult problem. With the exception of the rational-empirical approach, there seemed to be little difference in the correlations produced by the five formats on the 1966 sample. However, the rationally-based procedures appeared to have a definite advantage in the 1973-74 group, whether using the average 1966 B-weights, initial regression weights, or the same weights in cross-validation. When the average 1973-74 B-weights were applied to the 1966 sample, this gain disappeared. It was assumed that the empirically-based keys

might have had an unfair advantage, since they were developed on that sample. But the same phenomenon occurred with a unique 1963 group. The problem, then, was one of deciding whether to believe that the rationally-based dimensions were truly, if inexplicably, more valid for recent populations that they were for older ones. A major consideration was that on the 1963 and 1966 samples the average 1973-74 B-weights produced correlations which approximated the original cross-validated multiple correlations for the 1966 group. This led the author to believe that, until there were more data available on recent subjects, it was safest to conclude that the elevations in the 1973-74 rational and rational-empirical dimensions were some kind of artifact which would not prove to be as stable as the indices from other samples.

If one accepts the conclusion that there were no differences in terms of predictive validity, then the amount of work involved in applying any given scheme becomes a consideration of some significance. Theoretically, since the rationally-based techniques were developed without a sample of responses, one might expect them to be more stable and therefore less subject to revision in the long run. However, their lower levels of internal consistency would seem to allow for greater variations and fluctuations across time. In addition, while a limited number of new items might be easily classified under existing dimensions, a large number of new questions or a new item pool would demand a repetition of the rather laborious rational procedures defined earlier.

The empirical techniques have the advantage of being based in more objective and better defined procedures which are computer-based. There are certain steps in the program which require manual examination and decision making, but overall, the task is a much less onerous and time-consuming than the rational method. It would seem that the advantage of any rational grouping technique would have to be clear and exceptional to outweigh this factor alone, to say nothing of the weakness in internal reliability.

Once item clusters had been obtained with Matteson's (1969) program, neither a rational nor empirical item deletion strategy seemed to make any positive contribution to the resulting keys. The rational deletion strategy resulted in dropping only six items from four keys, leaving nine dimensions unchanged. On the other hand, the empirical-empirical approach dictated the removal of 39 of 125 items, but resulted in a noticeable drop in the average saturation coefficient. There appeared, then, to be little justification for either of these methods.

Summary

By way of summary, perhaps it can be said that the most noteworthy variations within the five grouping techniques under consideration came in the area of internal consistency. Whether in terms of saturation coefficients, KR-20's, or reliability per item, the empirically-based dimensions were clearly superior. The use of a criterion based item analysis

to modify item scoring or inclusion appeared to have a detrimental effect on the reliability of both the rational and empirical keys. All of the methodologies produced average intercorrelations among categories which were acceptable, according to the standards of previous research.

The evaluation of relative predictive efficiency and stability was more complex as a function of sample variations. The conclusion was that, until there was more evidence from recent populations it was safest to assume that there were no differences in the respective abilities to predict a composite criterion measure. This served to throw more weight on the effort factor, where the empirical formats had the clear advantage in being computer-based. Within the cluster analysis approaches, neither the rational nor empirical deletion strategies yielded any significant gains. This resulted in the final acceptance of the direct cluster analysis dimensions as having the greatest overall utility.

Observations and Recommendations

While not defined as one of the focal points of this study, it appeared to be of some interest to compare the specific factors generated by the two basic grouping methods. As can be seen in Table H of Appendix F, many of the rational dimensions have their empirical counterparts, whether or not they carry the same label. Those most closely related appear to be in the areas of leadership, part-time work experience, athletic orientation, family relations, and academic background. Of additional significance is the fact that Academic

Background and Achievement received the highest Beta weight in the rational regressions, and Collegiate Academic Success was second only to Scientific Interest in all of the empirical regressions.

To generalize even further, Matteson's (1969) research employed an abbreviated biodata form which contained items both similar to and unique from the ones which served as the basis for the author's work. Although he used a sample of blue collar applicants, his first and one of the more robust keys was Academic Ability. There were other keys involving both labels and item contents similar to those found in the current research. These included Scientific Interests, Mechanical-Electrical, Athletic Involvement, and Musical Interests.

Since cluster analysis was originally selected because of several perceived advantages over factor analysis, an attempt was made to compare the clusters produced during the current work with factors coming from the same questionnaire. Unfortunately, the factorial studies (Baker, 1967; Taylor, 1968) employing this questionnaire used a methodology which made such a comparison almost impossible. The basic procedure was initiated by Baker (1967). First, many of the items were treated quite differently. Continuous items were left as continuums, while discreet items had all alternatives transformed into dichotomies, rather than making each continuous and discreet item a single dichotomy, as was done for the cluster analysis. This meant that a mixed matrix

of continuous and dichotomized items were the basis of the correlation matrices. Secondly, since the resulting number of items was too large to factor with the available programs, second order factors were used. The tactics called for all items to be subjectively grouped into eight content areas. These eight areas were then factor analyzed, and resulting factor scores were combined for a second factor analysis. The result was some 18 second order factors, most of which were impressive in being both ponderous and rather complex if one inspected the content in terms of individual items. While a few of the first order factors were in some fashion similar to keys coming from the cluster analysis program, the differences in item definition, the methodology of factor analysis, and the rather confusing manner of presentation appeared to preclude a meaningful comparison.

This last point might suggest that at least one area for future research would be a more systematic contrast of the homogeneous dimensions obtained from factor analysis and cluster analysis. To avoid the problems which eliminated that option in this study, it would be necessary to use the same item pool and a factor analysis program capable of handling all variables at one time. As a side issue, it would be interesting to relate the factors developed through Baker's (1967) methodology with those resulting from the analysis of a single input matrix.

Another topic which was briefly considered but not thoroughly investigated was the possibility of special

characteristics, relationships, or even unique keys which might be found when dealing with minority group members and females. While the sample sizes in these groups may not be large enough to do individual cluster analyses, certainly they would merit individual scrutiny to ascertain the stability of the saturation coefficients, intercorrelations, and criterion relationships found with the total group.

A third research area issue would focus on the puzzling nature of the multiple correlations found in the 1973-74 sample. While certain demographic variables were briefly investigated as possible moderators, there are certainly a vast number of factors which could differentiate more recently acquired company employees from older populations. For example, it has been noted that Academic Ability was the most heavily weighted dimension in rational regressions, and second highest in the empirical regressions. Yet, a comparison of the 1973-74 and 1966 groups on their academic means demonstrates that the more recent group was significantly lower. There was also a significant difference in terms of the High School Academic Achievement factor. These differences might prove to be worthwhile leads when investigating other recent samples when they become available.

Another possibility for explaining the predictive superiority of the rationally based approaches on the 1973-74 sample would focus on the primary experimenter and the "expert judges" as well as the subjects. It should be noted that when forming the original rational dimensions, the author

was 26 years old. The average age of the four judges who were used to revise those dimensions was 28. At the time that the task was being carried out, the average ages of the 1973-74, 1966, and 1963 samples were 33, 41, and 43, respectively. The question would be whether the closer age proximity of the author and judges to the most recent sample gave them a much broader basis of shared experiences and values, and facilitated the construction of more valid dimensions. Support for this issue may be found in Schmuckler's (1966) evaluation of age differences in biodata factors. Using items from the same biographical questionnaire and subjects from the same petrochemical firm involved in the current research, Schmuckler compared the factor structures of middle managers who were under 25, 25 to 30, and 30 to 50. He concluded that:

> Differences were shown to exist in the items comprising the factors although the factors were similar in content. It was shown that the differences in these items could have arisen because of the different influences acting upon the individual as a function of the time period in which he was reared (p. 42).

This might lead one to conclude that the optimal development of rational biodata categories would require subjective grouping procedures by experimenters who were similar to the subject population at least in terms of age. An extension of the same logic would suggest that increasing experimenter-subject similarities along other lines, such as race, sex, geographic origin, etc., might continue to increase the validity of the rational categories. The development stage

of the rational technique has the advantage of being a sample-free procedure, and therefore would not require the large number of subjects in each age, race or sex category that factor analysis or cluster analysis would. However, the expansion of experimenter-subject similarities beyond age might necessitate the use of experimenters, or at least "expert judges", other than those with advanced psychological backgrounds. This might mean training students or managers in performing the item sort and definition tasks, and then comparing the validities of the dimensions produced by experimenters similar to and dissimilar from the subject population in question. In any event, the hypothesized improvements could be evaluated by following the procedures developed in Chapter III, with a major improvement being the use of independent samples for the comparison groups.

Finally, a somewhat broader definition of the utility of homogeneous keys might require a comparison of their predictive efficiency with that of the currently used heterogeneous scoring techniques. In at least one study (Sparks, 1975) using the same biographical questionnaire, subject population, and criterion measure employed in the current research, the average zero order correlation between the empirical scoring keys and the criterion was .42. The reader will recall that the best estimate of the validity of any grouping approach was assumed to be the correlation resulting from the application of the average B-weights to a new sample. The empirical clusters produced correlations

of .41 on both the 1973-74 and 1963 samples. Those figures reflect both high consistency and lack of any significant difference from the validity of the traditional scoring keys. Of course, if a biodata form were administered as part of a larger battery of tests, it would be necessary to recompute the multiple correlation coming from the total battery to determine the true worth of the clusters. A comparable criterion relationship between the clusters and empirical key might conceal a shift in the variance accounted for, with the possibility of greater overlap between the homogeneous keys and the other battery measures and a decreased multiple correlation.

However, the question of overlap with other measuring instruments does suggest another research topic. It seems quite possible that initial evaluation of the construct validity of at least some of the biodata dimensions might come through comparison with other tests administered in the same battery. Certainly there would be some interest in the relationship between the clusters presented in Appendix D and scores on intelligence tests, personality tests, aptitude and interest measures, etc.

By way of conclusion, then, there would seem to be ample evidence to recommend the substitution (or at least addition) of homogeneous biodata dimensions for the traditional empirical keys. The clusters derived in this study displayed the characteristics of reliability and validity which would make them useful in selection situations, and

have the additional advantage of providing scores which are potentially useful in areas such as placement and developmental counseling. Biodata dimensions such as these may even be a step toward the "parsimonious number of predicted variables" sought by Thompson and Owens (1964) in an effort to establish congruence within factors across populations and criteria.

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APPENDIX A

INSTRUCTIONS FOR THE RATIONAL SORTING OF BIODATA ITEMS

Instructions for the Rational Sorting of Biodata Items

Along with this instruction sheet you should have two decks of 4 x 6 cards. One deck contains approximately 60 items taken from a biographical information form, the other contains titles for seven general biodata dimensions or categories. Your task is to assign each of the biodata items to the dimension in which you feel it most appropriately falls.

You will find that some items are readily assigned to a dimension simply as a result of their content. However, the meaning of other items is contingent upon the way in which they are scored. Therefore, it is important to observe the value assigned to the item alternatives, which is written in pencil to the left of each distractor. The item alternative value reflects the positive or negative nature of that distractor in terms of the dimension to which the item belongs. It <u>does not</u> represent the relative <u>weight</u> of an item. Item alternative values are assigned on a scale ranging from 1 to 5, where

1 = extremely negative
2 = negative
3 = neutral
4 = positive
5 = extremely positive

Therefore, looking at the extreme values of an item's alternative will simplify the matter of categorizing items or deciding upon one of several dimensions which an item could fall into.

Before beginning your task, spread out the seven title cards in front of you such that you can see all seven at once. Then proceed through the item deck, assigning each item to one dimension. Please do <u>not</u> turn over the item cards during the sorting. You may change your mind or re-assign items to different dimensions, but when you are satisfied please put a rubber band around all of the items in each dimension, with the title card on top.

Thank you for your cooperation.

APPENDIX B

ITEM ANALYSIS TABLE FOR EMPIRICAL REVISION OF RATIONAL DIMENSIONS

Initial Distractor Value	Item Analysis Point Biserial Correlation With Criterion*	Revised Distractor Value
1	--	1
	-	1
	0-	2
	0+	2
	+	3
	++	3
2	--	2
	-	2
	0-	2
	0+	3
	+	3
	++	3
3	--	2
	-	2
	0-	3
	0+	3
	+	4
	++	4
4	--	3
	-	3
	0-	3
	0+	4
	+	4
	++	4
5	--	3
	-	3
	0-	4
	0+	4
	+	5
	++	5

* Where $-- \leq -.10 < - \leq -.05 < 0- < .00 < 0+ < +.05 \leq + < +.10 \leq ++$

APPENDIX C

RATIONAL AND RATIONAL-EMPIRICAL DIMENSIONS

Socio-economic Background

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
As a young person, I recall that my immediate family was (30)[1]			
A not always able to make ends meet	1	.029	2
B able to have necessities only	2	-.084	2
C able to live comfortably	3	.063	4
D well to do	4	--[2]	4
E quite wealthy	5	--	5
While growing up, the section of town in which my family lived the longest was (15)			
A one of the most exclusive	5	--	5
B good but not the best	4	-.010	3
C average	3	.012	3
D one of the poorer	2	--	2
E the poorest	1	--	1
When I was in high school, the money which my family had was (5)			
A less than most of the families of my classmates	1	.009	2
B about the same as the families of my classmates	3	-.015	3
C a little more than the families of my classmates	4	.030	4
D considerably more than the families of my classmates	5	--	5
E I don't know or didn't give it much thought	3	--	3
The occupation which my father followed most of his life may be best described as (25)			
A business executive	5	-.025	4
B clerical worker	3	-.034	3
C farmer or rancher	3	.028	3
D professional man	5	-.020	4
E salesman	4	.097	4
F store or shop owner	4	-.002	3
G service worker (barber, chauffer, etc)	2	--	2
H skilled craftsman (carpenter, machinist, etc)	2	-.028	2
I unskilled or semi-skilled worker	1	-.013	2
J other	3	.005	3

[1] The numbers in parentheses after an item stem indicate the relative weight of the item in the dimension. Where there are two numbers, the first represents the weight in the rational scoring, the second the weight in the rational-empirical scoring.

[2] Indicates that fewer than 5% of the sample responded to the alternative, and the item analysis biserials were ignored.

(Socio-economic Background, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
The highest educational level that my father attained was (15)			
A eigth grade or lower	1	.016	2
B some high school but did not graduate	1	.001	2
C high school graduate	2	.016	3
D some college but did not graduate	3	-.015	3
E college graduate	4	-.002	3
F master's degree or equivalent (MA,MS, etc)	5	--	5
G doctor's degree or equivalent (PhD, MD, etc.)	5	--	5
The highest educational level that my mother attained was (5)			
A eigth grade or lower	1	.024	2
B some high school but did not graduate	1	-.027	2
C high school graduate	3	-.008	3
D some college but did not graduate	4	-.015	3
E college graduate	4	.014	4
F master's degree or equivalent (MA, MS, etc.)	5	--	5
G doctor's degree or equivalent (PhD,MD,etc.)	5	--	5
The organizations to which my father belonged while I was growing up were (MAA)[1] (3)			
D country club	5	-.015	4
E farmer's association or Grange	3	.033	3
H labor union	1,2	.022	2
I management association	5	.043	4
K professional association	4	-.038	3
L trade association	2	.014	3
M university or college alumni club	4	.011	4
The organizations to which my mother belonged while I was growing up were (MAA) (2)			
C cultural society	4	.028	4
D Grange	3	--	3
F labor union	1	--	1
G management association	4	--	4
J professional association	4	.038	4
M university or college alumni club	4	.013	4
N other organization	3	.038	3
O none of these	3	.038	3

[1] Indicates a multiple response item in which the respondent had the option of either checking or not checking each alternative.

Leadership

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
At some time while in undergraduate college, I held the position of (MAA) (30)			
A captain of an athletic team	4	.058	4
B chairman of an important student committee	4	-.013	3
C editor of the school paper or yearbook	4	--	4
D head cheer leader	4	--	4
E leading actor in a class play	4	--	4
F manager of an athletic team	4	-.041	3
G president of an honorary scholastic or leadership organization	4	.063	4
H president of my class or the student council	4	--	4
I none of these	3	.011	3
By the time I had graduated from high school, I had been (MAA) (30)			
A captain of an athletic team	4	.009	4
B manager of an athletic team	4	.017	4
C editor of the school paper or yearbook	4	.054	4
D president of a school club	4	.013	4
E president of my class or the student council	4	-.009	3
F chairman of an important student committee	4	-.029	3
G none of these	3	.032	3
In thinking about my career in the business world and abilities in administration and supervisory activities on the one hand and in technical and scientific activities on the other, I believe that I have the greatest chances for success in positions which are (20)			
A entirely administrative and supervisory	5	-.110	3
B primarily administrative with some technical work	4	.121	3
C about equally divided between administrative and technical work	3	.010	3
D primary technical with some administrative work	2	-.030	2
E entirely technical and scientific	1	--	1
The highest grade I attained in the armed forces, not including ROTC, was (15)			
A private or apprentice seaman	3	-.051	2
B non-commissioned or petty officer	4	-.105	3
C warrant or flight officer	4	--	4
D commissioned officer	5	.060	5
E I was never in the armed forces	3	.097	3
During my teens when teams were being chosen, I was usually (5)			
D one of those doing the picking	5	.048	4

Part-time Work Experience

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
During the last couple of years I was in undergraduate college the average number of hours a week which I spent on part-time jobs was (20)			
A none	3	-.028	3
B less than 5	3	-.020	3
C 5 to 10	4	-.033	3
D 10 to 20	4	.023	4
E more than 20	5	-.029	4
The part of the money for my support which I personally earned during my last couple of years of undergraduate college was (30)			
A less than 10%	1	.021	2
B 10 to 30	2	-.050	2
C 30 to 60	3	-.053	2
D 60 to 90	4	-.020	3
E about all of it	5	.016	4
During my last couple of years in high school the number of hours a week I averaged on part-time paid jobs was (15)			
A none	3	-.036	3
B 1 to 5	3	-.025	3
C 6 to 10	4	.029	3
D 11 to 15	4	-.006	3
E 16 or more	5	.033	4
When I earned my first money on a regular job (other than from members of my family) my age was (15)			
A younger than 8	5	--	5
B 8 to 10	5	-.004	4
C 11 to 12	3	-.066	3
D 13 to 14	3	.048	3
E older than 14	1	.007	2
I was able to go to school as long as I did because (MAA) (10)			
A I was supported by my family	2	.067	3
B I worked and paid part of my expenses	4	.014	4
C I worked and paid all of my expenses	5	.005	4
D I received a scholarship, fellowship, or assistantship	3	-.024	3
E I obtained a loan	2	-.006	2
F I received assistance from a government agency	2	.054	3

(Part-time Work Experience, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
The largest number of part-time jobs I held at any one time during my last couple of years in undergraduate college was (5)			
A none	3	-.040	3
B 1	4	-.018	3
C 2	5	.004	4
D 3 or more	5	-.034	4
During my teens I usually spent my summers (MAA) (5)			
A attending summer school to get additional credit or training	3	--	D I
B attending summer school to make up work	3	--	S
C studying at home for the next school year	3	--	C
D going to camp.	3	.068	A
E taking life easy	3	.073	R
F taking a vacation alone	3	--	D
G vacationing with my family	3	.030	E
H working	4	-.001	D
I doing something else	3	-.046	
During the years I was in high school, most of my spending maney came from (10)			
A allowance from the family	1	-.093	1
B my own earnings	5	.010	5
C partly allowance and partly earnings	3	.029	3
D I did not have much spending money	3	.054	3

Need for Achievement

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
In thinking about my investment program for the next 10 or 15 years, excluding company plans, I expect to place major emphasis on (20)			
A savings accounts	2	.038	3
B government and municipal bonds	3	--	3
C insurance and annuities	3	.001	3
D preferred stocks and corporate bonds	3	.000	3
E mutual funds	3	--	3
F growth stocks	4	.078	4
G speculative stocks	5	--	5
H property or business investments	4	-.120	3
I. something else	3	--	3
J I have no plans for an investment program	1	--	1
The level at which I would like best to work (whether or not I ever attain that level) is (40)			
A president or chairman of the board	5	-.030	4
B the top executive level (vice president, director, or a principal officer)	4	.108	4
C the top management level below the executives	3	-.062	2
D the next level below (a division of a major function or area or a top staff or top specialist position)	3	-.062	2
E the next level below (a supervisory or staff position)	2	-.017	2
F a non-supervisory or operating position	1	--	1
Without any false modesty, I believe that the highest level that I can reach in the course of my career in a major company such as Standard Oil Company (New Jersey), General Motors, or U.S. Steel is (30)			
A president or chairman of the board	5	.056	5
B the top executive level (vice president, director, or a principal officer)	4	.028	4
C the top management level below the executives	3	.028	3
D the next level below (a division of a major function or area or a top staff or top specialist position)	3	-.031	3
E the next level below (a supervisory or staff position)	2	-.072	2
F a non-supervisory or operating position	1	--	1
Assuming that the dollar were to remain at its present value, I would expect to be earning 20 years from now (10)			
A about the same salary as at present	1	--	1
B about 25% more	2	--	2
C about 50% more	2	.019	2
D about twice as much	3	-.005	3
E three times as much or more	5	.005	4
F a salary in line with my position and performance	3	.023	3
G I don't know	3	--	3

Self-Concept

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
On a list of 100 typical people in the kind of job I can do best, I would belong in the (25)			
A best 5%	5	.013	4
B upper 20% but not in the best 5%	4	.026	4
C upper half but not in the top 20%	3	-.064	2
D in the lower half	1	--	1
E I haven't given it much thought	3	--	3
The speed at which I usually work is (10)			
A much faster than most people	5	.017	4
B somewhat faster than most people	4	.056	4
C somewhat slower than most people	2	-.051	2
D much slower than most people	1	--	1
E I am unable to tell	3	-.063	2
In terms of my own executive ability or potential executive ability (not just in this one but in any company) I think I stand in the (25)			
A top 5%	5	.042	4
B upper 20% but not in the top 5%	4	.033	4
C upper half but not in the top 20%	3	-.060	2
D in the lower half	1	--	1
E I don't know	2	-.043	2
In comparison with most other people as an entertainer or leader of the conversation in social affairs, I am (20)			
A at the top	5	--	5
B among the few best	5	.060	5
C above the average	4	.044	4
D about average	3	-.062	2
E below average	2	--	2
F I haven't given it much thought	3	--	3
With regard to my personal appearance, as compared with the appearance of my friends (10)			
A most of my friends make a better appearance	1	-.031	2
B I am equal to most of them in appearance	3	-.067	2
C I am better than most of them in appearance	5	.053	5
D I don't feel strongly one way or the other about my appearance	3	.075	4

(Self-Concept, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
During my teens, in comparison with most of the other fellows of my age, my general athletic ability was (5)			
A near the top	5	.044	4
B above the average	4	-.052	3
C about average	3	.040	3
D a little poorer than most	2	-.057	2
E much poorer than most	1	—	1
F I don't know or never gave it much thought	3	—	3
Insofar as automobile driving is concerned, I (5)			
A am not quite as good as most other drivers	2	—	2
B am as good as most other drivers	3	-.018	3
C am better than most other drivers	4	.012	4
D am one of the best drivers	5	.006	4
E do not drive	3	—	3

Sociability

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
During my last year in high school the number of evenings a week that I would go out socially was (10 - 20)			
A less than 1	1	.010	2
B 1	2	-.076	2
C 2	3	.068	3
D 3	4	-.054	3
E 4 or more	5	.057	5
During my high school years most of my unscheduled time was taken up with (10 - 20)			
A dances, dates, or parties	4	.071	4
B sports	3	.043	3
C making spending money	2	-.090	2
D music, art, reading	1	--	1
E scholastic activities	1	-.019	2
During my teens I spent most of my spending money on (5 - 8)			
A going out with my girl friends	5	.010	4
B bowling, golf, tennis, and similar sports	3	-.031	3
C models, tools, and materials, or equipment for my hobbies	2	.043	3
D my car and it maintenance	2	.039	3
E sandwiches, milkshakes, and other snacks	2	--	2
F going places with the gang	4	-.009	3
G something else	3	.002	3
H I didn't have much spending money	3	-.061	2
Before the age of 12 I spent most of my spare time (10 - 12)			
A playing games with other youngsters	3	.007	3
B reading or working on my hobbies	1	.032	2
C watching television, listening to the radio, or attending movies	1	--	1
D studying lessons for school	1	--	1
E practicing musical instruments	1	--	1
F something else	1	--	1
In comparison with most of the people I know, I am able to make new friends (15 - 30)			
A much easier	5	.008	4
B a little easier	4	.039	4
C with the same effort	3	-.009	3
D with somewhat more difficulty	2	--	2
E with a great deal more difficulty	1	--	1
F I haven't given it much thought	3	-.110	2

(Sociability, Cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
During my teens most of my friends (5 - 10)			
A were usually younger than I was	1	--	1
B were about my own age	3	-.017	3
C were usually older than I was	5	.020	4
D I did not have an opportunity to make many friends (work, isolated area, etc.)	3	--	3

(Sociability - Close Friends)

The one of the following statements which I think comes close to describing my own personality is (15 - 50)			
A difficult to really get to know	2	--	2
B have some really close friends and a number of acquaintances	3	-.089	2
C friendly, easy going, and have a lot of friends	4	.063	4
D fairly jolly; the life of the party	5	--	5
E I find it very difficult to describe myself	3	--	3
I think it would have been most desirable (whether or not it was true) during my last year in high school to have had (10 - 30)			
A no close friends	1	--	1
B one or two close friends	2	-.065	2
C a small group of close friends	3	-.068	2
D a great many close friends	4	.055	4
E almost everyone in my class a close friend	5	.091	5
During my last year in high school I had (20 - 20)			
A no close friends	1	--	1
B one or two close friends	2	-.034	2
C a small group of close friends	3	-.074	2
D a great many close friends	4	.088	4
E almost everyone in my class as a close friend	5	--	5

Athletic Orientation

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
During my last two years of high school the number of hours per week I spent on athletics, both in and out of school, was about (30)			
A none	1	--	1
B 1 to 4	2	-.006	2
C 5 to 9	3	-.035	3
D 10 to 14	4	.008	4
E 15 or more	5	.048	4
The number of activities I marked in the preceding item (sports and activities enjoyed) was (25)			
A none	1	--	1
B 1 to 3	2	--	2
C 4 to 7	3	-.019	3
D 8 to 12	4	.016	4
E 13 or more	5	.006	4
While in high school or college, I earned a school letter as a (MAA) (25)			
A baseball player	4	.040	4
B basketball player	4	.099	4
C boxer	4	--	4
D football player	4	.064	4
E swimmer	4	--	4
F tennis player	4	.013	4
G trackman	4	.073	4
H wrestler	4	--	4
I participating in some other sport	4	.023	4
J none of these	3	.009	3
While in high school, I did not participate in varsity athletics because (MAA) (5)			
A I did not have the ability to make the varsity	3	.045	3
B I had to work after school	3	-.040	3
C I preferred to work after school	3	-.003	3
D my studies took too much time	3	--	3
E I lived too far from the school	3	-.056	2
F I was too small	3	-.027	3
G my parents would not give their permission	3	--	3
H I was not interested	3	.025	3
I I did not maintain eligibility standards	3	--	3
J my health was not good enough	3	--	3
K some other reason	3	-.035	3
L I did participate in varsity athletics	5	.024	4

(Athletic Orientation, Cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
During my teens when teams were being chosen for games, I was usually (15)			
A among the last to be chosen	1	.024	2
B chosen around the middle	3	.070	3
C chosen near the first	4	-.104	3
D one of those doing the picking	5	.048	4
E I was too busy to participate in games	1	-.054	1

Health

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
During my last few years of high school the average number of days each year that I was absent because of illness was (35)			
A none	5	-.004	4
B 1 to 5	4	.026	4
C 6 to 10	3	--	3
D 11 to 25	2	--	2
E more than 25	1	--	1
My physical condition is (50)			
A poor - need rest or medical treatment often	1	--	1
B fair - can work regularly but don't always feel quite right	2	--	2
C good - as good as that of most people	3	-.074	2
D excellent - can tackle any job	4	.035	4
E perfect - can drive hard on any job night or day	4	.030	4
I am most likely to have headaches (10)			
A when I am trying to concentrate hard on doing something right	2	--	2
B after one of those nights out	3	.026	3
C after driving or looking at a strong glare during summer	3	.024	3
D when I don't get to eat on time	2	-.062	2
E for no particular reason that I can determine	1	.035	2
F I never have headaches	5	-.040	4
Insofar as dropping off to sleep is concerned, I (5)			
A can go to sleep right away at any time of the day or night	5	-.046	4
B can go to sleep within 15 minutes	3	-.017	3
C can go to sleep in 15 minutes to ½ hour	2	.006	3
D usually need ½ hour or more to fall asleep	1	--	1
E have no consistent pattern in the time required	3	.071	4

Aggressive Acting-Out

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
The way I act at the present when I become angry is (40)			
A storm aroun for a while letting off steam	5	.001	4
B try not to show that I am angry at all	1	.001	2
C talk it over with someone	3	-.007	3
D try to keep away from everybody for a while	2	-.040	2
E I never let my temper get the best of me	1	.031	2
As a youngster, when I became angry, I preferred to get over it by (30)			
A keeping it to myself and letting it wear off	1	.030	2
B kicking or throwing something	5	-.047	4
C taking it out on someone else	4	—	4
D using loud exclamations	3	-.041	3
E talking about the problem with friends	2	.019	3
I believe that the least desirable way for a youngster to react when he is angry is by (30)			
A keeping it to himself and letting it wear off	5	-.038	4
B kicking or throwing something	1	-.042	2
C taking it out on someone else	2	.067	3
D using loud exclamations	3	—	3
E talking about the problem with friends	4	.005	4

Family Relations

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
My childhood family situation was (15)			
A unusually happy	5	.024	4
B average	3	-.014	3
C not particularly happy	1	--	1
During my teens my parents and I got along (10)			
A very well; we agreed on almost everything	5	-.043	4
B better than most; we rarely had disagreements	4	.104	4
C about average; as well as other family groups	3	-.057	2
D not very well; we had many disagreements	2	-.018	2
E not at all; we almost never agreed	1	--	1
While I was growing up, my brothers and sisters and I (10)			
A got along very well together	5	-.054	3
B quarreled occasionally	3	.060	3
C rarely agreed	1	--	1
D didn't quarrel but we didn't have very much to do with one another	2	--	2
E I was an only child	3	-.018	3
My parents treated me (5)			
A like all the other children in the family	3	.006	3
B not too badly but I was not the favorite	2	-.019	2
C not as well as they treated the others	1	--	1
D better than the others	5	.050	5
E I was an only child	3	-.014	3
While I was growing up, the people who picked on me the most were (2)			
A brothers and sisters	2	-.029	2
B friends or others of my own age	3	.036	3
C parents or guardians	1	--	1
D teachers	3	--	3
E someone else	3	-.058	2
F none of these	3	.023	3
The one of the following statements which was most characteristic of my father when I was growing up is (2)			
A a strict person with strong moral principles	4	.004	4
B a very stern person but not too moralistic	4	.021	4
C a fairly principled person	3	-.053	2
D a person who was forced by circumstances to modify his principles	2	--	2
E a rather ineffectual person compared with what he might have been	1	--	1

(Family Relations, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
When I was growing up, my parents' discipline was (2)			
A very strict	5	--	5
B strict	4	.033	4
C not consistently strict	3	-.007	3
D not especially strict	3	.004	3
E far from strict	2	--	2
F I was rarely disciplined	1	--	1
As a boy, when I misbehaved at home or in the neighborhood, I was usually disciplined by (2)			
A my mother	3	.004	3
B my father	3	.019	3
C someone else	1	--	1
D no one	1	--	1
E I did not misbehave enough to need discipline	3	--	3
The years of my childhood which I would like most to live over are (2)			
A the time before I started to school	3	--	3
B the time I was in school	3	.023	3
C the time when I used to date	3	-.026	3
D none - my childhood was fine, but living it over doesn't interest me	3	-.009	3
E I dislike thinking about my childhood	1	--	1
During my teens my real parents were (10)			
A living together	3	.038	3
B separated but not divorced	2	-.044	2
C divorced	2	-.055	2
D separated by the death of one of them	2	.028	3
E both dead	1	-.062	1
During my teens my parents included me in their leisure-time or hobby activities (10)			
A most of the time	5	-.012	4
B frequently	4	.031	4
C occasionally	3	.011	3
D rarely	2	--	2
E almost never	1	--	1
During my teens, when my family was together for an evening, we would usually (10)			
A talk over subjects of general interest	5	.003	4
B talk about the personal problems we had during the day	5	.007	4
C play games together	4	-.059	3
D watch television or listen to the radio	3	.071	4
E read, work puzzles, write, etc.	2	.100	3
F concern ourselves with our own activities	2	-.097	2
G do something else	3	--	3

(Family Relations, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
When I was a boy, my mother helped me in (MAA) (2)			
A choosing clothes	4	.021	4
B choosing girl friends	4	.006	4
C music	4	.074	4
D school work	4	-.020	3
E selecting school subjects	4	-.026	3
F selecting reading material	4	-.065	3
G none of these	1	.018	2
When I was a boy, my father helped me in (MAA) (5)			
A learning to use tools	4	.108	4
B learning sports	4	.001	4
C school work	4	-.066	3
D selecting school subjects	4	-.021	3
E selecting a job	4	.085	4
F learning to drive a car	4	.102	4
G none of these	1	-.010	1
While I was growing up, my mother was employed outside of our home (MAA) (2)			
A never	3	-.010	3
B before I started to school	2	-.019	2
C when I was in grammer school	2	.020	3
D when I was in high school	2	.001	3
During my teens the person who understood me best was (2)			
A my mother	5	.030	4
B my father	5	-.012	4
C a brother or sister	5	--	5
D some other relative	4	--	4
E a teacher	2	--	2
F an athletic coach or manager	2	--	2
G a religious counselor	2	-.013	2
H a friend of my own age	3	--	3
I someone else	3	--	3
J no one really understood me	1	--	1
As a child, when I was hurt or worried, the person to whom I would usually go for sympathy was (3)			
A an older brother or sister	5	--	5
B my mother	5	.062	5
C my father	5	-.062	3
D someone else	3	--	3
E no one	2	--	2

(Family Relations, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
When I was about 16 years old, I usually went for advice to (2)			
A friends of my own age	3	-.055	2
B my father	5	.061	5
C my mother	5	.022	4
D teachers or ministers	2	-.056	2
E someone else	3	.022	3
F I didn't seek advice from anyone	1	-.065	1
With respect to my entertaining at home during my teens, my family (2)			
A encouraged me to make our home the center of activity	5	-.005	4
B encouraged me to bring several friends home	4	-.018	3
C encouraged me to bring a few friends home	3	-.008	3
D did not care whether I brought friends home	1	.081	3
E permitted but did not encourage my bringing friends home	2	--	2
F could not encourage my bringing friends home because of space or other limitations	3	--	3
During my teens my friends and I got together most often at (2)			
A my home	5	.008	4
B the home of one of my friends	3	.057	4
C a club or dance hall	3	--	3
D a street corner	3	--	3
E a community center	3	-.052	2
F some other place	3	-.040	3
G I did not get together with friends very often	3	--	3

Academic Background and Achievement

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
The highest educational level that I attained was (20)			
A less than high school graduate	1	--	1
B high school graduate	1	--	1
C high school graduate plus formal training other than college	2	--	2
D two years of college or less	2	-.048	2
E more than two years of college but did not graduate	2	-.071	2
F college graduate	3	.057	4
G master's degree or equivalent (MA, MS, etc.)	4	.098	4
H doctor's degree or equivalent (PhD, MD, etc.)	5	--	5
My scholastic standing when I graduated from or left undergraduate college was (15)			
A upper 5% of my class	5	.096	5
B upper 15 % (but not top 5%)	5	.092	5
C upper 30% (but not top 15%)	4	-.052	3
D upper half (but not top 30%)	3	.044	3
E lower half of my class	2	-.078	2
With respect to honors my bachelor's degree was awarded (10)			
A summa cum laude	5	--	5
B magna cum laude	5	--	5
C cum laude	4	--	4
D with distinction	4	-.015	3
E none of these, but I was usually an honor student in college	4	.074	3
F none of these because my marks were not high enough	3	.005	3
G I did not receive a bachelor's degree	3	-.072	2
My usual scholastic standing in high school was in the (10)			
A top 5%	5	.035	4
B upper third but not top 5%	4	-.005	3
C middle third	3	.019	3
D lower third	1	--	1
E I do not know	3	--	3
The reason I stopped full-time study in school was because (3)			
A I completed the education I had planned	3	.104	4
B I needed money to meet family responsibilities	2	-.110	2
C I preferred work to study in getting started on a career	2	.033	3
D I needed money because I wanted to get married	2	--	2
E I did not pass a sufficient number of courses	1	--	1
F some other reason	2	-.070	2

(Academic Background and Achievement, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
I failed or had to repeat one or more courses during high school or college because of (MAA) (3)			
A dropping the course due to illness or some other reason	1	-.006	2
B lack of the necessary background for the course	1	-.018	2
C inability to master the subject matter	1	-.067	1
D a personality conflict with the teacher	1	--	1
E some other reason	1	.042	2
F I did not fail or repeat any course	3	.100	4
My scholastic achievement in high school was rewarded by (MAA) (3)			
A placement in an accelerated group or special school	5	.002	4
B permission to take additional courses	5	.005	4
C promotions at a more rapid rate than the rest of the class	5	--	5
D assignment of extra projects	5	-.006	4
E granting of honor study hall or special study privileges	5	-.015	4
F no special consideration	5	.088	5
G I did not merit any special reward	3	-.066	2
At the time I graduated from high school, my age was (3)			
A 15 or younger	5	--	5
B 16	4	-.060	3
C 17	3	.032	3
D 18	3	.002	3
E 19	2	--	2
F 20 or older	2	--	2
G I did not graduate from high school	1	--	1
During my teens, as compared with others of my own sex, my rate of progress through school was (3)			
A much more rapid than most	5	.122	5
B just a little faster than most	4	.035	4
C about the same as most	3	-.113	2
D just a little slower than most	2	--	2
During my last full time year of undergraduate college, the number of hours per week that I spent in study outside of class was about (5)			
A 5 or less	1	-.031	2
B 6 to 10	2	-.052	2
C 11 to 15	3	.106	3
D 16 to 20	4	-.026	3
E more than 20	5	.054	5

(Academic Background and Achievement, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
With respect to studying during undergraduate college (3)			
A I did not do much studying because I didn't want to	1	-.031	2
B I did not do much studying because of other demands on my time	2	-.040	2
C I did not do much studying because it wasn't necessary	1	.043	2
D I studied hard but only before examinations	3	-.014	3
E I studied regularly through the school year	4	.084	4
F I planned and did extra studying beyond that specifically required for my school work	5	.043	4
When I was in school, I felt that the best way to get good marks in my subjects was to (2)			
A keep my homework up to date and of high quality	4	.050	4
B cram before exams	3	--	3
C ask for and complete additional assignments	5	--	5
D take a very active part in class discussions	4	.035	4
E make myself popular with the teachers	2	--	2
F find out what each teacher emphasized and concentrate on that	3	-.092	2
G do something else	3	--	3
H I was not especially interested in getting good marks	1	--	1
I seriously considered quitting school (5)			
A frequently	1	--	1
B occasionally	2	-.032	2
C seldom	3	-.035	3
D almost never	4	.061	4
While in school, I won a scholarship or fellowship because of ability in (10)			
A academic work	5	.101	5

(Academic Background and Achievement, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
The high school subjects which I took and liked very much were (5)			
A agriculture	4	-.006	3
B art	4	-.041	3
C biological sciences	4	.033	4
D bookkeeping	4	.020	4
E chemistry	4	.026	4
F civics	4	-.060	3
G English or literature	4	-.061	3
H foreign language	4	.005	4
I history	4	.055	4
J mathematics	4	.111	4
K mechanical drawing	4	-.033	3
L music	4	-.047	3
M physical education	4	-.009	3
N physics	4	.037	4
O religion	4	-.008	3
P shop	4	.077	4
Q shorthand	4	—	4
R speech	4	-.022	3
S typing	4	-.026	3
T none of these	1	—	1
The high school subjects which I took and disliked very much were (MAA) (5)			
A agriculture	2	—	2
B art	2	.009	2
C biological sciences	2	.039	3
D bookkeeping	2	—	2
E chemistry	2	-.062	2
F civics	2	—	2
G English or literature	2	.084	3
H foreign language	2	-.066	2
I history	2	.064	3
J mathematics	2	-.156	2
K mechanical drawing	2	—	2
L music	2	.096	3
M physical education	2	—	2
N physics	2	—	2
O religion	2	—	2
P shop	2	—	2
Q shorthand	2	—	2
R speech	2	—	2
S typing	2	—	2
T none of these	5	.017	4

Independence

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
During my teens my parents permitted me to make the final decisions concerning (MAA) (20)			
A attending religious services	4	.079	4
B courses I took in school	4	.045	4
C decorating my room	4	-.003	3
D drinking	4	.063	4
E selecting my clothes	4	-.036	3
F smoking	4	.037	4
G taking music lessons	4	.040	4
H the hour I should be home	4	.014	4
I use of my spare time	4	.031	4
J use of the automobile	4	.124	4
K whom I dated	4	.073	4
L none of these	1	--	1
The amount of influence the members of my family exercised on my vocational choice was (15)			
A a great deal; they virtually forced me to accept their choice	1	--	1
B some; they influenced me but did not insist that I accept their choice	2	-.073	2
C a little; they encouraged me generally but left the choice to me	3	.046	3
D none; they tried but failed to influence me	5	--	5
E none; they were indifferent to my choice	4	.034	4
As a young man, when I returned from a date, my parents usually (MAA) (5)			
A were very inquisitive	1	--	1
B scolded me because I did not come home earlier	2	--	2
C were waiting up when I came in	3	-.072	2
D were interested but did not ask many questions	3	-.010	3
E teased or kidded me about the evening	4	-.032	3
F had retired for the night	5	.040	4
When I was small and adult visitors came to our house, I usually (MAA) (5)			
A was coached in advance on what I should do	1	-.002	2
B was not permitted to be in the room with the guests	2	--	2
C was permitted to be in the room if I remained quiet	2	.044	3
D was permitted to participate in the conversation	3	-.053	3
E recited, sang, or performed for the guests	4	-.056	3
F made a nuisance of myself in spite of my parents orders	4	-.031	3
G did as I pleased since my parents paid no attention	5	-.031	4

(Independence, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
During my teens I attended religious services (5)			
A regularly because I wanted to	4	.042	4
B regularly because I felt it was my duty	2	-.081	2
C regularly but only because my family thought I should	1	.063	2
D occasionally with my family or friends	3	-.006	3
E rarely or never	3	--	3
When I first went along on a trip of over 100 miles, my age was (5)			
A younger than 10	5	-.016	4
B 10 to 12	4	-.042	3
C 13 to 15	3	-.073	2
D 16 to 18	2	.106	2
E 19 or older	1	-.014	2
When I had a very difficult task to do during my teens, I would usually (12)			
A ask someone else to do it for me	1	--	1
B ask someone else to show me or help me	2	-.074	2
C look up methods in a book or manual	4	.031	4
D try to work it out alone	5	.042	4
E look for some other approach	3	--	3
When I found problems hard to understand during my high school days, I think it would have been most desirable to (10)			
A ask teachers or parents for help	2	-.107	2
B ask schoolmates for help	2	--	2
C give closer attention in class	3	-.085	2
D plan and carry out background study	5	.058	5
E study until the problem was solved	5	.122	5
F none of these	3	--	3
If I made a potentially serious error at work, I would (5)			
A try to correct it as soon as possible	5	.010	5
B report it to my supervisor immediately	1	-.013	2
C ask my fellow workers to help me correct it before it is discovered	2	--	2
D wait and see if it is discovered before doing anything	3	--	3
E cover up as much as possible so that I will not get the blame	3	--	3

(Independence, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
While I was an undergraduate, my residence for the greatest part of the time was (10)			
A a dormitory	2	.031	3
B a fraternity house	2	.002	3
C a rooming house	5	.012	4
D with my parents or other relatives	1	.013	2
E some other arrangements	3	.029	3
While in undergraduate college, I would have preferred to live			
A in a dormitory	2	.013	3
B in a fraternity house	2	.008	3
C in a rooming house	5	.030	4
D with my parents or other relatives	1	-.046	2
E someplace else	3	.093	4
The distance from my home to the undergraduate college I attended for the longest period of time was (2)			
A less than 25 miles	1	-.003	2
B 25 to 100 miles	2	.042	3
C 100 to 500 miles	3	.022	3
D more than 500 miles	4	.030	4
I think that the most desirable distance between one's home and college would be (2)			
A less than 25 miles	1	-.051	1
B 25 to 100 miles	2	.093	3
C 100 to 500 miles	3	.017	3
D more than 500 miles	4	.036	4

Breadth of Experience

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
The number of items I checked in the preceding question was (By the time I was 18 years old, I had . . .) (30)			
A none	1	--	1
B 1 to 7	3	--	3
C 8 to 14	4	-.007	3
D 15 or more	5	.012	4
The branch of the service in which I spent the most time was (20)			
A Army	5	-.066	3
B Navy or Coast Guard	5	-.030	4
C Air Force or Army Air Corps	5	.006	4
D Marine Corps	5	--	5
E I was not in the service	3	.091	4
During my undergraduate years I participated in (MAA)(20)			
A a social club or fraternity	4	.019	4
B political clubs	4	-.012	3
C a school paper or yearbook	4	-.018	3
D dramatics	4	-.092	3
E musical activities	4	-.073	3
F forensics	4	--	4
G athletic activities	4	.021	4
H some other school-sponsored activity	4	.116	4
I none of these	1	-.012	2
The kind of college (or unit of a large university) which I attended for the longest period of time as an undergraduate may best be described as (15)			
A coeducational and liberal arts	4	-.025	3
B non-coeducational and liberal arts	2	.067	3
C teachers' college	2	--	2
D technical or engineering	2	.078	3
E junior college	2	--	2
F military	2	--	2
G something else	3	--	3
The type of community in which the undergraduate college was located which I attended for the longest period of time can be best described as			
A primarily a college town	1	.082	3
B a fairly small town but not primarily a college town	2	.072	3
C a medium sized city	3	-.048	3
D a large city with no other college	4	--	4
E a large city in which there were other colleges	5	-.026	4

(Breadth of Experience, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Optin Value
The type of community in which I would have preferred attending college could be best described as (5)			
A primarily a college town	1	.024	2
B a fairly small town but not primarily a college town	2	.043	3
C a medium-sized city	3	-.005	3
D a large city with no other college	4	—	4
E a large city in which there were other colleges	5	.024	4

Achievement (non-academic)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
While in school, I won a scholarship or fellowship because of ability in (MAA) (15)			
A academic work	5	.101	5
B art or music	5	--	5
C athletics	5	.071	5
D writing or speaking	5	--	5
E something else	5	--	5
F none of these	3	-.077	2
During my high school years I was a member of (MAA) (15)			
A an athletic team	4	.030	4
D a school musical organization (band, orchestra, chorus, etc.)	4	-.008	3
E an honor society or the honor roll	4	.095	4
During my college years the things I was able to do with little effort were (MAA) (15)			
A earn a letter in athletics	4	.025	4
D win a leading part in a school play	4	--	4
E win an election for a class position	4	.037	4
F become a member of the debating team	4	--	4
G get in a musical organization	4	-.030	3
H receive a responsible job on a school publication	4	--	3
I win a popularity contest	4	--	4
At some time while in undergraduate college, I held the position of (MAA) (25)			
A captain of an athletic team	4	.058	4
B chairman of an important student committee	4	-.013	3
C editor of the school paper or yearbook	4	--	4
D head cheer leader	4	--	4
E leading actor in a class play	4	--	4
F manager of an athletic team	4	-.041	3
G president of an honorary scholastic or leadership organization	4	.063	4
H president of my class or the student council	4	--	4
I none of these	3	.011	3

(Achievement, cont.)

	Rat Option Value	Point Bi-serial	Rat-Emp Option Value
By the time I had graduated from high school, I had been (MAA) (25)			
A captain of an athletic team	4	.009	4
B manager of an athletic team	4	.017	4
C editor of the school paper or yearbook	4	.054	4
D president of a school club	4	.013	4
E president of my class or the student council	4	-.009	3
F chairman of an important student committee	4	-.029	3
G none of these	3	.032	3
The highest grade I attained in the armed forces, not including ROTC, was (5)			
A private or apprentice seaman	3	-.051	2
B non-commissioned or petty officer	4	-.105	3
C warrant or flight officer	4	--	4
D commissioned officer	5	.060	5
E I was never in the armed forces	3	.097	deleted

Hedge Factor[1]

My usual scholastic standing in high school was
E I do not know

In terms of my own executive ability or potential executive ability (not just in this one but in any company) I think I stand in the
E I don't know

The speed at which I usually work is
E I am unable to tell

During my teens, in comparison with most of the other fellows my age, my general athletic ability was
F I don't know or never gave it much thought

When I was in high school, the money which my family had was
E I don't know or didn't give it much thought

Assuming that the dollar were to remain at its present value, I would expect to be earning 20 years from now
G I don't know

In comparison with most other people as an entertainer or leader of the conversation in social affairs, I am
F I haven't given it much thought

In comparison with most of the people I know, I am able to make new friends
F I haven't given it much thought

On a list of 100 typical people in the kind of job I can do best, I would belong in the
E I haven't given it much thought

With regard to my personal appearance, as compared with the appearance of my friends, I think that
D I don't feel strongly one way or the other about my appearance

The one of the following statements which I think comes closest to describing my own personality is
E I find it difficult to describe myself

I believe that most of my associates tend to think of me as
D I haven't given it much thought

[1] Items were given unitary weights and not revised for the rational-empirical scoring.

APPENDIX D

EMPIRICAL-RATIONAL, EMPIRICAL, AND EMPIRICAL-EMPIRICAL DIMENSIONS

APPENDIX D

As was mentioned in Chapter 3, all items going into the cluster analysis program were in the form of 0 - 1 dichotomies. On discreet and continuum type items, the options which were recoded as a one are preceded by a plus (+) sign. On multiple-response questions (designated by MAA after the stem) the alternatives were normally recoded to one if checked and zero if not checked. However, where this natural dichotomy was reversed, the alternative is preceded by a minus (-) sign.

Maternal Presence in Home	Emp-Rat Delete	Point Biserial	Emp-Emp Delete
At the present time my age is	X	.39	
A 25 or younger			
B 26 to 30			
+ C 31 to 35			
+ D 36 to 40			
+ E 41 to 50			
+ F 51 to 60			
+ G 61 or older			
At some time during her life my mother was employed for a substantial period of time in (MAA)			
- J sales work		.03	X
O she was never employed		-.08	
While I was growing up, my mother was employed outside of our home MAA)			
A never		.02	X
- B before I started to school		.07	X
- C when I was in grammar school		.01	X
- D when I was in high school		-.09	
While I was growing up, my mother worked outside the home because MAA)			
- B she enjoyed the work she did		-.05	
- C our family needed the money		-.01	X
D she never worked outside the home		.00	X
Domestic Stability and Intimacy			
The organizations to which my father belonged while I was growing up were (MAA)			
C church group		-.02	X
J parent-teacher' association		.16	
The organizations to which my mother belonged while I was growing up were (MAA)			
B church group		.01	X
During my teens my real parents were		.10	
+ A living together			
B separated but not divorced			
C divorced			
D separated by the death of one of them			
E both dead			

(Domestic Stability and Intimacy, cont.)

	Emp-Rat Delete	Point Biserial	Emp-Emp Delete
My childhood family situation was		.01	X
+ A unusually happy			
B average			
C not particularly happy			
During my teens the person who understood me best was		.07	
A my mother			
+ B my father			
+ C a brother or sister			
+ D some other relative			
+ E a teacher			
+ F an athletic coach or manager			
+ G a religious counselor			
+ H a friend of my own age			
+ I someone else			
+ J no one really understood me			
When I was a boy, my father helped me in (MAA)			
A learning to use tools		.11	
B learning sports		.03	X
D selecting school subjects		.01	X
F learning to drive a car		.07	
During my teens my parents included me in their leisure-time or hobby activities		-.02	X
+ A most of the time			
+ B frequently			
C occasionally			
D rarely			
E almost never			
As a boy, when I misbehaved at home or in the neighborhood, I was usually disciplined by		.04	X
A my mother			
+ B my father			
C someone else			
D no one			
E I did not misbehave enough to need discipline			
By the time I was 18 years old I had (MAA)			
O owned and cared for a pet		-.03	X
As a young person, I recall that my immediate family was		.10	
A not always able to make ends meet			
B able to have necessities only			
+ C able to live comfortably			
+ D well to do			
+ E quite wealthy			

(Domestic Stability and Intimacy, cont.)

	Emp-Rat Delete	Point Biserial	Emp-Emp Delete
When I was about 16 years old, I usually went for advice to		.06	
A friends of my own age			
+ B my father			
C my mother			
D teachers or ministers			
E someone else			

Economic Independence and Aggressiveness

At some time during her life my mother was employed for a substantial period of time in (MAA)			
D factory work	X	-.14	
The number of living brothers and sisters I had when I was 16 years of age was	X	-.09	
A none			
B 1			
+ C 2			
+ D 3			
+ E 4 or more			
The high school subjects which I took and liked very much were (MAA)	X	-.13	
D bookkeeping			
During the last couple of years I was in undergraduate college, the average number of hours a week which I spent on part-time paid jobs was		.05	X
A none			
B less than 5			
C 5 to 10			
+ D 10 to 20			
+ E more than 20			
The part of the money for my support which I personally earned during my last couple of years of undergraduate college was		.07	X
A less than 10%			
B 10% to 30%			
C 30% to 60%			
+ D 60% to 90%			
+ E about all of it			

(Economic Independence and Aggressiveness, cont.)

	Emp-Rat Delete	Point Biserial	Emp-Emp Delete
The main reasons why I left my last regular employer (excluding part-time and summer jobs) were (MAA)			
A little chance for advancement		-.22	
F dissatisfaction with salary		-.19	
- O I have had no previous regular employer		-.28	
I was able to go to school as long as I did because (MAA)			
- A I was supported by my family		-.04	X
C I worked and paid all of my expenses		.03	X
Musical Participation			
When I was a boy, my mother helped me in (MAA)		.12	
C music			
The high school subjects which I took and liked very much were (MAA)			
L music		-.03	X
During my undergraduate years I participated in (MAA)			
E musical activities		.01	X
During my college years the things I was able to do with little effort were (MAA)			
G get in a musical organization		-.03	X
During my high school years I was a member of (MAA)			
D a school musical organization (band, orchestra, chorus, etc.)		.08	
By the time I was 18 years old I had (MAA)			
L learned to play a musical instrument		.13	
Scientific Interest			
The high school subjects which I took and liked very much were (MAA)			
E chemistry		.12	
J mathematics		.17	
N physics		.30	
The high school subjects which I took and disliked very much were (MAA)			
T none of these		.16	
My undergraduate college majors were in (MAA)			
- D business administration		.12	
F engineering		.18	

(Scientific Interest, cont.)

	Emp-Rat Delete	Point Biserial	Emp-Emp Delete
While I was growing up, I had visions of becoming (MAA)			
J a scientist		.28	
In thinking about my career in the business world and my abilities in administrative and supervisory activities on the one hand and in technical and scientific activities on the other, I believe that I have the grestest chances for success in positions which are		.18	
A entirely administrative and supervisory			
+ B primarily administrative with some technical work			
+ C about equally divided between administrative and technical work			
+ D primary technical with some administrative work			
+ E entirely technical and scientific			

Mechanical - Realistic Interest

The high school subjects which I took and liked very much were (MAA)			
K mechanical drawing		.06	
P shop		.02	X
By the time I was 18 years old I had (MAA)			
B built a radio set		.02	X
D developed and enlarged photographs		.03	X
Q painted or papered a room		-.01	X
U repaired a mechanical or electircal appliance		.06	

High School Academic Achievement

My usual scholastic standing in high school was in the		.23	
+ A top 5%			
+ B upper third but not top 5%			
C middle third			
D lower third			
E I do not know			

(High School Academic Achievement, cont.)

			Emp-Rat Delete	Point Biserial	Emp-Emp Delete
My scholastic achievement in high school was rewarded by (MAA)					
	B	permission to take additional courses		.17	
	D	assignment of extra projects		.08	
	E	granting of honor study hall or special study privileges		.13	
-	G	I did not merit any special reward		.22	

Collegiate Academic Success

My scholastic standing when I graduated from (or left) undergraduate college was				.11	
+	A	upper 5% of my class			
+	B	upper 15% (but not top 5%)			
	C	upper 30% (but not top 15%)			
	D	upper half (but not top 30%)			
	E	lower half of my class			
With respect to honors my bachelor's degree was awarded				.15	
+	A	summa cum laude			
+	B	magna cum laude			
+	C	cum laude			
+	D	with distinction			
+	E	none of these, but I was usually an honor student in college			
	F	none of these, because my marks were not high enough			
	G	I did not receive a bachelor's degree			
I failed or had to repeat one or more courses during high school or college because of (MAA)					
-	B	a lack of the necessary background for the course		.20	
-	C	inability to master the subject matter		.12	
	F	I did not fail or repeat any courses		.27	
While in school, I won a scholarship or fellowship because of ability in (MAA)					
	A	academic work		.40	
-	F	none of these		.10	
At some period during my college years I was a member of					
	B	general honorary scholastic society		.41	
	D	an honorary society of scholastic achievement in a specific field		.46	

(Collegiate Academic Success, cont.)

	Emp-Rat Delete	Point Biserial	Emp-Emp Delete
During my college years the things I was able to do with little effort were (MAA)			
B make the honor roll		.28	
I was able to go to school as long as I did because (MAA)			
D I received a scholarship, fellowship, or assistantship		.28	
Athletic Involvement			
The high school subjects which I took and liked very much were (MAA)			
M physical education		-.08	X
While in high school or college, I earned a school letter as (MAA)			
A baseball player		.05	
B basketball player		.19	
D football player		.20	
G trackman		.21	
- J none of these		-.02	X
During my college years the things I was able to do with little effort were (MAA)			
A earn a letter in athletics		.05	
While I was growing up, I had visions of becoming (MAA)			
I a professional athlete		.09	
During my teens, in comparison with most of the other fellows my age, my general athletic ability was		-.02	X
+ A near the top			
+ B above the average			
C about average			
D a little poorer than most			
E much poorer than most			
F I don't know or never gave it much thought			
During my teens the sports and outdoor activities in which I really enjoyed participating were (MAA)			
B basketball		.11	
F football		.16	

(Athletic Involvement, cont.)

	Emp-Rat Delete	Point Biserial	Emp-Emp Delete
By the time I had graduated from high school, I had been (MAA)			
A captain of an athletic team		.05	
During my last two years of high school the number of hours per week I spent on athletics, both in and out of school, was about		.12	
A none			
B 1 to 4			
C 5 to 9			
+ D 10 to 14			
+ E 15 or more			
While in high school, I did not participate in varsity athletics because (MAA)			
L I did participate in varsity athletics		.15	
During my teens when teams were being chosen for games, I was usually		-.12	X
A among the last to be chosen			
B chosen around the middle			
+ C chosen near the first			
+ D one of those doing the picking			
E I was too busy to participate in games			

College Leadership Activities

At some period during my college years I was a member of (MAA)			
C an honorary society for some campus achievement		.32	
During my undergraduate years I participated in (MAA)			
B political clubs		.11	
C a school paper or yearbook		.20	
At some time while in undergraduate college, I held the position of (MAA)			
B chairman of an important student committee		.21	
G president of an honorary scholastic or leadership organization		.40	
- I none of these		.05	
During my college years the things I was able to do with little effort were (MAA)			
E win an election for a class position		.21	

Part-time Work History

	Emp-Rat Delete	Point Biserial	Emp-Emp Delete
The largest number of part-time jobs I held at any one time during my last couple of years in undergraduate college was		.17	X
A none			
B 1			
+ C 2			
+ D 3 or more			
During my last couple of years in high school the number of hours a week I averaged on part-time paid jobs was		-.06	
A none			
B 1 to 5			
C 6 to 10			
+ D 11 to 15			
+ E 16 or more			
During my teens I usually spent my summers (MAA)			
H working		-.06	
During my high school years most of my unscheduled time was taken up with		-.17	
A dances, dates, or parties			
B sports			
+ C making spending money			
D music, art, reading			
E scholastic activities			
By the time I was 18 years old I had			
K held a part-time job		.23	X
During the years I was in high school, most of my spending money came from		-.09	
A allowance from the family			
+ B my own earnings			
C partly allowance and partly earnings			
D I did not have much spending money			

Outdoor Recreational Interests

During my teens my parents permitted me to make the final decisions concerning (MAA)			
C decorating my room	X	.08	X
During my teens I usually spent my summers (MAA)			
D going to camp		-.14	
G vacationing with my family		.06	X

(Outdoor Recreational Interests, cont.)

	Emp-Rat Delete	Point Biserial	Emp-Emp Delete
During my teens the sports and outdoor activities in which I really enjoyed participating were (MAA)			
O wrestling		-.11	
P boating		-.07	
Q camping		.01	X
R fishing		.02	X
S hiking		-.11	
U skating		-.13	
V skiing		.04	X
The number of activities I marked in the preceding item was		.06	X
A none			
B 1 to 3			
C 4 to 7			
+ D 8 to 12			
+ E 13 or more.			

Assertiveness

The organizations to which my mother belonged while I was growing up were (MAA)			
K service club	X	.19	
The high school subjects which I took and liked very much were (MAA)			
R speech		.01	X
In terms of my own executive ability or potential executive ability (not just in this one but in any company) I think I stand in the		.28	
+ A top 5%			
+ B upper 20% but not in the top 5%			
C upper half but not in the top 20%			
D in the lower half			
E I don't know			
During my teens the sports and outdoor activities in which I really enjoyed participating were (MAA)			
M track		.07	
During my high school years I was a member of (MAA)			
A an athletic team		.01	X
C a school group (debating team, political science club, etc.)		.17	

(Assertiveness, cont.)

		Emp-Rat Delete	Point Biserial	Emp-Emp Delete
	By the time I had graduated from high school, I had been (MAA)			
	D president of a school club		.17	
	E president of my class or the student council		.05	
	F chairman of an important student committee		.12	
-	G none of these		.07	
	By the time I was 18 years old I had (MAA)			
	M made a long distance phone call		.28	
	N made a speech before more than 100 people		.21	
	X taken a girl out to dinner		.17	
	The number of items I checked in the preceding question was (By the time I was 18 . . .)		.33	
	A none			
	B 1 to 7			
	C 8 to 14			
+	D 15 or more			
	In comparison with most other people as an entertainer or leader of the conversation in social affairs, I am		.21	
+	A at the top			
+	B among the few best			
+	C above average			
	D below average			
	E I haven't given it much thought			

APPENDIX E

VARIABLE LOADINGS ON THE FIRST FACTOR DERIVED FROM A PRINCIPAL COMPONENTS FACTOR ANALYSIS OF AGE, SERVICE, APPRAISAL, POTENTIAL, AND JOB GRADE

Variable Loadings on the First Factor*

Derived from a Principal Components Factor Analysis

of Age, Service, Appraisal, Potential, and Job Grade

Variable	Loading
Age	-.11
Service	-.04
Appraisal**	-.61
Potential	.95
Job Grade	.92

* The first factor accounted for 42.7% of the variance.

** Where true weight is in opposite direction because scale is reversed: lower appraisal values mean better performance and vice versa.

APPENDIX F

INTERCORRELATIONS OF THE DIMENSIONS PRODUCED BY THE FIVE GROUPING TECHNIQUES

TABLE A

Intercorrelations of the Rational Dimensions

(N=753)

Rational Dimensions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Socio-economic Background	--															
2. Leadership	.11	--														
3. Part-time Work Experience	-.28	.10	--													
4. Need for Achievement	.19	.17	.04	--												
5. Self-Concept	.24	.40	.07	.43	--											
6. Sociability	.08	.27	.14	.22	.32	--										
7. Athletic Orientation	.09	.38	.10	.14	.26	.36	--									
8. Health	.07	.13	.09	.18	.25	.12	.15	--								
9. Aggressive Acting-Out	-.01	-.02	-.01	-.06	-.05	.01	-.01	-.06	--							
10. Family Relations	.20	.15	-.05	.09	.15	.22	.14	.11	-.10	--						
11. Academic Background and Achievement	.09	.06	-.12	.16	.10	-.14	-.01	.07	-.07	.14	--					
12. Independence	.07	.03	.02	.19	.16	.10	.12	.06	-.06	-.01	.22	--				
13. Breadth of Experience	.17	.32	.07	.15	.23	.19	.21	.08	-.01	.09	-.11	-.05	--			
14. Achievement (non-academic)	.14	.79	.04	.17	.34	.24	.47	.10	-.03	.14	.22	.11	.30	--		
15. Hedge Factor	-.09	-.16	-.03	-.08	-.32	-.09	-.07	-.08	-.02	-.13	-.07	.00	-.09	-.15	--	
16. Composite Criterion	.03	.04	-.07	.22	.18	.04	.07	.06	-.04	.04	.39	.19	-.10	.13	-.05	--

TABLE B

Intercorrelations of the Rational-Empirical Dimensions

(N=753)

Rational-Empirial Dimensions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Socio-economic Background	--																
2. Leadership	.15	--															
3. Part-time Work Experience	-.28	.00	--														
4. Need for Achievement	.17	.19	.03	--													
5. Self Concept	.22	.30	.02	.36	--												
6. Sociability	.19	.17	.07	.24	.33	--											
7. Close Friends	.00	.09	.11	.09	.16	.26	--										
8. Athletic Orientation	.12	.38	.07	.12	.23	.30	.24	--									
9. Health	.11	.09	.03	.22	.28	.12	.15	.17	--								
10. Aggressive Acting-Out	-.03	-.03	-.01	-.05	-.04	.06	-.04	-.01	-.05	--							
11. Family Relations	.21	.14	-.10	.09	.12	.08	.18	.15	.17	-.08	--						
12. Academic Background and Achievement	.09	.24	-.12	.15	.06	-.08	-.09	-.02	.04	-.05	.17	--					
13. Independence	.06	.13	.01	.16	.11	.17	-.03	.11	.07	-.08	.02	.18	--				
14. Breadth of Experience	.22	.26	-.03	.25	.27	.23	.00	.27	.14	.02	.13	.14	.11	--			
15. Achievement (non-academic)	.15	.79	.01	.17	.23	.15	.07	.44	.04	-.03	.14	.26	.16	.29	--		
16. Hedge Factor	-.07	-.16	-.03	-.07	-.27	-.11	-.04	-.07	-.08	-.02	-.09	-.07	.01	-.11	-.14	--	
17. Composite Criterion	.06	.18	-.07	.25	.14	.12	-.06	.08	.06	-.04	.08	.31	.19	.13	.25	-.05	--

TABLE C

Intercorrelations of the Empirical-Rational Dimensions

(N=753)

Empirical-Rational Dimensions	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Maternal Presence in Home	--													
2. Domestic Stability and Intimacy	.09	--												
3. Economic Independence and Aggressiveness	-.04	-.09	--											
4. Musical Participation	.05	.14	-.07	--										
5. Scientific Interest	-.02	.10	-.21	.11	--									
6. Mechanical-Realistic Inclination	.00	.06	.07	.01	.23	--								
7. High School Academic Success	-.01	.19	-.15	.08	.28	.05	--							
8. Collegiate Academic Success	.00	.04	-.12	.08	.42	.00	.29	--						
9. Athletic Involvement	.00	.19	.08	-.04	-.11	-.07	.09	-.04	--					
10. College Leadership Activities	-.07	.13	.00	.04	.04	.05	.22	.21	.11	--				
11. Part-time Work History	-.11	-.10	.35	.01	-.08	.10	-.01	-.02	-.03	.04	--			
12. Outdoor Recreational Interests	-.01	.27	.03	.07	.08	.21	-.01	-.02	.10	.18	-.07	--		
13. Assertiveness	-.09	.30	.05	.12	.07	.13	.31	.15	.46	.34	.05	.24	--	
14. Composite Criterion	-.09	.08	-.18	.01	.35	.03	.16	.33	.08	.14	-.01	-.02	.18	--

TABLE D

Intercorrelations of the Empirical Dimensions

(N=753)

Empirical Dimensions	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Maternal Presence in Home	--													
2. Domestic Stability and Intimacy	.06	--												
3. Economic Independence and Aggressiveness	.01	-.12	--											
4. Musical Participation	.04	.14	-.09	--										
5. Scientific Interest	-.06	.10	-.24	.11	--									
6. Mechanical-Realistic Inclination	.00	.06	.05	.01	.23	--								
7. High School Academic Success	-.03	.19	-.13	.08	.28	.05	--							
8. Collegiate Academic Success	-.03	.04	-.09	.08	.42	.00	.29	--						
9. Athletic Involvement	-.01	.19	.09	-.04	-.11	-.07	.09	-.04	--					
10. College Leadership Activities	-.09	.13	.01	.04	.04	.05	.22	.21	.11	--				
11. Part-time Work History	-.09	-.10	.35	.01	-.08	.10	-.01	-.02	-.03	.04	--			
12. Outdoor Recreational Interests	-.04	.29	.00	.08	.10	.23	.02	-.02	.10	.20	-.08	--		
13. Assertiveness	-.11	.31	.02	.13	.07	.12	.31	.14	.46	.35	.05	.27	--	
14. Composite Criterion	-.14	.08	-.19	.01	.35	.03	.16	.33	.08	.14	-.01	.00	.18	--

TABLE E

Intercorrelations of the Empirical-Empirical Dimensions

(N=753)

Empirical-Empirical Dimensions	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Maternal Presence in Home	--													
2. Domestic Stability and Intimacy	-.06	--												
3. Economic Independence and Aggressiveness	.10	-.12	--											
4. Musical Participation	-.01	.13	-.10	--										
5. Scientific Interest	-.10	.14	-.23	.12	--									
6. Mechanical-Realistic Inclination	-.01	.06	-.03	.04	.25	--								
7. High School Academic Success	-.08	.17	-.11	.08	.28	.00	--							
8. Collegiate Academic Success	-.09	.07	-.11	.03	.42	-.03	.29	--						
9. Athletic Involvement	-.02	.15	.04	.01	-.12	-.08	.09	-.03	--					
10. College Leadership Activities	-.12	.12	.02	.00	.04	.00	.22	.21	.11	--				
11. Part-time Work History	.00	-.11	.17	-.01	-.10	.07	-.04	-.01	-.09	-.01	--			
12. Outdoor Recreational Interests	-.04	.13	.01	.13	.06	.10	-.03	-.03	.02	.19	-.06	--		
13. Assertiveness	-.19	.29	-.03	.15	.11	.06	.34	.17	.37	.36	-.02	.16	--	
14. Composite Criterion	-.20	.12	-.19	.04	.35	.04	.16	.33	.08	.14	-.01	-.06	.19	--

TABLE F

Intercorrelations of the Rational

and Rational-Empirical Dimensions

(N=753)

Rational Dimensions	Rational-Empirical Dimensions															
	Socio-economic Background	Leadership	Part-time Work Experience	Need for Achievement	Self-Concept	Sociability	Close Friends	Athletic Orientation	Health	Aggressive Acting-Out	Family Relations	Academic Background and Achievement	Independence	Breadth of Experience	Achievement (non-academic)	Hedge Factor
Socio-economic Background	.92	.12	-.29	.18	.23	.16	-.04	.09	.11	-.01	.17	.07	.04	.24	.11	-.09
Leadership	.12	.77	.09	.17	.39	.24	.15	.36	.11	-.02	.12	.07	.03	.20	.59	-.16
Part-time Work Experience	-.28	.02	.98	.04	.04	.08	.11	.09	.05	-.01	-.09	-.12	.01	-.01	.02	-.03
Need for Achievement	.18	.20	.03	.92	.35	.23	.10	.14	.22	-.06	.09	.10	.18	.25	.16	-.08
Self-Concept	.23	.33	.05	.43	.88	.35	.13	.25	.28	-.05	.12	.08	.15	.28	.26	-.32
Sociability	.12	.18	.13	.21	.33	.75	.72	.35	.16	.01	.17	-.11	.07	.14	.16	-.09
Athletic Orientation	.12	.39	.08	.13	.23	.30	.25	.99	.18	-.01	.15	-.03	.11	.27	.45	-.07
Health	.08	.11	.08	.16	.24	.08	.13	.14	.84	-.06	.12	.10	.06	.09	.08	-.08
Aggressive Acting-Out	-.03	-.03	-.01	-.05	-.04	.06	-.04	-.01	-.05	1.00	-.08	-.05	-.08	.02	-.03	-.02
Family Relations	.23	.14	-.07	.08	.14	.10	.23	.14	.15	-.10	.87	.15	-.02	.16	.11	-.13
Academic Background and Achievement	.11	.24	-.11	.20	.07	-.08	-.13	-.01	.03	-.07	.19	.81	.22	.18	.43	-.07
Independence	.09	.11	.02	.18	.12	.20	.00	.12	.07	-.06	.01	.17	.93	.12	.16	.00
Breadth of Experience	.14	.12	.06	.13	.24	.18	.09	.21	.10	-.01	.07	-.10	-.06	.54	.13	-.09
Achievement (non-academic)	.16	.76	.03	.18	.33	.22	.14	.46	.09	-.03	.14	.18	.10	.30	.83	-.15
Hedge Factor	-.07	-.16	-.03	-.07	-.27	-.11	-.04	-.07	-.08	-.02	-.09	-.07	.01	-.11	-.14	1.00

TABLE G

Intercorrelations of the Rational

and Empirical-Rational Dimensions

(N=753)

Rational Dimensions	Empirical-Rational Dimensions												
	Maternal Presence in Home	Domestic Stability and Intimacy	Economic Independence and Aggressiveness	Musical Participation	Scientific Interest	Mechanical-Realistic Inclination	High School Academic Achievement	Collegiate Academic Success	Athletic Involvement	College Leadership Activities	Part-time Work History	Outdoor Recreational Interests	Assertiveness
Socio-economic Background	.01	.34	-.21	.10	.05	.00	.10	-.04	.03	.17	-.24	.23	.23
Leadership	-.06	.15	.12	.05	-.19	-.02	.23	.07	.38	.55	.08	.07	.62
Part-time Work Experience	-.10	-.06	.69	-.05	-.13	.13	-.06	-.04	.08	.01	.61	.00	.08
Need for Achievement	-.14	.14	.02	.08	.13	.09	.12	.08	.10	.14	.06	.08	.31
Self-Concept	-.09	.15	.04	.12	.02	.07	.17	.00	.23	.27	.05	.13	.50
Sociability	-.09	.20	.13	.02	-.20	.02	-.01	-.16	.32	.12	.04	.19	.39
Athletic Orientation	-.02	.25	.09	-.02	-.07	.01	.09	-.04	.89	.15	-.04	.32	.49
Health	-.05	.12	.10	-.04	.00	.13	.11	-.01	.13	.07	.08	.10	.18
Aggressive Acting-Out	-.07	-.08	-.01	-.02	-.05	-.08	-.09	-.05	-.03	.01	-.01	.02	-.05
Family Relations	.07	.63	-.04	.10	.01	.04	.20	.00	.10	.12	-.09	.23	.22
Academic Background and Achievement	-.01	.18	-.19	.10	.54	.06	.47	.76	-.03	.19	-.11	.02	.21
Independence	-.12	.06	-.01	.04	.19	.07	.15	.16	.10	.05	.00	.08	.23
Breadth of Experience	-.04	.11	.11	.16	-.19	.09	.05	-.17	.15	.28	.04	.21	.30
Achievement (non-academic)	-.05	.21	.06	.20	.04	.00	.33	.24	.50	.60	.02	.13	.69
Hedge Factor	.03	-.11	-.01	-.06	-.03	-.04	-.13	-.03	-.06	-.13	-.05	-.04	-.17

TABLE H

Intercorrelations of the Rational and Empirical Dimensions

(N=753)

Rational Dimensions	Empirical Dimensions												
	Maternal Presence in Home	Domestic Stability and Intimacy	Economic Independence and Aggressiveness	Musical Participation	Scientific Interest	Mechanical-Realistic Inclination	High School Academic Achievement	Collegiate Academic Success	Athletic Involvement	College Leadership Activities	Part-time Work History	Outdoor Recreational Interests	Assertiveness
Socio-economic Background	-.01	.34	-.27	.10	.05	.00	.10	-.04	.03	.17	-.24	.26	.24
Leadership	-.05	.15	.13	.05	-.19	-.02	.23	.07	.38	.55	.08	.08	.62
Part-time Work Experience	-.09	-.06	.67	-.05	-.13	.13	-.06	-.04	.08	.01	.61	.00	.07
Need for Achievement	-.17	.14	-.01	.08	.13	.09	.12	.08	.10	.14	.06	.10	.31
Self-Concept	-.09	.15	.03	.12	.02	.07	.17	.00	.23	.27	.05	.14	.50
Sociability	-.10	.20	.13	.02	-.20	.02	-.01	-.16	.32	.12	.04	.19	.39
Athletic Orientation	-.04	.25	.09	-.02	-.07	.01	.09	-.04	.89	.15	-.04	.32	.49
Health	-.06	.12	.11	-.04	.00	.13	.11	-.01	.13	.07	.08	.11	.18
Aggressive Acting-Out	-.08	-.08	-.02	-.02	-.05	-.08	-.09	-.05	-.03	.01	-.01	.01	-.04
Family Relations	.05	.63	-.05	.10	.01	.04	.20	.00	.10	.12	-.09	.25	.22
Academic Background and Achievement	-.05	.18	-.18	.10	.54	.06	.47	.76	-.03	.19	-.11	.04	.21
Independence	-.15	.06	-.03	.04	.19	.07	.15	.16	.10	.05	.00	.13	.23
Broadth of Experience	-.02	.11	.08	.16	-.19	.09	.05	-.17	.15	.28	.04	.23	.31
Achievement (non-academic)	-.07	.21	.06	.20	.04	.00	.33	.24	.50	.60	.02	.15	.69
Hedge Factor	.02	-.11	-.01	-.06	-.03	-.04	-.13	-.03	-.06	-.13	-.05	-.05	-.17

TABLE I

Intercorrelations of the Rational and Empirical-Empirical Dimensions

(N=753)

Rational Dimensions	Empirical-Empirical Dimensions												
	Maternal Presence in Home	Domestic Stability and Intimacy	Economic Independence and Aggressiveness	Musical Participation	Scientific Interest	Mechanical-Realistic Inclination	High School Academic Achievement	Collegiate Academic Success	Athletic Involvement	College Leadership Activities	Part-time Work History	Outdoor Recreational Interests	Assertiveness
Socio-economic Background	-.14	.29	-.17	.16	.05	-.03	.10	-.04	.02	.17	-.27	.18	.25
Leadership	-.05	.11	.14	.05	-.19	-.05	.23	.07	.37	.55	.03	.04	.60
Part-time Work Experience	-.03	-.07	.24	-.05	-.13	.10	-.06	-.04	.06	.01	.56	.02	.06
Need for Achievement	-.23	.15	-.03	.10	.13	.05	.12	.08	.09	.14	.02	.05	.32
Self-Concept	-.12	.14	.02	.13	.02	.02	.17	.00	.20	.27	.00	.13	.50
Sociability	-.12	.16	.07	.03	-.20	-.02	-.01	-.16	.31	.12	.00	.10	.37
Athletic Orientation	-.06	.21	.05	.03	-.07	-.01	.09	-.04	.86	.15	-.11	.21	.41
Health	-.07	.11	.08	-.05	.00	.06	.11	-.01	.10	.07	.05	.08	.17
Aggressive Acting-Out	-.08	-.08	.00	-.01	-.05	-.04	-.09	-.05	-.03	.01	-.01	.04	-.04
Family Relations	-.04	.45	-.04	.11	.01	-.03	.20	.00	.08	.12	-.11	.13	.22
Academic Background and Achievement	-.15	.18	-.19	.09	.54	.01	.47	.76	-.02	.19	-.12	.00	.24
Independence	-.20	.08	-.05	.06	.19	.06	.15	.16	.10	.05	-.02	.06	.24
Breadth of Experience	-.01	.07	.07	.15	-.19	.06	.05	-.17	.14	.28	-.01	.22	.30
Achievement (non-academic)	-.10	.19	.06	.16	.04	-.02	.33	.24	.49	.60	-.04	.09	.67
Hedge Factor	.01	-.08	.01	-.07	-.03	.00	-.13	-.03	-.06	-.13	-.03	-.01	-.16

TABLE J

Intercorrelations of the Rational-Empirical

and Empirical-Rational Dimensions

(N=753)

Rational-Empirical Dimensions	Empirical-Rational Dimensions												
	Maternal Presence in Home	Domestic Stability and Intimacy	Economic Independence and Aggressiveness	Musical Participation	Scientific Interest	Mechanical-Realistic Inclination	High School Academic Success	Collegiate Academic Success	Athletic Involvement	College Leadership Activities	Part-time Work History	Outdoor Recreational Interests	Assertiveness
Socio-economic Background	-.01	.40	-.23	.10	.05	.00	.12	-.03	.07	.16	-.25	.23	.25
Leadership	-.06	.19	-.02	.04	.10	.03	.30	.22	.41	.50	-.01	.06	.56
Part-time Work Experience	-.08	-.07	.70	-.06	-.12	.12	-.06	-.02	.06	.00	.58	-.01	.05
Need for Achievement	-.15	.14	.00	.10	.14	.08	.12	.11	.10	.15	.06	.08	.31
Self-Concept	-.06	.14	.03	.11	-.02	.06	.14	-.03	.19	.29	.04	.14	.46
Sociability	-.13	.17	.07	.04	-.12	.02	-.01	-.08	.25	.15	-.02	.20	.38
Close Friends	.02	.17	.13	.03	-.14	.05	.00	-.16	.24	.02	.07	.12	.23
Athletic Orientation	-.03	.25	.08	-.02	-.07	.02	.09	-.04	.87	.15	-.05	.33	.48
Health	-.08	.16	.07	-.03	-.01	.13	.06	-.06	.16	.03	.07	.15	.20
Aggressive Acting-Out	-.07	-.08	-.01	-.02	-.05	-.08	-.09	-.05	-.03	.01	-.01	.02	-.05
Family Relations	.06	.61	-.08	.09	.04	-.02	.20	.05	.11	.11	-.10	.20	.20
Academic Background and Achievement	.01	.14	-.19	.01	.44	.06	.40	.53	-.02	.18	-.12	.00	.12
Independence	-.09	.04	-.02	.03	.20	.04	.15	.17	.10	.05	.00	.04	.20
Breadth of Experience	-.12	.21	-.06	.11	.16	.18	.17	.07	.21	.29	-.04	.25	.44
Achievement (non-academic)	-.08	.22	-.02	.08	.18	.00	.35	.49	.49	.47	-.03	.08	.58
Hedge Factor	.03	-.11	-.01	-.06	-.03	-.04	-.13	-.03	-.06	-.13	-.05	-.04	-.17

TABLE K

Intercorrelations of the Rational-Empirical and Empirical Dimensions

(N=753)

Rational-Empirical Dimensions	Empirical Dimensions												
	Maternal Presence in Home	Domestic Stability and Intimacy	Economic Independence and Aggressiveness	Musical Participation	Scientific Interest	Mechanical-Realistic Inclination	High School Academic Success	Collegiate Academic Success	Athletic Involvement	College Leadership Activities	Part-time Work History	Outdoor Recreational Interests	Assertiveness
Socio-economic Background	-.04	.40	-.28	.10	.05	.00	.12	-.03	.07	.16	-.25	.25	.26
Leadership	-.07	.19	-.01	.04	.10	.03	.30	.22	.41	.30	-.01	.07	.56
Part-time Work Experience	-.07	-.07	.67	-.06	-.12	.12	-.06	-.02	.06	.00	.58	-.02	.05
Need for Achievement	-.19	.14	-.02	.10	.14	.08	.12	.11	.10	.15	.06	.10	.31
Self-Concept	-.07	.14	.01	.11	-.02	.06	.14	-.03	.19	.29	.04	.16	.47
Sociability	-.17	.17	.04	.04	-.12	.02	-.01	-.08	.25	.15	-.02	.21	.38
Close Friends	.02	.17	.17	.03	-.14	.05	.00	-.16	.24	.02	.07	.12	.23
Athletic Orientation	-.05	.25	.08	-.02	-.07	.02	.09	-.04	.87	.15	-.05	.33	.49
Health	-.09	.16	.07	-.03	-.01	.13	.06	-.06	.16	.03	.07	.16	.20
Aggressive Acting-Out	-.08	-.08	-.02	-.02	-.05	-.08	-.09	-.05	-.03	.01	-.01	.01	-.04
Family Relations	.04	.61	-.09	.09	.04	-.02	.20	.05	.11	.11	-.10	.21	.21
Academic Background and Achievement	-.01	.14	.17	.01	.44	.06	.40	.53	-.02	.18	-.12	.01	.12
Independence	-.12	.04	-.03	.03	.20	.04	.15	.17	.10	.05	.00	.07	.19
Breadth of Experience	-.14	.21	-.09	.11	.16	.18	.17	.07	.21	.29	-.04	.28	.45
Achievement (non-academic)	-.10	.22	-.01	.08	.18	.00	.35	.49	.49	.47	-.03	.10	.58
Hodge Factor	.02	-.11	-.01	-.06	-.03	-.04	-.13	-.03	-.06	-.13	-.05	-.05	-.17

TABLE L

Intercorrelations of the Rational-Empirical and Empirical-Empirical Dimensions

(N=753)

Rational-Empirical Dimensions	Empirical-Empirical Dimensions												
	Maternal Presence in Home	Domestic Stability and Intimacy	Economic Independence and Aggressiveness	Musical Participation	Scientific Interest	Mechanical-Realistic Inclination	High School Academic Success	Collegiate Academic Success	Athletic Involvement	College Leadership Activities	Part-time Work History	Outdoor Recreational Interests	Assertiveness
Socio-economic Background	-.17	.38	-.19	.15	.05	-.05	.12	-.03	.07	.16	-.28	.17	.27
Leadership	-.09	.18	.01	.04	.10	.01	.30	.22	.41	.50	-.05	.03	.55
Part-time Work Experience	-.01	-.08	.23	-.06	-.12	.10	-.06	-.02	.04	.00	.54	.01	.04
Need for Achievement	-.26	.15	-.05	.11	.14	.04	.12	.11	.09	.15	.03	.03	.32
Self-Concept	-.10	.13	.02	.13	-.02	.02	.14	-.03	.16	.29	.00	.14	.47
Sociability	-.22	.15	-.02	.04	-.12	.00	-.01	-.08	.25	.15	-.07	.11	.37
Close Friends	.01	.12	.14	.03	-.14	.00	.00	-.16	.23	.02	.06	.07	.21
Athletic Orientation	-.07	.21	.04	.03	-.07	-.01	.09	-.04	.86	.15	-.12	.22	.41
Health	-.13	.15	.06	-.02	-.01	.03	.06	-.06	.13	.03	.03	.12	.19
Aggressive Acting-Out	-.08	-.08	.00	-.01	-.05	-.04	-.09	-.05	-.03	.01	-.01	.04	-.04
Family Relations	-.06	.46	-.06	.11	.04	-.04	.20	.05	.10	.11	-.12	.11	.21
Academic Background and Achievement	-.09	.15	-.16	.00	.44	.01	.40	.53	-.01	.18	-.12	-.02	.15
Independence	-.17	.07	-.05	.04	.20	.03	.15	.17	.10	.05	-.01	.01	.21
Breadth of Experience	-.19	.18	-.12	.12	.16	.15	.17	.07	.20	.29	-.11	.21	.46
Achievement (non-academic)	-.14	.21	-.03	.07	.18	-.04	.35	.49	.49	.47	-.07	.05	.56
Hedge Factor	.01	-.08	.01	-.07	-.03	.00	-.13	-.03	-.06	-.13	-.03	-.01	-.16

TABLE M

Intercorrelations of the Empirical-Rational and Empirical Dimensions

(N=753)

Empirical-Rational Dimensions	Empirical Dimensions												
	Maternal Presence in Home	Domestic Stability and Intimacy	Economic Independence and Aggressiveness	Musical Participation	Scientific Interest	Mechanical-Realistic Inclination	High School Academic Success	Collegiate Academic Success	Athletic Involvement	College Leadership Activities	Part-time Work History	Outdoor Recreational Interests	Assertiveness
Maternal Presence In Home	.99	.09	-.01	.05	-.02	.00	-.01	.00	.00	-.07	-.11	-.02	-.08
Domestic Stability and Intimacy	.06	1.00	-.12	.14	.10	.06	.19	.04	.19	.13	-.10	.29	.31
Economic Independence and Aggressiveness	-.01	-.09	.94	-.07	-.21	.07	-.15	-.12	.08	.00	.35	.02	.04
Musical Participation	.04	.14	-.09	1.00	.11	.01	.08	.08	-.04	.04	.01	.08	.13
Scientific Interest	-.06	.10	-.24	.11	1.00	.23	.28	.42	-.11	.04	-.08	.10	.07
Mechanical-Realistic Inclination	.00	.06	.05	.01	.23	1.00	.05	.00	-.07	.05	.10	.23	.12
High School Academic Success	-.03	.19	-.13	.08	.28	.05	1.00	.29	.09	.22	-.01	.02	.31
Collegiate Academic Success	-.03	.04	-.09	.08	.42	.00	.29	1.00	-.04	.21	-.02	-.02	.14
Athletic Involvement	-.01	.19	.09	-.04	-.11	-.07	.09	-.04	1.00	.11	-.03	.10	.46
College Leadership Activities	-.09	.13	.01	.04	.04	.05	.22	.21	.11	1.00	.04	.20	.35
Part-time Work History	-.09	-.10	.35	.01	-.08	.10	-.01	-.02	-.03	.04	1.00	-.08	.05
Outdoor Recreational Interests	-.03	.27	.02	.07	.08	.21	-.01	-.02	.10	.18	-.07	.98	.24
Assertiveness	-.11	.30	.03	.12	.07	.13	.31	.15	.46	.34	.05	.26	.99

TABLE N

Intercorrelations of the Empirical-Rational

and Empirical-Empirical Dimensions

(N=753)

Empirical-Rational Dimensions	Empirical-Empirical Dimensions												
	Maternal Presence in Home	Domestic Stability and Intimacy	Economic Independence and Aggressiveness	Musical Participation	Scientific Interest	Mechanical-Realistic Inclination	High School Academic Success	Collegiate Academic Success	Athletic Involvement	College Leadership Activities	Part-time Work History	Outdoor Recreational Interests	Assertiveness
Maternal Presence In Home	.80	.11	.05	.03	-.02	.00	-.01	.00	-.01	-.07	-.09	.02	-.09
Domestic Stability and Intimacy	-.07	.87	-.11	.18	.10	.04	.19	.04	.18	.13	-.13	.14	.31
Economic Independence and Aggressiveness	.04	-.11	.65	-.07	-.21	.04	-.15	-.12	.04	.00	.31	.04	.02
Musical Participation	.01	.10	-.09	.89	.11	.04	.08	.08	-.04	.04	.00	.12	.14
Scientific Interest	-.10	.14	-.23	.12	1.00	.25	.28	.42	-.12	.04	-.10	.06	.11
Mechanical-Realistic Inclination	-.03	.08	-.03	.02	.23	.77	.05	.00	-.09	.05	.06	.18	.13
High School Academic Success	-.08	.17	-.11	.08	.28	.00	1.00	.29	.09	.22	-.04	-.03	.34
Collegiate Academic Success	-.09	.07	-.11	.03	.42	-.03	.29	1.00	-.03	.21	-.01	-.03	.17
Athletic Involvement	-.01	.16	.07	.00	-.11	-.06	.09	-.04	.97	.11	-.09	.03	.37
College Leadership Activities	-.12	.12	.02	.00	.04	.00	.22	.21	.11	1.00	-.01	.15	.36
Part-time Work History	-.02	-.09	.17	.01	-.08	.09	-.01	-.02	-.04	.04	.94	-.02	.05
Outdoor Recreational Interests	-.10	.24	.00	.11	.08	.11	-.01	-.02	.09	.18	-.13	.87	.23
Assertiveness	-.17	.27	-.01	.13	.07	.05	.31	.15	.44	.34	-.02	.16	.98

TABLE O

Intercorrelations of the Empirical and Empirical-Empirical Dimensions

(N=753)

Empirical Dimensions	Empirical-Empirical Dimensions												
	Maternal Presence in Home	Domestic Stability and Intimacy	Economic Independence and Aggressiveness	Musical Participation	Scientific Interest	Mechanical-Realistic Inclination	High School Academic Success	Collegiate Academic Success	Athletic Involvement	College Leadership Activities	Part-time Work History	Outdoor Recreational Interests	Assertiveness
Maternal Presence In Home	.87	.07	.07	.02	-.06	-.01	-.03	-.03	-.02	-.09	-.07	.00	-.12
Domestic Stability and Intimacy	-.07	.87	-.11	.18	.10	.04	.19	.04	.18	.13	-.13	.14	.31
Economic Independence and Aggressiveness	.06	-.13	.79	-.10	-.24	.02	-.13	-.09	.05	.01	.32	.03	.00
Musical Participation	.01	.10	-.09	.89	.11	.04	.08	.08	-.04	.04	.00	.12	.14
Scientific Interest	-.10	.14	-.23	.12	1.00	.25	.28	.42	-.12	.04	-.10	.06	.11
Mechanical-Realistic Inclination	-.03	.08	-.03	.02	.23	.77	.05	.00	-.09	.05	.06	.18	.13
High School Academic Success	-.08	.17	-.11	.08	.28	.00	1.00	.29	.09	.22	-.04	-.03	.34
Collegiate Academic Success	-.09	.07	-.11	.03	.42	-.03	.29	1.00	-.03	.21	-.01	-.03	.17
Athletic Involvement	-.01	.16	.07	.00	-.11	-.06	.09	-.04	.97	.11	-.09	.03	.37
College Leadership Activities	-.12	.12	.02	.00	.04	.00	.22	.21	.11	1.00	-.01	.15	.36
Part-time Work History	-.02	-.09	.17	.01	-.08	.09	-.01	-.02	-.04	.04	.94	-.02	.05
Outdoor Recreational Interests	-.12	.25	-.01	.12	.10	.13	.02	-.02	.09	.20	-.14	.85	.26
Assertiveness	-.17	.28	-.01	.14	.07	.04	.31	.14	.44	.35	-.02	.17	.98