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This is to certify that the thesis prepared by William B. Pettus entitled Relationship Between Personality and Value Structure has been approved by his committee as satisfactory completion of the thesis requirement for the Master of Science degree in Psychology.

[redacted]

John M. Mahoney, Ph.D.
Associate Professor of Psychology
Chairman

[redacted]

Edwin R. Thomas, Ph.D.
Professor of Psychology
Committee Member

[redacted]

Everett L. Worthington, Ph.D.
Assistant Professor of Psychology
Committee Member

[redacted]

Willaim S. Ray, Ph.D.
Department of Psychology
Chairman

[redacted]

Elske v.P. Smith, Ph.D.
Dean
School of Arts and Sciences

August 17, 1978.

Date

RELATIONSHIP BETWEEN PERSONALITY AND VALUE STRUCTURE

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science at Virginia Commonwealth University

by

William B. Pettus
Director: John M. Mahoney, Ph.D.
Associate Professor of Psychology
Richmond, Virginia
August, 1981

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INTRODUCTION

Humankind has been interested in the study of individual differences throughout recorded history. Plato discussed the issue of individual variations in aptitudes and suggested having tests for selecting those persons most suited for the military, artisans and rulers (Tyler, 1965). Hippocrates proposed a two-fold classification system of body builds which he called "habitus apoplecticus" and "habitus phthisicus" (Tyler, 1965). The nineteenth century German astronomer, Bessel, discovered discrepancies among individuals in recording the time of the passage of stars across the meridian at the Royal Observatory at Greenwich. This source of error, due to individual differences, became known as the "personal equation" (Murphy & Kovach, 1972). The founder of modern experimental psychology, Wilhelm Wundt, was strongly interested in physiological variations and developed various indices of human differences in sensation and perception (Sheridan, 1971).

The field of "psychological studies" (Koch, 1976) has been vitally concerned with individual differences since its inception including variations in intelligence, achievement, aptitude, creativity, interests, cognitive style, personality and values. It is these latter two areas and the implicit relationship between them which have specific interest for this investigator.

CATTELL'S MODEL OF PERSONALITY

One of the first problems in studying individual differences in personality is defining personality. Allport (1937) reviewed the

existing psychological literature on the topic and derived nearly 50 different definitions with which psychologists had used the term personality. Hall and Lindzey (1970) concluded that there does not exist any plausible way of defining personality which provided both generality of application and substantiveness; they suggested that personality be defined "... by the particular empirical concepts which are a part of the theory of personality employed by the observer ..." (Hall & Lindzey, 1970, p. 9).

Another complication with comprehending personality research is the range of quantitative methods available for measuring personality traits. These techniques include ratings (scales with various numerical degrees of specific traits), questionnaires or self-report inventories (usually yes/no responses by subject as to the applicability of various traits), projective techniques (Rorschack test being a representative example of one), and behaviorial or physiological measures (involving measures of behavior or physiology in a given situation).

Another difficulty with personality investigation is the diversity in personality variables that have been measured. Some tests of personality confine their measurements to one trait, e.g., extroversion-introversion, while others attempt to distinguish among dozens. Oftentimes, essentially the same personality characteristic is referred to by investigators by different labels. It should be apparent then that the personality variables measures by different tests frequently have considerable variation in scope.

As these problems emerged and statistical techniques improved, there developed a trend among British and American psychologists toward more complex factor-analytic personality research. One of the earliest works in this area was that done by Guilford and Guilford (1939a, 1939b) and Martin (1945) in which factor analyses of interitem correlations from various tests were made and 13 independent personality traits identified. Subsequent investigators, using similar statistical methods, have suggested the use of fewer or greater numbers of different personality traits. Hence, the issue of the number of independent factors represented by the multitude of personality ratings, questionnaires, projective techniques, and behavioral measures remains controversial.

The work of Raymond B. Cattell represents the most elaborate attempt to integrate the results of the various personality tests into classifications of personality using factor analysis. Using Allport and Odbert's (1936) list of 4,500 trait names, which was supplemented from other sources, Cattell reduced this number to a mere 171 by grouping synonyms and discarding rare terms. This revised list was further reduced to only 35 by intercorrelating ratings of the traits by 100 adults and grouping those with correlations of .45 or higher (cluster analysis procedure). Finally, 208 male adults were rated on these 35 variables. The correlations between these ratings provided the basis for the factor analysis which suggested 16 primary factors as listed in Appendix A. Subsequent research by Cattell has modified and extended his list of primary traits. Nevertheless, this initial work served as a basis for the eventual publication of a

personality factor questionnaire (16 PF) which is in wide use today (Cattell, Eber, and Tatsuoka, 1970).

These 16 personality dimensions can be reduced to a smaller number of broader, second-order or-stratum factors. By correlating the 16 scale scores and factoring the resultant correlation matrix, six to nine second-stratum factors are obtained. Appendix B lists the more significant second-stratum factors with the chief primary factors involved with each.

Cattell, Eber, and Tatsuoka (1970) mention that five third-stratum factors and even two fourth-stratum factors can be obtained, but discourage practitioners from using these for diagnostic purposes. They do advocate, however, the use of second-stratum factors in conjunction with the 16 primary factors to obtain the best description and measurement of personality.

Eysenck and Eysenck (1976) argue that their P (psychoticism), E (extraversion), N (neuroticism) and L (lie) factors can account for a substantial amount of the variance in Cattell's 16 primary factors. They maintain that the reliabilities of Cattell's 16 primary factors are low and their intercorrelations very high, as evidenced by Cattell's own data. Thus, Eysenck and Eysenck believe that their P, E, N, and L scales, involving complex higher-order factors, provide a meaningful and sufficient account of all essential variation in trait ratings.

Digman and Takemoto-Chock (1981) reanalyzed the correlations of six studies (including Cattell's classical work) and concluded that

five factors (possibly six) can sufficiently describe the personality domain. They referred to these "big five" factors as "Friendly Compliance vs. Hostile Non-compliance", "Extraversion vs. Introversion", "Ego Strength vs. Emotional Disorganization", "Will to Achieve", and "Intellect". Factor VI, "Culture" was considered to be of marginal status. Digman and Takemoto-Chock suggested that the variety of factor analytic techniques employed by investigators cause different results. They maintained that some of Cattell's eight second-stratum factors tend to mirror their "big five" factors, which have been previously identified by such theorists as Jung, Freud, and Cattell.

ROKEACH'S CONCEPT OF VALUE STRUCTURE

The second area of interest to this researcher is individual differences in values. Like the term "personality", the term "value" has been variously defined and there is still considerable controversy about which psychological characteristics this term encompasses. Jacob and Fink (1962) summarized the various attempts to establish the parameters of the term and proceeded to define values as normative standards by which human beings are influenced in their choice among the alternative courses of action which they perceive.

Another problem in investigating personality and values is that the latter tends to employ ipsative rather than normative measures (Tyler, 1974). Some personality tests, such as the Edwards Personal Preference Schedule, use ipsative scores which are converted to normative percentiles, making interpretation somewhat confusing (Anastasi, 1968). Ipsative scores are concerned with the individual

patterns of high and low scores as opposed to normative scores which look at the individual's scores within a group distribution. Instruments assessing values with ipsative measures do not permit high scores on every value, since choosing a high preference for one value necessarily relegates others to a lower preference. This must be considered when comparing the scores between individuals or between groups. One can make these restrictions of functionally little consequence by factor analyzing across individuals, thereby making the results meaningful as normative ipsative data (Cattell, 1944).

One of the early writings in the area of values came from a German philosopher, Spranger (1928). After analyzing a wide breadth of literature, he elaborated six basic types of values by which humans live. These six types, enumerated below, formed the basis of a widely used instrument, Study of Values, devised originally by Allport, Vernon, and Lindzey in 1951.

1. Theoretical - interest in the pursuit of truth by intellectual means.
2. Economic - interest in useful, practical things.
3. Aesthetic - interest in beauty and art.
4. Social - interest in helping people.
5. Political - interest in power or influence over people.
6. Religious - interest in mystical experience.

Morris developed an alternative instrument for measuring values known as the "Ways to Live" scale. He initially distinguished among

three basic orientations, founded on the world's major religions and associated cultures, which were called Dionysian, Promethean, and Buddhistic (later referred to by the labels dependence, dominance, and detachment). Morris subsequently wrote seven descriptions of ways of life (value profiles) which were expanded to 13 with input from college students. These 13 ways of life, with accompanying descriptions, form the "Ways to Live" scale, which are ranked by participants in order of personal preference (Tyler, 1974).

Subsequent research with this instrument demonstrated that the 13 ways to live (value orientations) could be reduced to five by factor analyzing the correlations between ratings. Nevertheless, Morris ignored the empirical evidence that at least five factors were required to account for the correlations, preferring his original assumption that value structure is three dimensional (Tyler, 1974).

One of the most recent and extensive models of values is that of Milton Rokeach. Rokeach (1968, 1973) defined a value as an enduring belief that a particular mode of conduct or end state of existence which is personally or socially preferable to alternative modes of conduct or end states of existence. He distinguishes between "terminal" values (possible life goals) and "instrumental" values (preferred modes of conduct) and suggests a concentric structure of beliefs, attitudes, and values reflecting increasing levels of abstraction. Thus, a person may have tens of thousands of beliefs, but only dozens of values.

After compiling a comprehensive list of values, Rokeach derived final,

separate lists for terminal and instrumental values. A national sample of 1,409 persons was administered this Value Survey in April 1968 by National Opinion Research Center (NORC) and asked to rank order the importance of these values. This initial research formed the basis for the Rokeach Value Survey, providing a useful tool for investigating individual and group differences in value structure. Appendix C contains the list of 18 terminal and 18 instrumental values used in the Rokeach Value Survey (Tyler, 1974).

Rokeach (1973) has found significant differences in value structures among various segments of American society on various issues. Value structure differences (and similarities) among groups were analyzed by sex, race, age, religious and political preference, income, and education. The efforts of independent investigators has further demonstrated value differences among American, Australian, Canadian, and Israeli university populations.

As a group, Americans tend to place the terminal values "a world at peace", "family security", and "freedom" at the top of the hierarchy and "an exciting life", "pleasure", "social recognition", and "a world of beauty" at the bottom of the hierarchy. American men and women place "honest", "ambitious", and "responsible" at the top of the instrumental value hierarchy and "imaginative", "obedient", "intellectual" and "logical" at the bottom of the hierarchy.

The most significant terminal value difference found between American men and women was "a comfortable life", which women on the average rank thirteenth and men rank fourth. "Imaginative" was the largest

instrumental value difference found between sexes, with the median for women being 16.1 and 14.3 for men. Sixteen of the 36 values had no significant differences between males and females.

The instrumental value "clean" was found to decrease linearly as income increases (seven income groups were operationally defined) with the rich (highest income group) having a composite ranking of 17 and the poor (lowest income group) having a composite ranking of two. The terminal value "a comfortable life" was next best in distinguishing poor from rich, with the poor having a composite rank for this value of six and the rich having a composite rank of 15. Rokeach (1973) interpreted these findings as indicating that the poor do not have clean surroundings or comfortable living conditions and therefore are less inclined than the rich to take them for granted. The value differences among Americans of varying levels of education (seven groups) were essentially similar to those for Americans differing in income, which is to be expected given the high relationship between education and income.

Examination of value differences between black and white Americans indicated that the terminal value "equality" showed the greatest difference between the races, with white Americans ranking this value eleventh and black Americans ranking "equality" second. Even after controlling for education and income, the composite rank order for blacks remained unchanged and the relative importance of this value for whites was only reduced from eleventh to twelfth. Before controlling for socioeconomic differences between races, there were

12 values which distinguished whites from blacks, but only seven values which differed significantly after controlling for education and income (Rokeach, 1973).

Rokeach (1973), using data collected separately for adults by the NORC (21 years of age and older), for a college group (18-21 years of age), and for adolescent groups (11, 13, and 15 years of age), analyzed the patterns of value development. A variety of trends were observed in the relative importance assigned to values as the age group changed. Thirty of the values demonstrated significant fluctuation among the 11 age groups. These findings were interpreted as supporting Erikson's (1964) view of continuing maturational change.

Rokeach has several publications concerning value differences among religious groups. These findings are extensive and too lengthy for a detailed review. Of particular interest, however, was the finding that "salvation" and "forgiving" were the two values that best distinguished "Christians" (six Protestant groups and Catholics) from Jews and atheists, with the former groups ranking these values considerably higher than the latter two groups did. However, no significant differences were detected between "Christian" groups and "non-Christian" groups on the relative importance assigned by them to "loving" or "helpful" (Rokeach, 1973).

Examination of the value differences among political groups, whether it be defined by party affiliation or candidate preference, reveals substantial similarity in the relative importance assigned by all groups to most of the 36 values. While there were significant

differences for ten of the values among Democrats, Republicans and Independents, these differences were generally small in contrast to the value differences found among other groups, e.g., blacks and whites or males and females. The terminal value "equality" failed to differentiate the three political (party) groups, but did differ when subjects were divided into seven presidential candidate preference groups (Rokeach, 1973).

The Rokeach Value Survey has been administered to American, Austrailian, Canadian and Israeli college students by three independent investigators. Rokeach (1973) compared the rank orderings of values from these four different cultural groups and found value differences which were generally consistent with prevalent American notions of what would be expected of these cultures. He cautioned against making generalizations from this analysis, however, since the college students in the four samples were not necessarily representative of their cultures (all were male) or even the university tested. One example of an expected value difference (and the largest among the four groups) was that Israelis rank the terminal value "a world at peace" first and "national security" second, while students from the other three countries rank "a world at peace" ninth to twelfth and "national security" seventeenth. Obviously, this value difference reflects the greater threat of external attack faced by the Israelis.

Rokeach (1973) factor-analyzed the data collected by NORC and obtained a correlation matrix for the 36 values. Seven bipolar factors, using varimax rotation, were isolated. This accounted for 41 percent of

the variance, although no single factor accounted for more than 8 percent of the variance. Rokeach tends to dismiss the higher order structure that is indicated by this reduction and continues to develop his theory of values using all 36 values.

Mahoney and Katz (1976) critiqued the efforts of Rokeach and others to identify second order factors in values and concluded that the methodology, conception, execution, or interpretation of these investigations were flawed. The Rokeach Value Survey was administered to 130 college students and the value structures were subjected to rank correlation. After factor-analyzing the matrix using principal components with iteration methodology, 13 factors were isolated. These extracted factors were rotated to Varimax criterion and found to account for 19.2 percent (factor 1) to 2.9 percent (factor 13) of the variance. Mahoney and Katz concluded that underlying structural factors in the Rokeach Value Survey could be meaningfully identified and provide useful interpretative information.

UNIDIMENSIONALITY OF PERSONALITY AND VALUES

Individual and group differences in value structures and personality have each been the subject of extensive research and theorizing. However, little effort has been directed at attempting to integrate the findings on the basis of empirical investigation of both.

Geoffrey Brown (1975) commented that it was evident that the two areas were not discrete. He felt that a description of a person's value structure constituted, in some respects, a general description

of the person's personality. Using the Junior Personality Questionnaire (providing measures of psychoticism, extraversion, neuroticism, and lying) and a value inventory of his own (providing high, medium, and low scores for six value orientations), Brown found significant relationships between (1) "psychoticism" and "low family loyalty", "passivity", "educational primacy", and high "cynicism", and (2) "neuroticism" and high "intolerance", and (3) lie scores and high "family loyalty", "passivity", and "educational primacy".

N. T. Feather (1971) used different personality measures (Rokeach Dogmatism Scale, Budner's test of intolerance of ambiguity, and an Australian ethnocentrism scale) in conjunction with the Rokeach Value Survey and also observed clear relationships between personality and value structure. High "dogmatism" was positively related to "salvation". High "intolerance of ambiguity" was positively associated with higher importance assigned to "obedient" and "clean" and lower importance assigned to "imaginative". High "ethnocentrism" scores were correlated with high importance assigned to "clean" and low importance assigned to "imaginative", "equality", and "helpful".

More recently, Feather (1979), using the Rokeach Value Survey (Rokeach, 1968) and the Conservatism Scale (Wilson & Patterson, 1968) demonstrated a positive relationship between "conservatism" and relatively high importance assigned to "national security", "clean", "obedient", "polite", and "salvation" (values which tend to reflect attachment to rules and authority and ego defense). Negative relationships were found with "equality", "mature love", "freedom", "a comfortable life",

"broadminded", "intellectual", and "imaginative". Feather interpreted these findings as supporting cognitive or social learning theory and psychodynamic explanations of value/attitude relationships.

Yeshayahu Rim, like Feather, has also been active in demonstrating relationships between personality variables and values, as measured by the Rokeach Value Survey. Rim (1970) tested four groups (63 to 71 subjects per group) of male Israeli students and found a positive relationship between high "dogmatism" and high rankings of "honest", "obedient", and "equality", while low "dogmatism" tended to be related to high rankings of "independent" and "broadminded". Subjects scoring high in "authoritarianism" tended to value "polite", "clean" and "family security" more highly, while subjects scoring low in "authoritarianism" regarded the values "ambitious", "independent", "broadminded" and "equality" more highly. Using the Mach IV scale (designed to measure personality traits which are consistent with successful manipulation of interpersonal relationships), Rim found that subjects scoring high on the scale ranked "ambitious", "independent", and "equality" relatively high. Subjects scoring low on the Mach IV scale considered the values "courageous", "imaginative", "loving", and "freedom" relatively more important. Finally, Rim found that high "intolerance of ambiguity" was related to high rankings of "polite", "ambitious", "national security", "a comfortable life", and "social recognition". Low "intolerance of ambiguity" was related to "cheerful", "broadminded", "happiness", and "inner harmony".

Rim has at least six other publications (foreign journals) involving

investigations of the relationship between value structure (using the Rokeach Value Survey) and a variety of personality dimensions. In Rim's 1970 article discussed above, he refers to another investigation he conducted, which was published in a foreign journal in 1971. Rim administered the Rokeach Value Survey and Eysenck's P, E, and N scales to male and female Israeli subjects. Among other findings, extroverts (similar to Cattell's second-stratum factor Q_I) were found to rank the values "polite", "family security", and "inner harmony" higher than introverts.

Mahoney (1974) investigated Maslow's assertion that self-actualized persons shared a cluster of values. Using the Rokeach Value Survey and Shostrom's Personal Orientation Inventory (measuring self-actualization), he found partial support for this idea. The value of "social recognition" was negatively correlated with self-actualization. Categorizing subjects into four groups (self-actualizing, normal, moderate, and nonactualizing), a curvilinear relationship was found for the values "a world at peace", and "a comfortable life", with self-actualizing and nonactualizing subjects rating these values relatively higher than the other two subject groups.

Mahoney (1977) tested 220 American college students (equal number of male and female), using the Rokeach Value Survey and the Emotionality scale of the Pittsburg revision of the Maudsley Personality Inventory (similar to Cattell's second-stratum factor Q_{II}). Male subjects scoring high on the Emotionality scale ranked the values "salvation", "self-respect", "broadminded", "honest", "loving", and "polite"

higher than male subjects scoring low on the Emotionality scale. "Highly emotional" female subjects only ranked the value "logical" as more important than the "low emotional" female group. These results were different from those found earlier by Rim for Israeli students. Mahoney concluded that values associated with neuroticism are specific to culture and sex.

MULTIVARIATE APPROACH

The existing research on personality and value structure demonstrates the complexity of the relationship. It is evident that univariate approaches to the problem are limited, at best. The existing data suggest a deep structural relationship between values and personality, requiring a multivariate methodology. Hotelling's (1935) canonical correlation analysis provides a useful method for investigating this relationship.

Canonical correlation analysis is a technique for examining the significance and magnitude of the relationships (correlations) between two sets of variables. No causation is implied and the relationship is symmetric. The purpose of canonical analysis is to determine the complexity of the relationship and provide information about the overall nature of that relationship.

Canonical correlation analysis differs from multiple correlation analysis in that the latter involves the correlation of a set of variables with a single external variable. Multiple correlation analysis is actually canonical analysis with just one variable in one of the

sets. Canonical analysis can be viewed as multiple correlation analysis when more than one criterion variable is being considered simultaneously.

Canonical analysis provides a way of finding linear composites in one set of variables that has maximum correlation with their corresponding linear composites from the other set. Each of these components is defined by a set of regression weights and each is described by a set of component loadings that are the correlations of the observed variables with the composite.

Since a single composite of either set cannot account for all the variance in the set, a correlation between a pair of composites can only indicate the proportion of variance in each composite that is related to the other composite of the pair. Therefore, the square of the largest canonical correlation is the proportion of variance of the first composite in one set that was accounted for by the first composite of the other set. The square of the second largest canonical correlation represents the proportion of variance of the second composite in one set that was accounted for by the second composite of the other set and so forth.

The decision as to when to stop extracting variate pairs is essentially up to the subjective judgement of the researcher. A criterion for the size of the canonical correlation can be predetermined and the remaining covariation ignored. Another way is to use one of various statistical tests of significance. A third approach is to rely on the proportion of redundant variance associated with a given

canonical relationship. Two or even all three of these approaches can be used together to decide which canonical correlations and their associated composites should be focused upon.

Statistical significance provides no assurance that the relationship has any generality or scientific importance since the results may be due to sample-specific covariation. Small correlations obtained using large samples and few variables may be statistically significant, but scientifically trivial. Normally, any composite accounting for less the 10 percent of the variance of the other composite is disregarded.

Thorndike (1978) recommends that ten subjects be used for each variable employed (with 50 subjects added to this number with small sets of variables). The second and more stringent recommendation is that the number of subjects used should be equal to the square of the number of variables (with 50-100 added for small sets). Thorndike admits the practical difficulty of satisfying this second rule (2550 subjects using 50 variables) and suggests that most researchers attempt to meet the standards of his first rule (550 subjects). When this is not feasible, he suggests that as many subjects as possible be used, with one group reserved for cross-validation, and extreme caution employed in interpretations.

The meaning of a canonical correlation can be understood and interpreted by examining the "redundancy" indices. The procedure for computing redundancy involves the canonical component loadings which are the correlations between the variables in a set and a composite of the set. Each loading is a bivariate correlation which can be

interpreted as the amount of variance of the variable that is accounted for by the composite, when squared. By summing the squared loadings of a given composite, the amount of variance of the set that is accounted for by the composite is produced. Then the sum of squared loadings can be divided by the number of variables in the set to obtain the proportion of the variance of the set that is accounted for by the composite. By multiplying this value by the squared canonical correlation, the proportion of variance in one set that is accounted for by the composite of the other set is obtained. Finally, the proportion of variance of one set that is accounted for by the other set can be determined by computing the above for all the composites of a set and summing the results.

HYPOTHESES

Previous factor analytic research, using univariate approaches to personality and value structure, has demonstrated the relationship between particular personality traits and values. Specifically, Mahoney (1977) found high rankings of the values "salvation", "self-respect", "broadminded", "honest", "loving", and "polite" to be related to high scores of Emotionality. Rim (1970) found high rankings of the values "polite", "family security", and "inner harmony" to be correlated with high scores on extraversion. Canonical correlation analysis provides a multivariate technique for discovering the deep structural relationship between personality and value structures.

Hypothesis 1 - It was hypothesized that there would be a canonical root with common saturation for the 16 PF primary factors A+, E+, F+, H+, and Q_2- (chief primaries for Q_1) and Rokeach Value Survey values "polite", "family security", and "inner harmony".

Hypothesis 2 - It was hypothesized that there would be a canonical root with common saturation for the 16 PF factors C-, H-, L+, O+, Q_3-, and Q_4+ (chief primaries for Q_2) and Rokeach Value Survey values "salvation", "self-respect", "broadminded", "honest", "loving", and "polite".

METHOD

1. Subjects - A sample population of 110 subjects (77 female and 33 male) participated in this study. All were volunteers obtained primarily from psychology classes at Virginia Commonwealth University, representing a diversity of socioeconomic classes, ethnic, identifications, and rural, urban, and suburban backgrounds.

2. Materials - Form E of the Value Survey (Rokeach, 1967) was used to assess respondents' value structures. The survey contains two lists of 18 values each, to be ranked in order of personal importance by each subject. One list contains 18 "terminal" values (existential goals) and the other contains 18 "instrumental" values (preferred modes of conduct). This variation of the Value Survey has a demonstrated test-retest reliability of .74 (Feather, 1971) and requires approximately 15-20 minutes to complete.

Form C of the 16 PF (Cattell, Eber & Tatsuoka, 1970) was used to obtain profiles of respondents' personality. This questionnaire provides normative scores on 16 personality dimensions. It contains 6-8 multiple choice items for each scale (total of 105 questions) and requires 30-40 minutes to complete. The equivalence coefficients between Forms C and D range from .16 for factor N to .55 for factor H.

3. Procedures - Respondents completed the 16 PF and Rokeach Value Survey in one of several group-testing situations. The completed 16 PF instrument was hand-scored by the researcher.

The Rokeach Value Survey data, containing 18 terminal and 18

instrumental values, which are rank ordered according to personal importance, were converted via the Feather transformation to z scores corresponding to a division into 18 equal areas under the normal curve (Feather, 1971). The 16 PF data, which contained 17 scores (one of which represents a motivational distortion measure) were left as raw scores for purposes of the canonical correlational analysis.

Using data from all 110 subjects (33 male and 77 female) and 53 variables (36 values and 17 16 PF scores), a canonical correlation analysis was performed using Statistical Analysis System (SAS).

RESULTS

Two significant ($p < .05$) canonical roots emerged from the canonical correlational analysis. The standardized canonical coefficients used to obtain the first significant canonical correlation (Rc = .89; F (612/958) = 1.3488, $p < .0001$) are presented in Table 1. Table 2 contains the correlations between the variables in each set and their corresponding variates for the first significant canonical correlation.

Inspection of Table 1 reveals that the greatest saturations for latent root one are for terminal values "salvation", "wisdom", and "self-respect" and for instrumental values "helpful" and "loving". The corresponding 16 PF factors which load highest on the first root are MD- (motivational distortion), I+ (tender-minded), and M+ (imaginative). All saturations for the values cited above are positive. Interpretation of these coefficients has all the problems of interpreting beta coefficients of common multiple regression (Stewart & Love, 1968) and therefore will not be explored.

Inspection of Table 2 reveals that the highest correlations (all negatives) between the Rokeach Value Survey variables and their corresponding variate are instrumental values "ambitious", "polite", and "self-controlled". The highest correlations between the 16 PF variables and their corresponding variate are MD- (motivational distortion), I+ (tender-minded), and M+ (imaginative).

The standardized canonical coefficients used to obtain the second significant canonical correlation (Rc = .85; F (560/916) = 1.1949,

TABLE 1

STANDARDIZED CANONICAL COEFFICIENTS USED FOR FIRST LATENT ROOT OF THE CANONICAL CORRELATIONAL ANALYSIS SHOWING ORTHOGONAL COMPONENTS OF COMMON VARIANCE BETWEEN THE ROKEACH VALUE SURVEY AND THE CATTELL 16 PF

Terminal Values	Saturation	Instrumental Values	Saturation	16 PF	Saturation
A Comfortable Life	.39	Ambitious	-.09	MD = Motivational Distortion	-.59
An Exciting Life	.25	Broadminded	.27	A = Outgoing	.36
A Sense of Accomplishment	.13	Capable	.12	B = More Intelligent	.20
A World at Peace	.20	Cheerful	.08	C = Emotionally Stable	.31
A World of Beauty	.33	Clean	.12	E = Assertive	-.09
Equality	-.05	Courageous	.14	F = Happy-Go-Lucky	-.12
Family Security	.09	Forgiving	.06	G = Conscientious	-.16
Freedom	.35	Helpful	.46	H = Venturesome	.16
Happiness	.14	Honest	.11	I = Tender-Minded	.54
Inner Harmony	.36	Imaginative	.11	L = Suspicious	.05
Mature Love	.12	Independent	.13	M = Imaginative	.43
National Security	.08	Intellectual	.15	N = Shrewd	.02
Pleasure	.06	Logical	.08	O = Apprehensive	-.01
Salvation	.63	Loving	.52	Q_1 = Experimenting	-.01
Self-Respect	.41	Obedient	.05	Q_2 = Self-Sufficient	.02
Social Recognition	.37	Polite	-.09	Q_3 = Controlled	-.02
True Friendship	.36	Responsible	.07	Q_4 = Tense	.05
Wisdom	.51	Self-Controlled	-.11		

TABLE 2

CORRELATIONS BETWEEN VARIABLES AND CORRESPONDING VARIATES FOR FIRST LATENT ROOT OBTAINED FROM THE CANONICAL CORRELATIONAL ANALYSIS SHOWING ORTHOGONAL COMPONENTS OF COMMON VARIANCE BETWEEN THE ROKEACH VALUE SURVEY AND THE CATTELL 16 PF

Terminal Values	Correlation	Instrumental Values	Correlation	16 PF	Correlation
A Comfortable Life	-.28	Ambitious	-.42	MD = Motivational Distortion	-.43
An Exciting Life	-.06	Broadminded	.30	A = Outgoing	.20
A Sense of Accomplishment	-.19	Capable	.07	B = More Intelligent	.27
A World at Peace	-.11	Cheerful	.12	C = Emotionally Stable	.06
A World of Beauty	.20	Clean	-.21	E = Assertive	-.09
Equality	-.-8	Courageous	.14	F = Happy-Go-Lucky	.02
Family Security	-.17	Forgiving	.29	G = Conscientious	-.17
Freedom	-.11	Helpful	.36	H = Venturesome	.05
Happiness	-.07	Honest	-.07	I = Tender-Minded	.60
Inner Harmony	.32	Imaginative	.24	L = Suspicious	.05
Mature Love	.17	Independent	.04	M = Imaginative	.55
National Security	-.34	Intellectual	.18	N = Shrewd	-.18
Pleasure	-.28	Logical	-.12	O = Apprehensive	.03
Salvation	.14	Loving	.33	Q_1 = Experimenting	.32
Self-Respect	.10	Obedient	-.21	Q_2 = Self-Sufficient	.05
Social Recognition	.09	Polite	-.42	Q_3 = Controlled	-.01
True Friendship	.25	Responsible	-.10	Q_4 = Tense	-.01
Wisdom	.30	Self-Controlled	-.46		

$p < .0089$) is presented in Table 3. Table 4 contains the correlations between the variables in each set and their corresponding variates for the second significant canonical correlation.

Review of Table 3 indicates that the greatest saturation for canonical correlation 2 are the terminal values "salvation", "a sense of accomplishment", "freedom", "equality" and "pleasure" and instrumental value "helpful". The corresponding 16 PF factors are A- (outgoing), E+ (assertive) and Q_4+ (tense). All saturations for the terminal values cited are positive, whereas saturations for all instrumental values cited are negative. Again, interpretation of these coefficient loadings is most confusing and will not be explored.

Inspection of Table 4 reveals that the highest correlations between the Rokeach Value Survey variables and their corresponding variate are terminal value "family security" and instrumental values "broadminded", "clean", "helpful", "imaginative", "intellectual", and "obedient". The highest correlations between the 16 PF variables are MD- (motivational distortion), E+ (assertive), and Q_4+ (tense). "Broadminded" and "intellectual" are negative correlations and the other values cited are positive correlations.

TABLE 3

STANDARDIZED CANONICAL COEFFICIENTS USED FOR SECOND LATENT ROOT OF THE CANONICAL CORRELATIONAL ANALYSIS SHOWING ORTHOGONAL COMPONENTS OF COMMON VARIANCE BETWEEN THE ROKEACH VALUE SURVEY AND THE CATTELL 16 PF

Terminal Values	Saturation	Instrumental Values	Saturation	16 PF	Saturation
A Comfortable Life	.33	Ambitious	-.15	MD = Motivational Distortion	.31
An Exciting Life	.33	Broadminded	.07	A = Outgoing	-.45
A Sense of Accomplishment	.62	Capable	-.04	B = More Intelligent	.14
A World at Peace	.28	Cheerful	-.18	C = Emotionally Stable	.14
A World of Beauty	.36	Clean	-.36	E = Assertive	.53
Equality	.47	Courageous	-.09	F = Happy-Go-Lucky	.26
Family Security	.18	Forgiving	-.21	G = Conscientious	-.10
Freedom	.50	Helpful	-.43	H = Venturesome	-.23
Happiness	.13	Honest	-.30	I = Tender-Minded	.01
Inner Harmony	.27	Imaginative	-.03	L = Suspicious	-.26
Mature Love	.29	Independent	-.30	M = Imaginative	.22
National Security	.28	Intellectual	.11	N = Shrewd	-.07
Pleasure	.61	Logical	-.18	O = Apprehensive	-.23
Salvation	.83	Loving	-.36	Q_1 = Experimenting	.34
Self-Respect	.33	Obedient	-.33	Q_2 = Self-Sufficient	-.24
Social Recognition	.17	Polite	-.09	Q_3 = Controlled	-.09
True Friendship	.18	Responsible	-.15	Q_4 = Tense	.46
Wisdom	.15	Self-Controlled	-.29		

TABLE 4

STANDARDIZED CANONICAL COEEFICIENTS USED FOR SECOND LATENT ROOT OF THE CANONICAL CORRELATIONAL ANALYSIS SHOWING ORTHOGONAL COMPONENTS OF COMMON VARIANCE BETWEEN THE ROKEACH VALUE SURVEY AND THE CATTELL 16 PF

Terminal Values	Correlation	Instrumental Values	Correlation	16 PF	Correlation
A Comfortable Life	.05	Ambitious	.26	MD = Motivational Distortion	.17
An Exciting Life	.25	Broadminded	.42	A = Outgoing	-.38
A Sense of Accomplishment	.23	Capable	.29	B = More Intelligent	.22
A World at Peace	-.19	Cheerful	-.15	C = Emotionally Stable	-.02
A World of Beauty	.26	Clean	-.39	E = Assertive	.47
Equality	-.02	Courageous	.28	F = Happy-Go-Lucky	.22
Family Security	-.43	Forgiving	-.17	G = Conscientious	-.33
Freedom	.32	Helpful	-.38	H = Venturesome	-.05
Happiness	-.02	Honest	-.32	I = Tender-Minded	.07
Inner Harmony	-.03	Imaginative	.56	L = Suspicious	-.01
Mature Love	-.06	Independent	.26	M = Imaginative	.37
National Security	-.22	Intellectual	.45	N = Shrewd	.04
Pleasure	-.31	Logical	.00	O = Apprehensive	-.11
Salvation	-.34	Loving	-.36	Q_1 = Experimenting	.57
Self-Respect	.16	Obedient	-.41	Q_2 = Self-Sufficient	.21
Social Recognition	.13	Polite	-.32	Q_3 = Controlled	-.22
True Friendship	-.10	Responsible	-.15	Q_4 = Tense	.28
Wisdom	.06	Self-Controlled	-.25		

DISCUSSION

Hypothesis 1, which predicted a significant canonical root with common saturations for 16 PF factors A+, E+, F+, H+, and Q_2- (extraversion) and the corresponding values of "polite", "family security", and "inner harmony" was not supported. This hypothesis was proposed on the basis of Rim's (1970) finding with Israeli university students using factor analytic methods. As discussed earlier, value structures between Israelis and Americans appear to be quite different. Furthermore, values within a given culture or subculture (university students as an example) could be expected to change to some degree over a ten-year period. Indeed, moderate changes in values have been found in research with U. S. students (Mahoney, Note 1). Another explanation for the disconfirmation of the hypothesis is that canonical correlation analysis is quite different from factor analysis. As Digman and Takemoto-Chock (1981) suggested, different statistical techniques may yield quite different results. Finally, it should be emphasized that the few canonical correlational analyses reported in the literature are primarily used for exploratory purposes as an external factor analysis device, and rarely for prediction.

Hypothesis 2, which predicted a significant canonical root with common saturations for 16 PF factors C-, H-, L+, O+, Q_3-, and Q_4+ (anxiety) and corresponding values "salvation", "self-respect", "broadminded", "honest", "loving", and "polite" was partially supported. Canonical root two shared a saturation common to the values "salvation" and "self-respect" (among others) and 16 PF factor Q_4+ (tense).

The results obtained from factor analysis and canonical analysis has been shown to yield results similar to each other in other studies (Burt, 1948). However, the psychological literature with canonical correlation is sparse and requires much more theoretical and empirical study before the relationship between factor analytic and canonical analysis results can be clearly determined. That hypothesis two was only partially supported may well be an artifact of the mathematics involved in computing a canonical correlation.

An explanation of possible differences attributed to sex was also considered. Unfortunately, there were only 33 male participants, which made canonical correlation analysis, using males only, infeasible (there must be at least one more subject than the number of variables in the sets). However, the canonical correlation for females using the 17 16 PF factors and 36 values produced one significant canonical root ($Rc = .95$; $F(612/449) = 1.2141$, $p < .0143$). The coefficients used to obtain the canonical correlation are presented in Table 5.

Inspection of Table 5 reveals that the greatest saturations for the root are the values "pleasure", "polite", and "loving", with the latter being negative. The corresponding 16 PF factors are MD+ (motivational distortion), A- (outgoing), and I- (tender-minded). This canonical root is markedly different from the two significant canonical roots produced using all subjects. Sex differences apparently affected the interrelations among personality factors and value structures with this subject population.

The possibility that the sample may not have been representative of Virginia Commonwealth University students, due to the relatively small

TABLE 5

COEFFICIENTS USED FOR FIRST LATENT ROOT OF THE CANONICAL CORRELATIONAL ANALYSIS SHOWING ORTHOGONAL COMPONENTS OF COMMON VARIANCE BETWEEN THE ROKEACH VALUE SURVEY AND THE CATTELL 16 PF, USING ONLY FEMALE SUBJECTS

Terminal Values	Saturation	Instrumental Values	Saturation		Saturation
A Comfortable Life	-.09	Ambitious	-.02	MD = Motivational Distortion	.52
An Exciting Life	.09	Broadminded	.01	A = Outgoing	-.52
A Sense of Accomplishment	.16	Capable	.15	B = More Intelligent	-.13
A World at Peace	.00	Cheerful	-.33	C = Emotionally Stable	-.07
A World of Beauty	-.03	Clean	.06	E = Assertive	.16
Equality	.30	Courageous	-.10	F = Happy-Go-Lucky	.03
Family Security	.03	Forgiving	-.09	G = Conscientious	.09
Freedom	.02	Helpful	-.34	H = Venturesome	-.20
Happiness	-.14	Honest	.08	I = Tender-Minded	-.53
Inner Harmony	-.05	Imaginative	.22	L = Suspicious	-.11
Mature Love	.02	Independent	-.39	M = Imaginative	-.27
National Security	.34	Intellectual	.21	N = Shrewd	-.03
Pleasure	.45	Logical	.09	O = Apprehensive	.22
Salvation	.20	Loving	-.44	Q_1 = Experimenting	.30
Self-Respect	-.20	Obedient	-.32	Q_2 = Self-Sufficient	.15
Social Recognition	-.04	Polite	.43	Q_3 = Controlled	.00
True Friendship	-.19	Responsible	-.11	Q_4 = Tense	.02
Wisdom	-.20	Self-Controlled	.07		

number of subjects and the inclusion of non-university participants, was considered. To evaluate this possibility, the medians of the rank order of untransformed values for this sample were correlated with those of another larger sample (204 subjects) collected by Mahoney (Note 1). The data sets were similar in gender composition (27.4 percent male for the Mahoney sample and 30.6 percent male for the current sample). Spearman rank order correlation coefficients of .91 and .93 were obtained between the medians of the terminal and instrumental values for the two sets, respectively. This finding is consistent with the notion that there is a very high similarity in value structures between the two sample populations.

Table 6 presents the results of a canonical redundancy analysis for the 2 significant roots of the canonical correlational analysis. This analysis, the mathematics of which were explained earlier, was developed by Stewart and Love (1968) for interpreting canonical correlations. Inspection of Table 6 reveals the following:

1. The first canonical variate formed by the Rokeach Value Survey scores has 5.48 percent of variance associated with its own variables (and 4.35 percent with the opposite variables). The first canonical variate formed by the 16 PF scores has 6.73 percent of variance associated with its own variables (and 5.35 percent with the opposite variables).

2. The second canonical variate formed by the Rokeach Value Survey scores has 7.65 percent of variance associated with its own variables (and 5.54 percent with the opposite variables). The second canonical variate formed by the 16 PF scores has 7.37 percent of variance associated with its own variables (and 5.34 percent with the opposite variables).

3. All 17 canonical variates formed from the Rokeach Value Survey set extract 55 percent of the variance of that set.

TABLE 6

CANONICAL REDUNDANCY ANALYSIS FOR THE TWO SIGNIFICANT ROOTS OF THE CANONICAL CORRELATIONAL ANALYSIS OF THE RELATIONSHIPS BETWEEN THE ROEACH VALUE SURVEY AND THE CATTELL 16 PF

PROPORTION OF VARIANCE OF THE "VALUE" VARIABLES EXPLAINED BY:

Root	Their Own Canonical Variables	The Opposite Canonical Variables
1	5.48%	4.35%
2	7.65%	5.54%
	13.13%	9.89%

PROPORTION OF VARIANCE OF THE "16 PF" VARIABLES EXPLAINED BY:

Root	Their Own Canonical Variables	The Opposite Canonical Variables
1	6.73%	5.35%
2	7.37%	5.34%
	14.10%	10.69%

Note. Percent of total variance extracted from the Rokeach Value Survey set by all 17 canonical variates = 54.89%

Percent of total redundancy for Rokeach Value Survey set, given 16 PF set, using all 17 canonical variates = 24.41%

Percent of total variance extrated from the 16 PF set using all 17 canonical variates = 100%

Percent of total redundancy for 16 PF set, given Rokeach Value Survey set, using all 17 canonical variates = 41.04%

4. Twenty-four percent of the variance of the Rokeach Value Survey set is predicted by the variance in the 16 PF set.

5. The total percent of variance extracted from the 16 PF set, using all 17 canonical correlations is 100 percent (which is always true of the smaller set in the canonical correlation according to Stewart and Love, 1968).

6. Forty-one percent of the variance of the 16 PF set is predicted by the variance in the Rokeach Value Survey set.

This study was undertaken to improve understanding of the relationship between personality factors and value structure. The two significant canonical correlations obtained using all subjects and 53 variables, accounted for only 9.89 percent of the variability in the Rokeach Value Survey, given the 16 PF set, and only 10.69 percent of the variability in the 16 PF given the Rokeach Value Survey set. Although the proportion of total redundancy increases to 24.41 percent and 41.04 percent, respectively, when all 17 canonical correlations are considered, this includes substantial error variance which does noer permit generalization beyond this sample. Therefore, it would appear that the common domain shared by personality (as measured by the Cattell 16 PF) and value structure (as measured by the Rokeach Value Survey) is relatively small. This would suggest that personality is independent of value structure, at least as measured by these instruments. Further research, using larger subject populations, is needed to collaborate these findings and ascertain the precise relationship between personality factors and value structures. It is also recommended that the results obtained from the 16 PF and Rokeach Value Survey

be compared with those obtained using other personality and value structure instruments to determine the extent to which canonical correlational results can be replicated with similar instruments.

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APPENDICES

APPENDIX A

CATTELL'S 16 PERSONALITY FACTORS

Standard Index	Bipolar Title	Popular Title
A	Sizothymia vs. Affectothymia	Reserved-Outgoing
B	Low Intelligence vs. High Intelligence	Less Intelligent-More Intelligent
C	Emotional Instability vs. High Ego Strength	Emotional-Stable
E	Submissiveness vs. Dominance	Humble-Assertive
F	Desurgency vs. Surgency	Sober-Happy Go Lucky
G	Low Superego Strength vs. Superego Strength	Expedient-Conscientious
H	Threctia vs. Parmia	Shy-Venturesome
I	Harria vs. Premsia	Tough Minded-Tender Minded
L	Alaxia vs. Protension	Trusting-Suspicious
M	Praxernia vs. Autia	Practical-Imaginative
N	Naivete vs. Shrewdness	Forthright-Shrewd
O	Untroubled Adequacy vs. Guilt Proneness	Placid-Apprehensive
Q_1	Conservatism of Temperament vs. Radicalism	
Q_2	Group Dependency vs. Self- Sufficiency	
Q_3	Low Self-Sentiment Integration vs. High Strength of Self-Sentiment	
Q_4	Low Ergic Tension vs. High Ergic Tension	

APPENDIX B

SECOND-STRATUM FACTORS

Standard Index	Bipolar Title	Chief Primaries Involved
Q_I	Invia vs. Exvia	A+, E+, F+, H+, Q_2-
Q_{II}	Adjustment vs. Anxiety	C-, H-, L+, O+, Q_3-, Q_4+
Q_{III}	Pathemia vs. Cortertia	A-, I-, M-
Q_{IV}	Subduedness vs. Independence	E+, L+, M+, Q_1+, Q_2+

APPENDIX C

18 TERMINAL VALUES

1. A COMFORTABLE LIFE (a prosperous life)
2. AN EXCITING LIFE (a stimulating, active life)
3. A SENSE OF ACCOMPLISHMENT (lasting contribution)
4. A WORLD AT PEACE (free of war and conflict)
5. A WORLD OF BEAUTY (beauty of nature and the arts)
6. EQUALITY (brotherhood, equal opportunity for all)
7. FAMILY SECURITY (taking care of loved ones)
8. FREEDOM (independence, free choice)
9. HAPPINESS (contentedness)
10. INNER HARMONY (freedom from inner conflict)
11. MATURE LOVE (sexual and spiritual intimacy)
12. NATIONAL SECURITY (protection from attack)
13. PLEASURE (an enjoyable, leisurely life)
14. SALVATION (saved, eternal life)
15. SELF-RESPECT (self-esteem)
16. SOCIAL RECOGNITION (respect, admiration)
17. TRUE FRIENDSHIP (close companionship)
18. WISDOM (a mature understanding of life)

18 INSTRUMENTAL VALUES

1. AMBITIOUS (hard-working, aspiring)
2. BROADMINDED (open-minded)
3. CAPABLE (competent, effective)
4. CHEERFUL (lighthearted, joyful)
5. CLEAN (neat, tidy)

18 INSTRUMENTAL VALUES (Continued)

6. COURAGEOUS (standing up for your beliefs)
7. FORGIVING (willing to pardon others)
8. HELPFUL (working for the welfare of others)
9. HONEST (sincere, truthful)
10. IMAGINATIVE (daring, creative)
11. INDEPENDENT (self-reliant, self-sufficient)
12. INTELLECTUAL (intelligent, reflective)
13. LOGICAL (consistent, rational)
14. LOVING (affectionate, tender)
15. OBEDIENT (dutiful, respectful)
16. POLITE (courteous, well-mannered)
17. RESPONSIBLE (dependable, reliable)
18. SELF-CONTROLLED (restrained, self-disciplined)

VITA

