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BEHAVIORAL COGNITION AS RELATED TO
INTERPERSONAL PERCEPTION AND SOME
PERSONALITY TRAITS OF COLLEGE STUDENTS.**

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BEHAVIORAL COGNITION AS RELATED TO INTERPERSONAL PERCEPTION
AND SOME PERSONALITY TRAITS OF COLLEGE STUDENTS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

Chandra Mohan Nath Mehrotra, B.Sc., M.Ed.,
Diploma in Guidance Psychology

* * * * *

The Ohio State University
1968

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"Vocational Development of Junior High School Students," Center for Vocational and Technical Education, The Ohio State University, Columbus, Ohio (In Press).

FIELDS OF STUDY

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Chapter I

The Problem in Perspective

The present study has been designed to determine the relationship of some selected variables in the area of personality, interests, values and interpersonal perception to behavioral cognition factors, as defined within Guilford's model of the Structure of the Intellect.

This chapter will be devoted to give a brief review of literature in the area of social intelligence (behavioral cognition) and will mainly focus on the problems involved in the measurement of social intelligence. This will lead to the statement of the problem and the specific hypotheses proposed for this study. The last section of the chapter will provide the definition of abilities, and consequently the factors, as defined within the Structure of Intellect model.

Review of Literature

The construct of intelligence has been the subject of theories, research and discussion for a very long time. The empirical study of the structure of the intellect can be traced back to Galton (1883) when he tried to use the measurement of sensory processes for arriving at an estimate of the subject's intellectual level and to J. McKeen Cattell (1890) who employed tests of muscular strength, speed of movement, sensitivity to pain, reaction time, etc., for

a similar purpose. Spearman (1904) and Binet and Simon (1905) emphasized the importance of a general factor of intellectual ability.

Spearman's two-factor theory was followed by other theories, proposed by British psychologists Burt (1949) and Vernon (1950) which assume general, group and specific factors and the theory due to Thurstone (1938) in which a number of primary abilities are assumed. Guilford (1957, 1958, 1959, 1967) has recently extended Thurstone's approach in his Structure of Intellect (SI) Model which also shows some similarities to the one published by Eysenck (1953). The SI Model is illustrated in Appendix A. Guilford has classified the intellect into operations which it can perform, different contents of these operations, and different products; by taking all possible interactions one obtains 120 cells corresponding to different mental abilities. Each intellectual factor may thus be described uniquely in terms of one of the four content areas, one of five operations, and one of six products. The model hypothesizes four kinds of content--semantic, symbolic, figural, and behavioral. Semantic content refers to material dealing with word meanings. Symbolic content refers to information such as numbers and letters which have no significance in themselves. Figural content area includes materials which are concrete or perceivable as space. These three content areas are not unfamiliar to the psychologists as they were included previously in other models (e.g., those of Eysenck, Thurstone, and others) and are also seen in most of the existing test batteries as verbal, numerical, and spatial tests respectively. The fourth content area, the behavioral one, has been added to the SI Model recently by

Guilford (1958a). This area includes feelings, motives, thoughts, intentions, attitudes or other psychological dispositions which might affect an individual's social behavior. Guilford (1967) has indicated that:

This step was taken on purely logical grounds for there was no known factors at the time to support the idea. The kind of content called by the term behavioral was added to take care of operations pertaining to the behavior of other people. We know that we know to some extent what the other person is perceiving, attending to, feeling, thinking and intending to do. We draw inferences from this information and we utilize such information in efforts to control his actions. The addition of this kind of content was also influenced by the proposal of E.L. Thorndike (1920) that there is a social intelligence, distinct from the traditional kind of intelligence.

The operation dimension of the SI Model refers to intellectual processes or activities performed by the organism to any particular kind of content. Five different operations have been hypothesized: cognition (discovering readily on the basis of what one knows), memory (retention or storage of information in any form), divergent production (generation of variety of output), and evaluation (judging in terms of criteria).

The product dimension of the SI model deals with the results of intellectual operations performed on the given content. Six different product categories have been hypothesized: units (things, segregated whole, figures on ground, or chunks), classes (sets of objects with one or more common properties), relations (connections between units), systems (complexes, patterns or organization of independent or interacting parts), transformations (change, or re-definitions in known information), and implications (expectation or anticipation from given information).

Since the focus of this study is on behavioral cognition (or social intelligence as it is generally called) a brief review of psychologist's concern with social intelligence follows. This, it is hoped, will help in placing the major concern of this research in perspective. In view of the complexity of the area this review will be limited to the extent that it helps the psychologists better to understand how the present research fits and extends their empirical knowledge.

Attempts at devising measures of behavioral cognition (or social intelligence as it is generally called) were made as long ago as 1915 when Cogan, Conklin and Hollingsworth published their study entitled "An Experimental Study of Self-Analysis Estimates of Associates and the Results of Tests." It was in 1920 that E. L. Thorndike pointed out that in addition to abstract and concrete intelligence a third kind of ability, social intelligence, is suggested by observations of everyday life. Following this suggestion Moss, Hunt, Omwake and Ronning (1927) produced the George Washington Social Intelligence Test. This test has a predominance of items requiring respondents to make judgments about the behavior of "generalized others." R. L. Thorndike (1936) factor analyzed the five subtests of the George Washington Social Intelligence Test along with the George Washington Mental Alertness Test (a measure of general intelligence) and found that "the comprehension and use of words" accounts for most of whatever either test measures. This finding was corroborated by Woodrow (1939) who included some other variables (e.g., attention, musical ability, and general intelligence) in factor analyzing the five

subtests of this instrument. Woodrow found that these five subtests were loaded on factors defined by verbal or memory variables. This finding is not surprising because most of the items of the Moss Social-Intelligence subtests are verbally presented. Wedeck (1932) conducted a similar study under Spearman's direction at University College, London. The main problem in his research was whether "psychological ability" (Social Intelligence) involved simply general intelligence or also a special ability or factor. He constructed eight tests for measuring "psychological ability." All of his tests used either auditory or pictorial stimuli. The pictorial tests employed (a) works of well-known contemporary artists and (b) photographs (stills) of popular film actors represented in psychological situations. Only those pictures were used for which there was complete agreement between the interpretation of three trained psychologists and the artists. These pictures covered a wide range of facial expressions and psychological situations. Words, phrases or sentences were supplied with the picture and the subjects were required to find one which they considered as most suitable for the picture. In one of the tests the questions were concerned with habitual or constitutional tendencies, e.g., hard-heartedness, ascetism, self-consciousness (instead of temporary mood or feelings represented) while in another the Ss were required to rate on a 3 point scale a wide range of aspects of personality of the person shown in the picture. Wedeck administered his battery of fifteen tests (tests of verbal and spatial abilities

along with those of psychological ability) to 203 girls aged between $13\frac{1}{2}$ and 14 years attending secondary schools in the London area. A tetrad difference analysis resulted in three non-orthogonal clusters. These factors were named as g (for general intelligence), v (for verbal ability), and Ψ (for psychological ability). Table 1 shows g, v, and Ψ saturation for the various tests used in Wedeck's study.

Table 1
g, v, and Ψ saturation for the various tests used in Wedeck's work

Test	g	v	Ψ
Understanding Paragraphs	252	454	Nil
Classification	211	636	Nil
Disarranged Sentences	617	503	390
Proverbs	512	652	490
Non-Verbal Analogies	675	Nil	Nil
Non-Verbal "Rights"	725	Nil	Nil
Alphabetical Series	653	Nil	Nil
Expressions (Pictorial)	281	181	614
Situations (Pictorial)	329	138	590
Character Qualities (Selective)	340	525	606
Character Qualities (Grading)	175	105	-
Situations (Photographic)	232	120	442
Verbal Delineations	276	092	-
Truth and Falsehood	234	085	246
Problematic Situations	155	298	263

Source: Wedeck, 1947

Between 1932 and 1961 most of the research in this area has used an experimental approach (instead of individual differences approach). These studies have used different methods, e.g., requiring subjects to rate or rank personality traits of peers or other target persons (Vernon, 1933; Wolf and Murray, 1937; Taft, 1950; Norman, 1953), asking subjects to predict happenings in the lives of

others (inter-personal predictions) or to guess about the answers of others to items on a personality test (Gage, 1952; Cline and Richards, 1955, 1960, 1962, 1963). These investigators used the term social perception, person perception, or interpersonal perception and employed the procedures used in other perceptual studies. Their main focus was on group tendencies; and similarities, rather than differences, among individuals were observed.¹

Sechrest and Jackson (1961) revived the interest in social intelligence by conducting a study to relate the accuracy of interpersonal prediction to social intelligence. Another purpose of their study was to establish convergent and discriminant validity of social intelligence in line with the model proposed by Campbell and Fiske (1959). Sechrest and Jackson developed a method for discriminating social intelligence from general intelligence based upon peer ratings. Their focus was on variance in social effectiveness which is beyond that accounted for by academic intelligence and general pleasantness. To appraise the hypothesis that interpersonal prediction can be considered as a meaningful reflection of social intelligence, they developed two measures of predictive accuracy viz., stereotype accuracy and differential accuracy. The scores on these predictive accuracy measures were found to be uncorrelated with reputational measures

¹For an excellent review of experimental approach see Libby (1965) and Hakel and Dunnette (1968).

of social intelligence suggesting lack of generality of predictive accuracy scores as indicants of "social intelligence." Differential accuracy did not correlate significantly with any of the personality variables studied. This was considered to be another indication of differential accuracy involving specific skills. However, stereotype accuracy probably reflecting sensitivity to group consensus, was found to have significant negative correlations with the MMPI Pd Scale and sociometric ratings of "least pleasant" and of "most unpredictable." This may be due to the fact that Ss who are deviant social are less likely to gain knowledge of common group behavior patterns by virtue of limited motivation, limited ability, and social isolation. It may also indicate that insensitivity to recognition of modal group behavior causes Ss with low stereotype accuracy scores to be seen as less pleasant by peers. As pointed out by Sechrest and Jackson, "these two possibilities are not mutually exclusive; the functional relationship could well be circular."

O'Sullivan, Guilford and deMille (1965) reanalyzed Wedeck's correlation matrix using the principal-factor method. On rotating the factor-analytic solution to the varimax criterion they obtained five interpretable factors: verbal, figural (spatial), and the remaining three factors were defined by the psychological ability tests. Noting Wedeck's success in demonstrating social-intelligence factors with tests using visual stimuli, O'Sullivan et al (1965) used a similar approach

in developing measures for six different factors of behavioral cognition hypothesized in Guilford's structure-of-intellect model. The main hypothesis of this study was that "there are six separate, intellectual abilities involved in understanding other people (behavioral cognition) and that each of these is factorially distinct from previously isolated intellectual abilities." In order to measure these six hypothesized behavioral factors, 23 experimental tests were constructed. As in Wedeck's study these investigators also used photographs, cartoons, silhouettes, stick figures, etc. These 23 tests along with 24 marker tests of twelve previously established factors of semantic and figural ability were administered to 240 eleventh graders. By using factor analytic procedures the investigators found the six hypothesized behavioral cognition factors: cognition of behavioral units (CBU), cognition of behavioral classes (CBC), cognition of behavioral relations (CBR), cognition of behavioral systems (CBS), cognition of behavioral transformation (CBT), and cognition of behavioral implication (CBI). Most of the 23 experimental tests were more or less successful in measuring the factor they were intended to measure and not other intellectual factors. The best six tests covering four of the behavioral-cognition abilities, for the psychological products of classes, systems, transformations and implications have been published. Table 2 gives the summary of test-score statistics as described in the test manual (1966).

Table 2
Summary of Test-Score Statistics

Test Variable	Mean	S.D.	Reliability ^a		Factor ^b Loading	Factor
			First	Second		
X ₁ Cartoon Predictions	20.9	3.0	.70	.68	.55	CBI
X ₂ Expressions Grouping	19.1	3.7	.58	.61	.59	CBC
X ₃ Missing Cartoons	18.9	5.0	.75	.82	.52	CBS
X ₄ Missing Pictures	13.2	2.6	.48	.46	.58	CBS
X ₅ Picture Exchange	9.6	2.5	.38	.32	.51	CBT
X ₆ Social Translations	14.8	5.1	.84	.85	.51	CBT
X ₇ CBS Composite (X ₃ + X ₄)	32.1	6.2	-	.78	.65	CBS
X ₈ CBT Composite (X ₅ + X ₆)	24.2	6.2	-	.67	.60	CBT
X ₉ Social-cognition Composite (X ₁ + X ₂ + X ₃ + X ₆)	73.0	13.2	-	.88	-	-

^aThe first estimate of reliability was from the unrevised forms used in the factor analysis.

^bFor the unrevised forms.

Construct validity of the behavioral cognition measures has thus been demonstrated by O'Sullivan et al. They have shown that Social Intelligence comprises a group of intellectual abilities each of which is demonstrably independent of previously identified intellectual factors. There is, however, no research evidence to show whether the constructs (factors) measured by these tests are different from the related factors in non-intellectual domain. It has been pointed out that "many of Guilford's tests are interesting variations of cognitive and perceptual functioning that have been variously considered as cognitive style or even personality variables. To broaden the meaning of intelligence by such over-inclusion and relabeling of terms serves more to confuse than to clarity." (Holtzman, 1966). In other words, discriminant validity has not been established for these measures of behavioral cognition. The research reported here was conducted to

achieve this goal. It was hypothesized that if these tests have discriminant validity they will have low relationships with such variables as interests (Social service, persuasive, artistic, and literary), values (social, political, and aesthetic), personality variables (extraversion-introversion, sensing-intuition, judgment-perception, and thinking-feeling). A test will be invalidated if it has too high correlations with other tests purporting to measure different constructs. Also, if the tests have convergent validity, the scores on cognition of behavioral implications (and not on behavioral classes, systems, and transformation) will be highly related to measures of interpersonal perception. The following hypotheses were made:

1. There is little overlap between measures of cognition of behavior² and measures of personality factors such as extraversion, sensing, perception, and feeling.
2. Tests of behavioral cognition are covering the dimension which is different from that being assessed by persuasive, social service, artistic and literary scales of interest inventories.
3. Social intelligence (or cognition of behavior) viewed as intellectual ability is different from social, political and aesthetic values.
4. The scores on cognition of behavioral implications are highly related to scores on measures of interpersonal perception.

²Hypotheses 1, 2 and 3 will be tested separately for each measure of behavioral cognition (viz., classes, systems, transformations, and implications).

The general research question to be answered was: How are the differences in behavioral cognition related to other attributes of the subjects--personality types, interests, and values?

Definitions

The present study seeks to determine the relation between certain intellectual abilities and certain personality traits. The abilities, and consequently the factors, are defined within the model of Structure of Intellect, shown in Appendix A. Each factor is defined in terms of three dimensions: operations, product and content. The present study uses factors which consist of the operation of cognition on behavioral content resulting in the product of classes, systems, transformations or implications. Only four, three-dimensional factors were used. The definitions of the dimensions describing the factors used in the present study are given below:

Operations - Major kinds of intellectual activities or processes; kinds of things that the organism does with the raw materials of information.

Cognition - Acquaintance with, knowing, recognizing, discovering immediately, rediscovering, comprehending, or understanding given information.

Contents - Broad general varieties of fields of information.

Behavioral Content - Information essentially non-verbal, involved in human interactions, where awareness of the attitudes, needs, desires, perceptions, intentions and thoughts of other persons and of ourselves is important.

Products - Results from the organism's processing of information; the basic forms in which information of any kind of content may be used.

Class - A conception underlying a set of items of information grouped because of their common property or properties.

System - An organized or structured aggregate of items of information; a complex of interrelated or interacting parts.

Transformation - A change in existing or known information or in its use, as in production. Any redefinition, or new way of looking at something is a transformation.

Implication - An extrapolation of information, in the form of expectancies, predictions, antecedents, concomitants, and consequents.

Chapter II

Design and Procedures

The basic objective of the present study was to see whether the new constructs of behavioral cognition proposed by Guilford in his Structure of Intellect Model were different from some of the already existing constructs in the area of interpersonal perception, personality (for example, extraversion-introversion, sensing-intuition, thinking-feeling, judgment-perception), interests (social, persuasive, artistic, and literary) and values (social, political, and aesthetic). Three techniques were used to study these relationships: (1) Product-Moment correlation was used to see the relationship of each of the behavioral cognition factors and their composite with the interpersonal perception, personality variables, interests, and values. (2) The Stepwise Procedure was used to perform the multiple regression analysis with each of the behavioral cognition factors as dependent variable and the interpersonal perception, personality, interests, and values as independent variables. (3) The *t* technique was used in making sex comparisons on each of the variables employed in this study.

Since a number of previous studies¹ have demonstrated the existence of sex differences in this area all analyses for this study were done separately for boys and girls.

¹See, for example, Cline 1955 and Bronfenbrenner (1958).

Subjects

The test battery was initially given to all the students enrolled in introductory educational psychology course at the Ohio State University in Spring 1968. For the purposes of this study, however, random samples of 100 boys and 100 girls were drawn. Their age range was from 17 to 25 years with the great majority in the age range between 18 and 22. Before starting the administration of tests the investigator gave a brief introduction to the course in educational psychology and distributed the outline of the course. This was followed by a description of the purpose of the testing program which is summarized below:

1. To acquaint them with the variety of techniques used in educational and psychological measurement.
2. To give them a "feel" of taking psychological tests.
3. To collect data about the students who enroll in courses in educational psychology so that the course contents in methods of teaching may be geared to their needs.
4. To collect data about some of the new tests which use photographs of faces and human figures instead of verbal material.

This testing was thus made a part of their course in educational psychology to obtain maximum cooperation in taking the tests which took about six hours.

Measures of the Variables

The measurement of the variables was accomplished by administration of the following instruments: The Expression Grouping Test (O'Sullivan et al, 1966), The Missing Cartoons Test

(O'Sullivan et al, 1966), The Social Translations Test (O'Sullivan, et al, 1966), The Cartoon Predictions Test (O'Sullivan et al, 1966), The CIP Opinion Predictions Test (Cline and Richards, 1960), The Adjective Checklist (Cline and Richards 1960), The Behavior Postdiction (Cline and Richards, 1960), Kuder's Vocational Preference Record (Kuder, 1942), The Study of Values (Allport, Vernon, Lindzey, 1960), Myer-Briggs Type Indicator (Myers, 1962), and the FIRO-B Scale (Schutz, 1967).

In selection of instruments for the study the following criteria were always kept in mind:

1. As far as possible two instruments should be employed for measuring the variables in one area.
2. Since the study was to be conducted with college population, those instruments should be preferred which have been developed primarily for college population.
3. Enough evidence should be available to show that the reliability and validity of the instrument are satisfactory.
4. The vocabulary of the instrument should be modest.
5. The instrument should not involve too much reading.
6. The items should be non-threatening and should not arouse feelings of privacy-invasion.
7. The instruments should be relatively short so that they can be completed in a few minutes by most subjects.

The instruments, the variables they purport to measure and the rationale for their use in this study will now be reviewed.

Behavioral Cognition

The selection of the four tests of intellectual abilities was based upon the following requirements: (1) that the test should measure a single factor as specified in Guilford's Structure of Intellect Model (2) that the test should have high reliability. As shown in Table 2 only six tests of behavioral cognition have been published. Though for each of these tests O'Sullivan et al (1965) have provided evidence of construct validity, two of these tests viz, Missing Pictures (CBS) and Picture Exchange (CBT) have reliabilities as low as .46 and .32 respectively. Moreover other tests measuring the same factors Missing Cartoons (CBS) and Social Translations (CBT), have much higher reliabilities (.82 and .85 respectively) and have also been shown to have adequate construct validity.

The tests Cartoon Predictions (CBI) and Expression Grouping (CBC) also met the requirements listed above. It was, therefore, decided to use only four out of the six published tests in this study. Table 3 gives the reliability estimated and the factor loadings of the selected tests as reported by O'Sullivan et al.

Table 3
Reliability Estimates and Factor Loadings of
The Selected Tests of Behavioral Cognition

Test	Reliability ^a		Factor Loading ^b	Factor
	First	Second		
Expression Grouping	.58	.61	.59	CBC
Missing Cartoons	.75	.82	.52	CBS
Social Translations	.84	.85	.51	CBT
Cartoon Predictions	.70	.68	.55	CBI

^aThe first estimate of reliability is from the unrevised form used in the factor analysis by O'Sullivan et al (1965).

^bFor the unrevised form.

A brief description of the four factors and their tests as given by Hoepfner and O'Sullivan (1968) follows:

Cognition of behavioral classes (CBS) - the ability to see similarity of behavioral information in different expressional modes. This ability is tested by Expression Grouping Test. In this test the examinee is required to choose the alternative expression that belongs with a group of expressions. A sample item is: Which alternative expression belongs with the given group of expressions?

Answer: 1.

Cognition of behavioral systems (CBS) - the ability to comprehend a social situation or sequence of social events. The test included in this study for measuring this variable is called Missing Cartoons. In this test the examinee is asked to select one of four alternative cartoons which completes a cartoon strip, making sense of the thoughts and feelings of the characters. A sample item is: Which alternative completes the cartoon strip, making sense of the thoughts and feelings of the characters?

Answer: 4.

Cognition of behavioral transformations (CBT) - the ability to reinterpret either a gesture, a facial expression, a statement, or a whole social situation so that its behavioral significance is changed. The test included in this study for measuring this variable is called the Social Translations Test. In this test the examinee is to select one of three

diadic pairs between which a given verbal statement would have a different meaning or intention from the one given. A sample item is:

Between which alternative pair will the given statement have a different intention or meaning?

Parent to child	(1) teacher to student
"I don't think so"	(2) student to teacher
	(3) student to student

Cognition of behavioral implications (CBI) - the ability to draw implications or make predictions about what will happen following a given social situation. This ability is assessed by the Cartoon Predictions Test. In this test the examinee is required to select one of three cartoon situations that may be predicted from the given cartoon based upon the feeling and intentions of the cartoon characters. A sample item is:

Which alternative situation can be predicted from the given one?

Answer: 1.

It may be pointed out that most of the work in the area of social intelligence or interpersonal perception has been concerned with assessment of ability involved in making predictions of a behavioral nature. Guilford's Structure of Intellect model has

suggested thirty different behavioral abilities and O'Sullivan et al (1965) have developed measures for CBU, CBC, CBT, CBS, and CBI and have demonstrated their construct validity. Thus it appears that most of the previous work has overemphasized the ability to make behavioral predictions which is only one of the many intellectual abilities (CBI) pertaining to the understanding of others. In the present study, therefore, measures of interpersonal perception which emphasize mainly the predictive accuracy were included to see their relationship not only with CBI but with other behavioral cognition factors, viz, CBC, CBS, and CBT. It was hypothesized that measures of interpersonal perception will have more common variance with measures of CBI than with those of CBC, CBS, and CBT. The following section describes the measures used to assess the accuracy of interpersonal perception.

Interpersonal Perception

Still photographs have frequently been used in the studies of interpersonal perception. This approach has, however, been criticized on the grounds that immobile photographs or drawings of faces do not provide enough cues (e.g., tone, interaction with other persons, behavior in different situations) to the judges as is the case in real life. Dr. Victor B. Cline of the University of Utah has been conducting a series of studies in the area of interpersonal perception. Unlike O'Sullivan, Guilford, and deMille's approach, Cline and his associates have developed

and used sound color motion pictures of an interview situation in their case studies. As stated in the previous section, in the present study these films were used to obtain measures of interpersonal perception which, it was hypothesized, is related more to CBI than to CBC, CBS, and CBT.

In the present study six of the films developed by Cline and Richards were used. Each of these films shows an interview probing the following areas: (a) personal values, (b) personality strengths and weaknesses, (c) reaction to the interview, (d) hobbies and activities, (e) self conception, and (f) temper. The interviewees in the selected films included: (a) a married male Ph. D. student in educational psychology, (b) a married male free-lance writer (c) a divorced male piano teacher (d) a single female sophomore in college majoring in German and mathematics, (e) a married female model maker, (f) a housewife who has done volunteer work in civic and political areas. These filmed interviews were quite diverse with regard to age and background. It would be noticed that three of these interviewees were males and three were females. This was so planned because in a previous study using questionnaire method (Bronfenbrenner, 1958) analysis of the behavioral correlates of individual differences in sensitivity degree had revealed striking contrasts in terms of the person judging and being judged. In other words, the personality correlates of females who are good at perceiving other females may be different from those of females good at predicting men, or men good at predicting men. After

viewing each film the students were required to fill out the three judging instruments: CPI Opinion Prediction Test, Adjective Checklist, and Postdiction test. These instruments were developed by Cline and Richards at the University of Utah. A brief description of these instruments is given below:

1. Opinion Prediction Test (OPT) - Here the judge was required to predict how the interviewee (in the film) answered 20 CPI items such as "I read at least ten books a year. True or False?" Only those CPI items which the interviewee on three different occasions answered consistently the same way were used. Each of the interviewees had previously filled out answers to CPI items on three occasions (several weeks apart). It was from this item pool that the 20 consistently answered items were selected. Cline and Richards have indicated that they tried to obtain ten of these items scored in the true direction and ten in the false direction and additionally that ten should have "favorable" type responses correct and ten "unfavorable" correct. This was done to prevent the judges from obtaining high accuracy scores merely by going through and checking only the socially desirable (or favorable) responses.

Since this test was constructed from each individual interviewee's responses, the items included are not necessarily the same for any two different interviewees (there are some common items). Thus for the six filmed interviews there was a total of 120 items (60 items for male and 60 for female interviews) on this test, and the score is the total number correct.

2. Adjective Checklist (ACL) - In this instrument the judge is to determine which one of a pair of adjectives has been checked by an interviewee as being descriptive of himself. A sample item is:

_____ resourceful
_____ cheerful

Only those adjectives which the interviewee had consistently checked on three different occasions as applying to himself were used as the "correct" items, and only those adjectives never checked as self descriptive were used as the incorrect alternatives. In constructing these instruments the authors did try to see that adjectives in each pair were highly equivalent as to social desirability, preventing the use of this variable in obtaining a high accuracy score. There were 20 such pairs for each interviewee, a total of 120 items in all (60 items for male and 60 for female interviewees), with the particular pairs included differing from one interviewee to another. The score is the total number correct.

3. Behavior Postdiction Test (BPT) - On this instrument the judge is required to postdict how the person shown in the filmed interview behaves in real life. A sample item is:

"She is a very active participant in athletics. True or False?"

A separate and individually tailored Behavior Postdiction Test has been constructed for each interviewee. Examples of areas tapped in this instrument are: relations with women, behavior in social gatherings, handling money, academic achievement, etc. Items with the person, his family, close friends, fraternity brothers, fiancée

or wife, etc. Only those behaviors which all agreed upon as being characteristic were used. Partial or occasional kinds of behaviors were not included. In constructing the items care was taken so that a judge could not achieve a high score by always checking the most socially desirable alternative. However as pointed out by Cline and Richards (1960), there was no formal control of social desirability on any of these instruments since the subjective judgement of the authors was used as the measure of social desirability throughout.

The reliabilities of the three judging instruments as reported by Cline and Richards (1962) are shown in Table 4.

Table 4
Reliabilities of Judging Instruments
(N=149)

Test	Reliability Coefficient
Opinion Prediction	.59
Adjective Checklist	.61
Behavior Postdiction	.37

These reliability coefficients were determined by using Kuder Richardson Formula 21 which provides a lower bound estimate of the reliability (Gulliksen, 1950). The relatively low reliability of Behavior Postdiction test has been attributed to the fact that about one-third as many items (42 vs. 120) as the other instruments were used in this instrument. The standard formula for relating test length to reliability (Gulliksen, 1950) indicates that if this

test were three times as long and thus had approximately as many items as the other judging instruments its reliability would have been .51, a value more comparable to the reliabilities of other instruments. The Behavior Postdiction Test used in the present study has, therefore, the same number of items as in case of the Opinion Prediction and the Adjective Checklist.

The Problem of Response Set. Much research on interpersonal prediction has been criticized (Cronbach, 1955, Gage and Cronbach, 1955, Gage, Leavitt and Stone 1956) that persons identified as accurate perceivers need not have been really sensitive to individual stimulus persons but had some gross knowledge of their nationality, sex, and occupation. Their accuracy may thus have been due to "stereotype accuracy" or knowledge of human nature in general, or of characteristic behaviors of particular social groups common to most stimulus persons. Also, if the subject assumes that a stimulus person is similar to himself (and if he really is similar) he may accurately identify certain behavior of that person. Or he may be accurate by assuming dissimilarity, when stimulus persons really are dissimilar. When the intent of research is to identify "differential accuracy" (ability to distinguish one stimulus person from another with respect to given behaviors) accuracy due to preceding reasons may be attributed to response sets which are irrelevant to experimental intent. For experiments involving subjects' guessing of stimulus person's self descriptions (or other's ratings of stimulus persons) which is often called the Dymond method

for assessing empathy (Dymond, 1950, Cronbach, 1955) statistical methods have been proposed for distinguishing stereotype accuracy from differential accuracy. These methods, however, do not distinguish stereotype accuracy from real-similarity-assumed similarity combinations. Most of the later work using Cronbach's method suggests that response set accounts for almost all subjects' accuracy in identifying the behavior of a stimulus person; that is, differential accuracy does not exist or is negligible. (Crow and Hammond, 1957; Baker and Block, 1957; Rabinowitz, 1956; Smedslund, 1961). However, there are some studies which seem to have successfully distinguished both differential accuracy and stereotype accuracy (Dymond 1954; Bronfenbrenner 1957; Cline 1955; Cline and Richards, 1960, 1961a, 1961b). Dymond's method for distinguishing differential from stereotype accuracy seems to be somewhat intuitive and Bronfenbrenner's method has been severely criticized (Wylie, 1961). The work of Cline and Richards, (1961b) suggests that the statistical procedures devised by Cronbach for separating stereotype accuracy from differential accuracy do not, in fact, separate the two components in a psychologically meaningful sense. They have shown that when subjects' guesses of a stimulus person's responses based upon minimum stereotypical information about the stimulus person are compared with a new set of guesses after observation of a color-sound film showing an interview about subject matter relevant to the guesses, both stereotype accuracy and differential accuracy scores increase as a result of added information. Results of these studies suggest

that the elimination of response sets may be approached through experimental design rather than post hoc statistical analysis of subjects' responses.

Partly due to the reasons mentioned in the preceding paragraphs and partly due to the fact that all the judging instruments used in the present study involved items with discrete rather than continuous response (True or False) no component analysis of the scores was done.² It may be pointed out that since six sets of each of the three judging instruments have been used the possibility of real similarity or dissimilarity is considerably reduced. In view of the fact that interviewees in the film were of different background, age, and sex, stereotype accuracy should have a minimum effect on the total score of each individual.

The FIRO-B Scale

The FIRO-B (Fundamental Interpersonal Relations Orientation--Behavior) Scale provides a measure of a person's characteristic behavior toward other people in the areas of inclusion, control, and affection. The fundamental interpersonal dimensions of the FIRO-B theory--Inclusion (I), Control (C), and Affection (A),--have been defined (Schutz, 1967) behaviorally as follows:

I - The interpersonal need for inclusion is the need to establish and maintain a satisfactory relationship with people with respect to interaction and association.

²Personal communication from Victor B. Cline

C - The interpersonal need for control is the need to establish and maintain a satisfactory relationship with people with respect to control and power.

A - The interpersonal need for affection is the need to establish and maintain a satisfactory relationship with others with respect to love and affection.

Since the author of this instrument was interested in predicting the interaction between people, two aspects of behavior are assessed for each of these dimensions: the behavior an individual expresses towards others (e) and the behavior he wants others to express toward him (w). Thus one aspect of interaction between two people can be predicted by seeing the fit between what one wants and what the other expresses. FIRO-B, therefore, comprises six scales: Expressed and Wanted Behavior in the areas of Inclusion, Control, and Affection. Table 5 gives the names and symbols for these scales.

Table 5. Names and Symbols for FIRO-B Scales

	Expressed Behavior	Wanted Behavior
Inclusion	eI I make efforts to include other people in my activities and to get them to include me in theirs. I try to belong, to join social groups, to be with people as much as possible.	wI I want other people to include me in their activities and to invite me to belong even if I do not make an effort to be included.
Control	eC I try to exert control and influence over things. I take charge of things and tell other people what to do.	wC I want others to control and influence me. I want other people to tell me what to do.
Affection	eA I make efforts to become close to people. I express friendly and affectionate feelings and try to be personal and intimate.	wA I want others to express friendly and affectionate feelings toward me and to try to become close to me.

The format of the items is as used in the two sample items given below:

I. I try to be with people.

1. Usually 2. Often 3. Sometimes 4. Occasionally
5. Rarely 6. Never.

II. I like people to invite me to things.

1. Most people. 2. Many people 3. Some people
4. A few people 5. One or two people 6. Nobody

Reliability. It has been shown by Schutz (1967) that these scales have adequate reliability. Coefficient of internal consistency as shown by reproducibility scores, is .93 for eC and .94 for both of the remaining scales. Test-retest reliability coefficients among Harvard students over a one month period (except for eA and wA which were based on an interlude of one week) are given below:

<u>Scale</u>	<u>Stability</u>	<u>Number of Subjects</u>
eI	.82	126
wI	.75	126
eC	.74	183
eA	.73	57
wC	.71	125
wA	.80	57
Mean	.76	

Validity. Evidence of adequate content and concurrent validity have been provided in the manual. As stated by Schutz, "If the theory underlying the use of Guttman scales is accepted, then content validity is a property of all legitimate cumulative scales and therefore, of all FIRO-B Scales." A number of studies have been reported to demonstrate the concurrent validity of these scales. A large amount of information has been obtained on various

occupational groups with FIRO-B. The differences among occupational groups are very striking and in most cases, consistent with occupational stereotypes.

Rationale for Choice of FIRO-B. Previous research has shown a significant relationship between interpersonal needs and social perception. For example, Chance and Meaders (1960) found that accurate judges had higher mean scores than inaccurate judges on needs affiliation and dominance. In other words, those who score high on tests of interpersonal perception (similar to the opinion prediction test described in the earlier part of this chapter) describe themselves as valuing strong and close relationships, preferring social to solitary activities, and liking to influence, supervise and direct the action of others. It seems, therefore, logical to expect that those who score high on behavioral cognition measures will obtain high scores on interpersonal needs of inclusion, control, and affection.

Myer-Briggs Type Indicator

The basic premise of this instrument (Myers, 1962) is that much apparent random behavior is consistent and can be accounted for by certain basic differences in the manner individuals prefer to exercise perception and judgment. Perception is broadly defined as the process of becoming aware of things or people or ideas, while "judgment" is defined as the process of coming to a conclusion about what has been perceived.

The indicator contains separate indices for assessing each of the four basic preferences which, according to this theory,

structure the individual's personality. These indices are:

1. Extraversion-Introversion (EI)
2. Sensing-Intuition (SN)
3. Thinking-Feeling (TF)
4. Judgment-Perception (JP)

The EI index is designed to indicate whether the person directs perception and judgment primarily upon outer world (people and things) or upon inner world (concepts and ideas).

The SN index is designed to show the person's preference as between two opposite ways of perceiving, i.e., whether he relies primarily on sensing (being aware of things directly through one or another of his five senses) or on intuition which is defined as indirect perception by way of the unconscious.

The TF index is designed to indicate the person's preference as between opposite ways of judging or coming to conclusions: thinking and feeling. Thinking refers to a logical process aimed at an impersonal finding while feeling is a process of appreciation giving things a personal, subjective value.

The JP index is designed to reflect whether the person relies primarily upon a judging process or upon a perceptive process in his dealings with the outer world.

Two sample items from this instrument are:

1. When you have to meet strangers, do you find it
 - (a) Pleasant, or at least easy
 - (2) Something that takes a good deal of effort

2. Which word appeals to you more?

(a) Firm minded

(b) Warm-hearted

The manual (Myers, 1962) shows that each of the four scales represent a dichotomous variable, and that they interact in a complex manner relating to behavior. As Mendelsohn (1965) points out there is no proof for either of these assumptions and that it "appears that the scales measure only limited aspects of their underlying constructs, and that all the data support the argument that interpretation based on item content are more accurate and parsimonious." (p. 147). In this study, therefore, the scales were treated as continuous rather than as dichotomous variables.

Reliability. Split half reliability of the indices have been reported for various groups. For college males their reliabilities range from .80 to .87 and for college females from .82 to .87. These reliabilities are quite satisfactory for a self-report-instrument of this length. It may be noted that these reliabilities are derived from product-moment correlations between continuous scores for the X half and Y half of each index (and not from type dichotomies based on the scores).

Rationale for Choice of Myer-Briggs Type Indicator. This instrument was used because it was thought that there was some similarity in the premises of this instrument and those of behavioral cognition measures. For example, in discussing the TF dimension Myer (1962) says "The child who prefers feeling becomes more adult in the handling of human relationships, (and one)

who prefers thinking becomes more adult in the organization of facts and ideas." It is therefore logical to expect a relationship of "feeling" with behavioral cognition.

In fact Wedeck (1947), who had used an approach similar to that of O'Sullivan et. al., gave an indication in this direction when he pointed out that

Individuals with high "psychological ability" would appear to fit closely Ribot's description of the sensitive type who might also be called the affective or emotional, have as their special characteristics the exclusive predominance of sensibility. They are like instruments in perpetual state of vibration and their life is for the most part inward . . . the extreme susceptibility of their nervous system to agreeable and disagreeable impressions.

The preference for sensing or for intuition also seems to be a relevant variable for this study. Intuition for the purposes of this study has been defined as "indirect perception by way of the unconscious tasks on to the perceptions coming from outside." (Myers, 1962). These unconscious contributions may range from just hunches or "woman's intuition" to examples of creative art or scientific discovery. Intuition may, therefore, have a relationship with the behavioral cognition.

Since the extravert tends to focus his perception and judgment upon people and things and the behavioral cognition deals mainly with information involved in human interactions it is likely that extroverted subjects will obtain higher scores on behavioral cognition measures as compared with those obtained by introverted subjects.

The JP dimension of Myer-Briggs indicates whether the individual uses judging or perceptive attitude for dealing with environment. In the judging attitude the person comes to a conclusion by shutting off perception for the time being. In other words he uses perception only up to a certain point after which he relies primarily on judgment. Same is perhaps the case in cognition of behavior. The Ss see the given stimulus material for a small fraction of time after which they go beyond it to get at the thoughts, desires, feelings, moods, and intentions of the human figures they have seen. It is, therefore, expected that people high on judgment, rather than on perception, will do better on behavioral cognition tests.

The Kuder Preference Record (KPR)

This instrument which was used in this study for measurement of interests was developed by Kuder (1942) for use with high school age and college age students, and with adult men and women. Its items are such as to be applicable to both sexes, the vocabulary is that of the high school level, and the content seems to have been selected for its familiarity to adolescents as well as to adults. Unlike the Strong's Vocational Interest Blank (SVIB) which was developed to assess interests in specific occupations, KPR was designed to indicate relative interest in a small number of broad areas. KPR, thus, has few clusters of occupational interests, a cluster being a group of items having substantial correlations with each other. The items in the KPR are of the

forced choice triad type. The following item illustrates the principle:

Tinker with a broken sewing machine

Play a piano

Sketch an interesting scene

The examinee decides which of these three activities he likes best and marks it to show his first choice, then he decides which of these activities he likes least and marks it to show his third choice. The activities in each item have been so selected as to tap three or more different types of interests, in this case, mechanical, musical and artistic. The test provides ten interest scales: Outdoor, Mechanical, Computational, Scientific, Persuasive, Artistic, Literary, Musical, Social Service, and Clerical.

Reliability. The reliabilities of the Kuder scales, as determined by the Kuder-Richardson technique, cluster around .90. Stability over intervals of about a year or less also appears to be satisfactory. This is, however, not the case when retest reliabilities are studied over a longer period of time. For example, in a study with college students over a four year period Long and Perry (1953) found that clerical and mechanical scores had reliabilities of -.22 and .14, persuasive interest scores .27 and others from .49 to .66. It has, therefore, been suggested that Kuder gives a helpful picture of a person's interests at a moment in time, but not one which is sufficiently stable over a several year period. (Super, 1962).

Since the purpose of the present study was to see the relationship of behavioral cognition with interests at a given point in time the problem of stability over longer periods of time was not considered to be very relevant. The SVIB though significantly better from this viewpoint, was not used because instead of describing the individual in terms of psychological traits it compares the individual's preferences with those of successful men in various occupations.

Rationale for Choice of Kuder Preference Record. Adkins and Kuder (1940) conducted a study with university students to investigate the relationship of interest scores to primary mental abilities. The correlations between Kuder and PMA test scores were low except for one of .39 between number ability and computational interest. Triggs (1943) correlated the Kuder with ACE Psychological Examination scores, also finding low correlations, except for one of .40 between literary interests and verbal scores, and another of .40 between computational interests and quantitative scores. These relationships, however, held for women only. Seeing these relationships one may expect some association between social, persuasive and literary interests and behavioral cognition. In view of the fact that most of the behavioral cognition tests have used figures it is likely that students with artistic interests might do better on these tests.

The Study of Values

The Study of Values (SOV), developed by Allport, Vernon and Lindzey (1960) was used to measure the relative prominence of

six basic motives in personality. This instrument enables one to measure the relative order of importance of six classes of values: the theoretical (interest in truth and knowledge), economic (interest in the useful or material), aesthetic (interest in form and harmony), social (interest in social welfare), political (interest in prestige and power), and religious (interest in unity with cosmos). It is, thus, based directly upon the theoretical framework developed by Spranger. It may be pointed out that this scale does not measure the absolute strength of each of the six values but only their relative strength. The SOV consists of 45 items, the first thirty of which are paired comparisons and the last fifteen multiple choice giving a total of 120 alternatives. Two sample items (one from each format) are given below:

1. The main object of scientific research should be the discovery of truth rather than its practical applications.
 - (a) Yes
 - (b) No
2. Do you think that a good government should aim chiefly at
 - (a) More aid for the poor, sick, and old
 - (b) The development of manufacturing and trade
 - (c) Introducing highest ethical principles into its policies and diplomacy.

As in the Kuder, each of the choices represents one of the types of interests or values. Due to this format a high score on one type of value automatically makes for a lower score on some other.

Reliability. The mean split-half reliability coefficient is .90, the range being from .84 (Theoretical) to .95 (Religious). This reliability seems to be quite satisfactory particularly when it is considered that each value is measured by only 20 questions.

The items analysis has shown a positive correlation between each item and the total score for its value at the .01 level of significance.

The mean repeat reliability coefficient is .89 for an interim of one month (34 cases) and .88 for a two month interval (53 cases).

Rationale for Choice of "The Study of Values." This instrument was employed because it was thought that it will provide a measure of interests and values broader than those given by the Kuder Preference Record. As in the case of KPR here too it was hypothesized that Ss for whom the highest value is love of people (shown by high scores on social values) would obtain high scores on behavioral cognition measures. Since the political man is primarily interested in dominating over other people one may expect that he should have sufficient social intelligence to do so. In other words, one may find a certain amount of relationship between scores on political values and on behavioral cognition measures. In view of the fact that the tests of CBC, CBS, and CBI use cartoons and expressions it is likely that individuals with high scores on aesthetic values (interested in form and harmony, interested in persons but not in the welfare of others) may obtain high scores on behavioral cognition measures.

Statistical Treatment of Data

As stated in the beginning of this chapter the techniques used in the analysis of data are: (1) Product-Moment Correlation, (2) Multiple Regression Analysis, and (3) The t Test for difference between independent means.

This section will give the procedural details followed in using these techniques.

Product-Moment Correlation

The design of this study requires the determination of the relationship between scores on measures of interpersonal perception, personality, interests and values and behavioral cognition scores. The Pearson Product-Moment correlation formula was used to examine the relationship between each of the behavioral cognition scores and the interpersonal perception, personality, interests and values scores separately. The obtained correlation coefficients were subjected to significant test at .05 and .01 levels, non-directional test.

Multiple Regression Analysis

Multiple regression analysis was used as it enabled the investigator to see how far it is possible to predict the performance on behavioral cognition tests by using the weighted sum of interpersonal perception, personality, interests and values. This was done at The Ohio State University Computer Center (IBM7094) by using the Stepwise Regression Analysis Program (BMD02R) developed at the University of California, Los Angeles. This program computes a series of multiple regressions in steps, adding or deleting

one variable at each step. The criteria for addition or deletion are preselected values representing percentages of the appropriate F distributions (Draper and Smith, 1966, p. 171). The particular variable entered at a given step is that one which accounts for the greatest reduction in the error sum of squares, and therefore, has the highest partial correlation with the dependent variable. (These particular correlation coefficients refer to the correlation between the variables not used so far and the dependent variable with the effect of the variables already used in the equation taken out.) To enter the regression equation this variable must also exceed the addition criterion. At each step the variables included in the regression equation of the previous step are evaluated. If the F value corresponding to the partial correlation of a variable in the equation (partialled on the other variables in the equation) is below the preselected deletion criterion value, the variable is removed and a new equation is computed. The procedure continues until the partial F value related to the most recently entered variable becomes nonsignificant.

The following formula would help in understanding the results and their interpretations:

$$\begin{array}{lcl} \text{Sum of Squares about} & & \text{Sum of Squares about} \\ \text{the mean} & = & \text{regression} \\ & & + \text{Sum of Squares} \\ & & \text{due to} \\ & & \text{regression} \end{array}$$

which is equivalent to

$$\sum (Y - \bar{Y})^2 = \sum (Y - \hat{Y})^2 + \sum (\hat{Y} - \bar{Y})^2,$$

where Y is the i^{th} person's score on the dependent variable and $\hat{Y}$ is the predicted score for this person.

The multiple correlation coefficient (R^2) is defined as

$$R^2 = \frac{\text{SS due to regression}}{\text{Total SS, corrected for mean}}$$

The F ratio for the total regression at a given step is defined as

$$T(X) = \frac{R^2/p}{(1 - R^2)/(N - p - 1)}$$

where p is the number of predictor variables and N is the sample size for a given step. This test statistic is distributed as an

$F_p, N - p - 1$ variable.

The Partial F Test (F value to enter or remove) for testing the significance of m additional predictors is defined as

$$T(X) = \frac{(R^2_{p+m} - R^2_p)/m}{(1 - R^2_{p+m})/(N - p - m - 1)}$$

where R^2_{p+m} is the squared multiple correlation coefficient of the $p + m$ predictors and R^2_p is that of the p predictors and m is the number of additional predictors. This test statistic is distributed as an $F_{m, N - p - m - 1}$ variable.

t Test

This test was used to see whether there were significant sex differences on the variables included in this study. The following formula was used:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s^2/N_1 + s^2/N_2}}$$

The ratio has a distribution of t with $N_1 + N_2 - 2$ degrees of freedom.

The value of s^2 was obtained by using the following formula:

$$s^2 = \frac{\sum_{i=1}^{N_1} x^2 - (\sum x)^2/N_1 + \sum_{i=1}^{N_2} x^2 - (\sum x)^2/N_2}{N_1 + N_2 - 2}$$

A computer program recently developed at the Ohio State University Computer Center was used for doing these analyses at the IBM 7094 computer.

It was noticed that for some of the variables the standard deviations were not equal. However, as t test has been described as a very "robust" test (a test that is relatively impervious to violations of its underlying assumptions) it was thought that heterogeneity of variances will affect the value of t only to an inconsequential degree. This was especially so because in the present case the sample sizes were equal and sufficiently large. (For a detailed discussion of this point see Boneau, 1960; Box, 1953; 1954a; 1954b; David & Johnson, 1951; Horsnell, 1953).

Chapter III

Results and Discussion I

In the present chapter, data pertinent to the convergent and discriminant validity of the behavioral cognition measures will be presented. Convergent validity will be studied by seeing the relationship of behavioral cognition variables with accuracy of interpersonal prediction. Discriminant validity will be examined by presenting the relationship of behavioral cognition with personality, interests and values variables. As stated in Chapter II all the results will be presented separately for boys and girls.

Independence of Intellectual Factors

Intercorrelations among the five scores on measures of behavioral cognition are shown in Tables 6, 7, and 8. In case of boys, all the ten coefficients were significant at the .01 level while for girls 8 coefficients are significant at .01 level, one at .05 level and one is not significant. This indicates that these four behavioral cognition factors are not statistically independent of one another. Independence is somewhat greater for the female than for the male sample. It is thus obvious that the various measures of behavioral cognition are strongly intercorrelated. It is evident that the Social Translations Test (CBT) which is the only test using verbal material is minimally related to other measures of behavioral

cognition in the case of the girls. This, however, does not hold good in case of boys.

While there is a sex difference in the magnitude of r 's in Tables 6 and 7 there is no evidence for a sex difference in the patterning of the coefficients. Correlating the matched r 's across sex yields a Spearman ρ of .70 which is statistically significant at .05 level.

In an earlier paper Guilford (1964) had indicated that the intellectual factors which constitute Structure of Intellect are independent and unique. For the purposes of this study, therefore, those tests were selected which have been shown to have loadings on only one Behavioral Cognition Factor:

Expression Grouping: CBC

Social Translations: CBT

Cartoon Predictions: CBI

The fourth test, Missing Cartoons, used for Factor CBS, had secondary loadings for CBU and CBI. This test was used in the study because unlike Missing Pictures, the other available test for CBS, it had a fairly high reliability coefficient.

But there seems to be a change in this thinking. In a recent paper Guilford (1968) says:

It might be thought that only the product of units can enter into classes, relations, systems, transformations, and implications. In fact this principle was implied earlier. But more recent findings indicate that there may be interactions such as classes of relations and of

systems, and transformations of classes and of systems, for example. Such interactions increase even more the many intricate kinds of mutual involvements of abilities in everyday life. The range of ideas offered for psychological theory is also tremendously increased, not only by the model itself, but by these refinements in the use of the concepts of the model.

The high correlations obtained in the present study can, therefore, be interpreted as indicative of mutual involvement of abilities in solving the problems with behavioral content. The interaction between classes, systems, transformation and implications is, thus, obvious.

Considering in terms of the criteria specified by Campbell and Fiske (1959), one might say that as these measures are conceptually independent these high correlations are indicative of inadequate discriminant validity of these measures. However, in view of the fact that construct validity of these instruments have already been established, these correlations may be interpreted as reflecting the attributes of the testees and not as indicators of only the formal properties of the tests, as implied by the concept of discriminant validity.¹

¹For a detailed discussion relating to this issue see Kroger (1968).

Table 6
Intercorrelations Among the Five Behavioral Cognition
Scores for the Girls (N=100)

Tests	2	3	4	22
1. Missing Cartoons (CBS)	355*	164	559*	764*
2. Expression Grouping (CBC)		234	354*	663*
3. Social Translations (CBT)			313*	481*
4. Cartoon Predictions (CBI)				780*
22. Composite				

*Significant at $p = .01$ level, non-directional test.
Decimal points are omitted.

Table 7
Intercorrelations Among the Five Behavioral Cognition
Scores for the Boys (N=100)

Tests	2	3	4	22
1. Missing Cartoons (CBS)	540*	508*	563*	792*
2. Expression Grouping (CBC)		564*	668*	822*
3. Social Translations (CBT)			638*	825*
4. Cartoon Predictions (CBI)				868*
22. Composite				

*Significant at $p = .01$ level, non-directional test.
Decimal points are omitted.

Table 8
Intercorrelations Among the Five Behavioral Cognition Scores
for the Total Sample

Tests	2	3	4	22
1. Missing Cartoons (CBS)	457*	341*	550*	770*
2. Expression Grouping (CBC)		403*	553*	747*
3. Social Translations (CBT)			523*	696*
4. Cartoon Prediction (CBI)				838*
22. Composite				

*Significant at $p = .01$ level, non-directional test
Decimal points are omitted.

Independence of Personality Traits

Intercorrelations among the ten personality variables as measured by Myer-Briggs Type Indicator (MBTI) and FIRO-B Scale are shown in Tables 9, 10 and 11. For obtaining these correlations continuous scores rather than dichotomous scores were used in case of MBTI. Of all correlations, 27 percent were significant for girls and 22 percent for boys. It may be noted that Extraversion-Introversion Scale of the MBTI shows significant correlation with Expressed Inclusion and Expressed Affection Scales of FIRO-B both in the male and female samples. These correlations are somewhat higher for males than for females. These correlations are negative because in the scoring system of MBTI extraversion is on the lower end of the scale while in case of FIRO-B individuals who express inclusion are on the upper end of the scale. Thus introverted individuals, the high scorers on the EI scale, obtain low scores on Expressed Inclusion

and Expressed Affection Scales of FIRO-B and viceversa. This may be viewed as evidence of convergent validity--a confirmation by independent measuring devices.

Only in case of females the scores on EI scale of MBTI are positively correlated with scores on Wanted Control Scale of FIRO-B. This indicates that introverted girls, the high scorers on the EI Scale, obtain high scores on Wanted Control and not on Expressed Control. On the Wanted Control Scale the mean score of introverted girls is significantly greater than the mean score of extraverted girls but in case of Expressed Control the extraverted girls obtain a higher mean score. In the male sample, however, these relationships are not statistically significant (Tables 12 and 13).

Considering the scales within the two personality tests separately one finds that the relationships are quite different. In case of MBTI only one out of the six intercorrelations is significant: Scores on Sensing-Intuition Scale are correlated with scores on Judgment-Perception Scale. This is true both for the boys sample as well as the girls. For FIRO-B, however, out of the 16 intercorrelations 7 are significant for girls, and 6 for boys. These high correlations may be due either to the non-independence of the variables measured by these scales or to the inadequate discriminant validity of the scales.

Table 9
Intercorrelations Among Scores on
Personality Scales for the Girls (N=100)

Variables	19	20	21	50	51	52	53	54	55
18. Extraversion-Introversion	-.028	.046	.129	-.351*	-.203	-.285*	-.150	-.163	.309*
19. Sensing-Intuition		.182	.474*	-.113	-.088	-.090	-.249	-.158	-.176
20. Thinking-Feeling			.186	.015	.178	.157	-.238	-.189	.087
21. Judgment-Perception				-.194	.120	-.186	-.207	-.293*	-.152
50. Expressed Inclusion					.562*	.521*	.395*	.149	.154
51. Wanted Inclusion						.346*	.361*	.258*	.207
52. Expressed Affection							.598*	.217	.073
53. Wanted Affection								.174	.216
54. Expressed Control									.056
55. Wanted Control									-

*Significant at $p = .01$ level, non-directional test
Decimal points are omitted.

Table 10
Intercorrelations Among Scores on
Personality Scales for the Boys (N=100)

Variables	19	20	21	50	51	52	53	54	55
18. Extraversion-Introversion	-052	-031	026	-506*	-224	-555*	-188	-195	078
19. Sensing-Intuition		020	283*	-092	-161	009	-012	084	-303*
20. Thinking-Feeling			216	021	246	121	191	098	156
21. Judgment-Perception				-139	024	-093	-018	-074	-033
50. Expressed Inclusion					525*	577*	416*	244	090
51. Wanted Inclusion						485*	584*	230	140
52. Expressed Affection							633*	231	-042
53. Wanted Affection								207	054
54. Expressed Control									-019
55. Wanted Control									-

*Significant at $p = .01$ level, non-directional test
Decimal points have been omitted.

Table 11
Intercorrelations Among the Scores on
Personality Scales for the Total Sample (N=200)

Variables	19	20	21	50	51	52	53	54	55
18. Extraversion- Introversion	-053	-021	-68	-449*	-227	-380*	-174	-142	168
19. Sensing- Intuition		142	383*	-068	-101	-014	-112	-063	-201
20. Thinking- Feeling			209	084	247	185	210	-221	172
21. Judgment- Perception				-142	-033	-124	-101	-185	-079
50. Expressed Inclusion					556*	568*	405*	124	159
51. Wanted Inclusion						438*	485*	175	203
52. Expressed Affection							611*	155	055
53. Wanted Affection								101	134
54. Expressed Control									-049
55. Wanted Control									

*Significant at $p = .01$ level, non-directional test
Decimal points are omitted.

Table 12
Means, Standard Deviations, and Significance of
Differences on Expressed Control and Wanted Control Scores
for the Extraverted and Introverted Girls

FIRO-B Scales	Extraverted Girls N=50		Introverted Girls N=41		t
	Mean	SD	Mean	SD	
Expressed Control	2.458	2.077	1.585	1.963	2.091 ^a
Wanted Control	4.389	2.155	5.585	2.024	2.769 ^b

^aSignificant at $p = .05$ level, two-tailed test

^bSignificant at $p = .01$ level, two-tailed test

Table 13
Means, Standard Deviations, and Significance of
Differences on Expressed Control and Wanted Control Scores
for the Extraverted and Introverted Boys

FIRO-B Scales	Extraverted Boys N=53		Introverted Boys N=47		t
	Mean	SD	Mean	SD	
Expressed Control	3.962	2.403	3.149	2.551	1.625
Wanted Control	3.793	1.774	4.213	2.093	1.076

Intercorrelations among measures of interests and values are shown in Tables 14, 15, and 16. As both of these instruments (KPR and SOV) give ipsative scores the intercorrelations among the scales within each of these instruments should be viewed accordingly. For the purposes of this study it is important to note that both for the male and female sample (1) scores on social service scale of KPR are highly correlated with scores on social values of SOV, and (2) scores on artistic interests show a high positive correlation with scores on aesthetic values of SOV. Both of these are instances of convergent validity and give the investigator more confidence in interpreting the results. Low correlations of political values with scientific, computational and literary interests can be viewed as evidence of discriminant validity of the scales. These results are quite similar to those obtained by Windholz (1967) with a similar population, and can, therefore, be considered as reliable.

Table 14
Intercorrelations Among the Interests and Values Scores for the Girls (N=100)

Interests and Values	6	7	8	9	10	11	12	13	14	15	16	17
5 Mechanical Interests	-.013	.237	-.121	.302*	.305*	-.170	-.395*	-.253	.044	.193	-.220	.116
6 Computational Interests		.289*	-.162	-.336*	.113	-.083	-.289*	.546*	.217	-.126	-.048	.082
7 Scientific Interests			-.324*	-.162	-.400*	.112	-.135	-.068	-.113	-.189	-.095	.039
8 Persuasive Interests				-.223	.063	-.255*	.182	-.097	.237	-.142	.059	.230
9 Artistic Interests					-.025	-.007	-.336*	-.329*	-.147	-.463*	-.345*	.126
10 Literary Interests						-.064	-.196	-.106	-.148	.147	-.045	-.006
11 Musical Interests							-.138	-.044	.042	.240	-.043	-.344*
12 Social (Service) Interests								-.160	-.143	-.434*	.600*	-.233
13 Clerical Interests									.354*	-.098	-.184	.140
14 Economic Values										-.188	-.355*	.078
15 Aesthetic Values											-.276*	.137
16 Social Values												-.409*
17 Political Values												

*Significant at $p = .01$ level, non-directional test. Decimal points have been omitted.

Table 15
Intercorrelations Among the Interests and Values Scores for the Boys (N=100)

Interests and Values	6	7	8	9	10	11	12	13	14	15	16	17
5 Mechanical Interests	-106	369*	-338*	131	-398*	-420*	-227	-116	148	140	-240	-232
6 Computational Interests		385*	-199	-332*	-126	-070	-319*	576*	104	-283*	-087	114
7 Scientific Interests			-357*	-226	-251	-359*	-181	-082	-028	-327*	-169	-083
8 Persuasive Interests				-139	-002	077	164	-029	370*	-117	028	231
9 Artistic Interests					-167	049	-159	-243	-114	483*	101	-129
10 Literary Interests						223	-068	-155	-242	275*	-075	275*
11 Musical Interests							-152	014	-227	450*	067	-215
12 Social (Service) Interests								-262*	-067	-208	308*	028
13 Clerical Interests									167	-178	-015	063
14 Economic Values										-374*	-365*	042
15 Aesthetic Values											-003	-203
16 Social Values												-184
17 Political Values												

*Significant at $p = .01$ level, non-directional test.

Decimal points are omitted.

Table 16
Intercorrelations Among the Interests and Values Scores for the Total Sample (N=200)

Interests and Values	6	7	8	9	10	11	12	13	14	15	16	17
5 Mechanical Interests	.137	.480*	-.100	-.027	-.306*	-.447*	-.446*	-.259*	.282*	-.235*	-.273*	.141
6 Computational Interests		.415*	-.131	-.387*	-.128	-.165	-.378*	.461*	-.238*	-.290*	-.157	.185*
7 Scientific Interests			-.255*	.280*	-.306*	-.271*	-.283*	-.148	.071	-.371*	-.245	.106
8 Persuasive Interests				-.211*	.022	-.120	.108	-.092	.329*	-.167	-.003	.260*
9 Artistic Interests					-.081	.110	-.126	-.219	-.206*	.521*	-.126	-.088
10 Literary Interests						.106	-.104	-.116	-.203*	.219*	-.040	.121
11 Musical Interests							-.002	.053	-.120	.432*	.119	-.353*
12 Social Service Interests								-.107	-.213	-.145	.540*	.217*
13 Clerical Interests									.180	-.050	-.039	.029
14 Economic Values										-.369*	-.426*	.158
15 Aesthetic Values											-.009	-.268*
16 Social Values												-.379*
17 Political Values												

*Significant at $p = .01$ level, non-directional test.

Decimal points are omitted.

Independence of Measures of Interpersonal Perception

The intercorrelations among different measures of interpersonal perception employed in this study are shown in Tables 17, 18, and 19. Considering the instruments pertaining to Male objects (M) one finds that the three instruments, though not correlated with each other, do show significant correlations with their composite.

This indicates that (1) these three measures are assessing different aspects of the criterion and (2) they are internally consistent. Measures pertaining to Female objects (F) are also independent of one another and correlated with their composite F. Thus the findings regarding the instruments for M and F taken separately are quite similar both for the boys sample and girls sample.

However, the relationship between M and F measures is different in the two samples. In the boys sample none of the M instruments or their Composite M have a significant correlation with the F instruments or their composite. On the other hand, in the girls sample Adjective Checklist M and Composite M give statistically significant correlation with Composite F. Also in case of girls Adjective Checklist M is correlated with Adjective Checklist F which is not true for the boys.

This indicates that boys who were perceptive towards their own sex showed a tendency to be insensitive towards girls; girls

sensitive towards their own sex, however, were likely to be sensitive to men as well.

When sex comparisons were made on measures of interpersonal perception (Appendix C) it was noticed that only on tests involving F objects the differences were significant. On each of the F tasks the mean score of girls was greater than that of boys. These results are in agreement with the findings of previous studies in this and related areas. For example, Witryol and Kaess (1957) found that females remember females better than they remember males. Since sex differences were unrelated to either general intelligence or rote memory it was concluded that the female role requires greater social facility and more highly developed social skills than the male role.

Relationship of Behavioral Cognition with Interpersonal Perception

The correlations of behavioral cognition scores with scores on different measures of interpersonal perception are given in Tables 20, 21, and 22.

As shown in Tables 20 and 21, for boys only 8 out of 40 correlations are significant and for girls, only 3. The hypothesis that scores on Cartoon Predictions, a measure of cognition of behavioral implications, are unrelated with scores on measures of interpersonal perception is, therefore, not rejected.

However, it may be pointed out that some of the correlations do not approach significance because of the low reliability of

Table 17
Intercorrelations Among the Nine Interpersonal Perception Scores for the Girls (N=100)

Measures of Interpersonal Perception	30	34	35	39	43	47	48	49
26 Opinion Prediction M	245	202	598*	-011	-008	128	129	494*
30 Adjective Checklist M		278*	812*	090	314*	046	297*	744*
34 Behavior Postdiction M			674*	-102	123	202	247	595*
35 Composite M				005	237	160	331*	886*
39 Opinion Prediction F					-083	016	345*	174
43 Adjective Checklist F						074	589*	485*
47 Behavior Postdiction F							584*	528*
48 Composite F								700*
49 Overall								

M and F indicate male and female objects respectively

*Significant at $p = .01$ level, non-directional test

Table 18
Intercorrelations Among the Nine Interpersonal Perception Scores for the Boys Sample (N=100)

Measures of Interpersonal Perception	30	34	35	39	43	47	48	49
26 Opinion Prediction M	088	254*	621*	056	-208	066	-059	404*
30 Adjective Checklist M		174	669*	196	212	-002	208	602*
34 Behavior Postdiction M			710*	143	054	048	122	579*
35 Composite M				194	052	052	146	799*
39 Opinion Prediction F					109	001	496*	441*
43 Adjective Checklist F						093	689*	455*
47 Behavior Postdiction F							645*	430*
48 Composite F								711*
49 Overall								

M and F indicate male and female objects respectively.

*Significant at $p = .01$ level, non-directional test.

Table 19
Intercorrelations Among the Nine Interpersonal Perception Scores for the Total Sample (N=200)

Measures of Interpersonal Perception	30	34	35	39	43	47	48	49
26 Opinion Prediction M	173	228*	605*	029	-100	104	042	452*
30 Adjective Checklist M		232*	755*	132	258*	011	235*	671*
34 Behavior Postdiction M			689*	028	090	121	181*	583*
35 Composite M				098	151	104	235*	840*
39 Opinion Prediction F					032	028	434*	313*
43 Adjective Checklist F						119	650*	481*
47 Behavior Postdiction F							642*	445*
48 Composite F								709*
49 Overall								

M and F indicate male and female objects respectively

*Significant at $p = .01$ level, non-directional test

the measures used. For example, the reliability of Adjective Checklist is .61 and that of Cartoon Predictions is .68. If a correction for attenuation is made by using the formula

$$r_{\infty\infty} = \frac{r_{xy}}{\sqrt{r_{xx}} \sqrt{r_{yy}}}$$

the correlation of Cartoon Predictions with Adjective Checklist F is .324 (instead of .209 as shown in Table 21) which is statistically significant. This is also true for the correlation of Missing Cartoons (CBS) with Adjective Checklist F where the correlation of .240 becomes .372 after correction for attenuation is applied. In other words, the magnitude of the correlations will be greater than what is shown in the Table but their rank order will remain the same. Considering the correlations of scores on Adjective Checklist F which is the only measure of Interpersonal Perception giving significant correlations with behavioral cognition measures, one finds that its correlation with the measure for CBI is the lowest. In case of the girls the correlation of the CBI measure does not become significant even after it is corrected for attenuation.

It may be recalled that the SI product category of implications is concerned with extrapolations from given information to either its antecedents or its consequents. Cartoon Predictions, the measure of cognition of behavioral implications used in the present study, is based mainly on the consequent part of the definition. The measures of interpersonal perception are also concerned with

the extrapolations from given information. In behavior postdiction test, for example, the subjects are required to postdict the behavior of the Object on the bases of what they have seen and listened to in the filmed interview. Thus the main difference between these two sets of instruments is that of method: filmed interviews versus photographs and cartoons. Since convergent validity is represented in the agreement between two attempts to measure the same trait through maximally different methods, it may be said that the data in the present study failed to provide enough evidence for convergent validity of behavioral cognition measures.

Possible reasons for these low relationships include:

- (a) low reliability of Opinion Prediction, Adjective Checklist, and Behavior Postdiction tests which were used as measures of accuracy of interpersonal prediction;
- (b) low reliability of Cartoon Predictions Tests which was used as a measure of CBI;
- (c) the restricted range of scores on each of the measures employed in the present study.

Table 20
Correlations Between Behavioral Cognition Scores and
Interpersonal Perception Scores for the Girls (N=100)

Interpersonal Perception	Behavioral Cognition				
	1. Missing Cartoons (CBS)	2. Expression Grouping (CBC)	3. Social Translation (CBT)	4. Cartoon Predictions (CBI)	22. Composite
26. Opinion Prediction M	-131	-141	-018	-214*	-138
30. Adjective Checklist M	076	095	099	120	095
34. Behavior Postdiction M	-075	-091	069	-105	-086
35. Composite M	-034	-032	086	-051	-029
39. Opinion Prediction F	-004	144	119	117	133
43. Adjective Checklist F	143	185	069	124	149
47. Behavior Postdiction F	-224*	-074	-061	-192	-221*
48. Composite F	-021	121	052	024	041

*Significant at $p = .05$ level, non-directional test

Decimal points have been omitted.

Table 21
Correlations Between Behavioral Cognition Scores and
Interpersonal Perception Scores for the Boys (N=100)

Interpersonal Perception	Behavioral Cognition				
	1. Missing Cartoons (CBS)	2. Expression Grouping (CBC)	3. Social Translation (CBT)	4. Cartoon Predictions (CBI)	22. Composite
26. Opinion Prediction M	-068	-001	-103	033	-043
30. Adjective Checklist M	211 ^a	121	164	116	185
34. Behavior Postdiction M	-205 ^a	-066	-135	-138	-161
35. Composite M	-003	043	-018	014	010
39. Opinion Prediction F	-018	-131	-049	053	-073
43. Adjective Checklist F	240 ^a	259 ^b	343 ^b	209 ^a	321 ^b
47. Behavior Postdiction F	-077	113	026	-062	-007
48. Composite F	088	162	195 ^a	063	153

^aSignificant at $p = .05$ level, non-directional test.

^bSignificant at $p = .01$ level, non-directional test.

Decimal points have been omitted.

Table 22
Correlations of Behavioral Cognition Scores and
Interpersonal Perception Scores for the Total Sample (N=200)

Interpersonal Perception	Behavioral Cognition				
	1. Missing Cartoons (CBS)	2. Expression Grouping (CBC)	3. Social Translation (CBT)	4. Cartoon Predictions (CBI)	22. Composite
26. Opinion Prediction M	-104	-073	-058	-065	-082
30. Adjective Checklist M	136	109	117	111	134
34. Behavior Postdiction M	-140 ^a	-079	-043	-121	-127
35. Composite M	-022	002	030	-015	-008
39. Opinion Prediction F	-020	014	027	009	005
43. Adjective Checklist F	174 ^a	205 ^b	240 ^b	170 ^a	242 ^b
47. Behavior Postdiction F	-166 ^a	000	030	-106	-090
48. Composite F	010	114	165 ^a	046	102

^aSignificant at p = .05 level, non-directional test

^bSignificant at p = .01 level, non-directional test

Decimal points have been omitted.

Relationship of Behavioral Cognition
with Personality Traits

As was stated in Chapter II the two personality instruments used are: Myer Briggs Type Indicator (MBTI) and FIRO-B Scale. The Extraversion-Introversion (E-I) Scale of MBTI is related to the Expressed Inclusion and Expressed Affection Scales of the FIRO-B (Tables 8 and 9).

MBTI and Behavioral Cognition. Considering first the correlations between the behavioral cognition scores with the four MBTI scales for the girls (Table 23), one finds that 60 percent of the correlations are significant. Missing Cartoons, a measure of cognition of behavioral systems, gives significant correlations with sensing-intuition and judging-perceiving scales. Thus 9 percent of the variance in Missing Cartoons Test can be predicted from that of JP and 7 percent from that of SN scale. Individuals who are high on perception and those who are high on intuition tend to obtain high scores on measures of CBS. Scores on Cartoon Predictions Test (CBI) which uses materials similar to those in Missing Cartoons (CBS) are also correlated with scores on SN and JP scales of MBTI. This is, however, not the case with CBC measures where only the EI scale gives significant correlations.

It would be noticed that Social Translations Test which is the only test using verbal material is also correlated with judging-perceiving scale of MBTI. This indicates that irrespective of the fact whether the test material is comprised of pictures or words, perception does play an important role in the cognitive process.

Results for the boys are quite different (Table 24). Only one out of the twenty correlations is significant: the correlation of Sensing-Intuition with the Missing Cartoons Test (CBS). This may be due to the homogeneity in the boys' sample.² It is quite a selected population of boys who go to the College of Education as an undergraduate while, the teaching profession being very popular with girls, one finds a heterogeneous group of girls enrolled in the College of Education.

FIRO-B and Behavioral Cognition. Considering the relationship of behavioral cognition scores with scores on FIRO-B scales one finds that in general the correlations are rather low. This may be due to the fact that the scores on FIRO-B scales range from

²Most of the students enrolled in Educational Psychology course where this study was conducted are undergraduates in the College of Education. The course in Educational Psychology is a required course for the purposes of teacher certification.

0 to 9 which is quite a small range compared to the range in MBTI which goes from 33 to 166 or to the range in behavioral cognition tests themselves where the range is from 0 to 28. This constricted range affects the numerator of the formula for correlation.

$$r = \frac{\sum (X - \bar{X}) (Y - \bar{Y})}{(N - 1) S_x S_y}$$

and the correlation is reduced. This fact should, therefore be kept in mind while interpreting the correlations of FIRO-B with behavioral cognition measures.

In the girls' sample only two correlations are significant. These correlations of (a) Expressed Affection with Missing Cartoons and (b) Wanted Control with Cartoon Predictions. The negative correlation of "Expressed Affection" with Missing Cartoons can be considered as replication of the finding regarding the relationship of extraversion-introversion with behavioral cognition. The introverted individuals who do not express affection and/or inclusion are high scorers on behavioral cognition tests. Also, the scores on "Wanted Control" (and not on "Expressed Control") have a positive correlation with the measures of CBI and CBC. This is not unexpected because the introverted girls tend to get high scores on "Wanted Control" Scales of FIRO-B.

In the boys' sample the relationships are again quite different. Unlike the girls' sample, the Expressed Inclusion and the Expressed Affection Scales give statistically significant correlations with the scores on Cartoon Predictions which is not related to any of the scales used in MBTI. This is, however, not surprising because

there are significant sex differences on the FIRO-B Scale (See Appendix C), and relationships between the MBTI and the FIRO-B scales are different in the two samples.

In short, it can be said that male Ss who express the need for inclusion and affection tend to obtain high scores on tasks involving extrapolation of behavior. The relationship of Wanted Control and cognition of behavior is in the opposite direction. All of these correlations are negative. This indicates that boys who want others to express control toward them do not achieve high scores on behavioral cognition measures.

Relationship of Behavioral Cognition with Interests and Values

The correlations of scores on behavioral cognition measures with those on measures of interests and values are given in Tables 26, 27, and 28. Looking first at the boys' sample one finds that Artistic Interests are significantly correlated with Missing Cartoons (CBS) and with Cartoon Predictions (CBI). The lowest correlation of artistic interests is with Social Translations (CBT) which is the only test using verbal material instead of pictures, cartoons, and photographs. These correlations are thus in the expected direction. Missing Cartoons (CBS) giving the highest correlations with Artistic Interests is the test which uses the largest number of pictures--each item requires the students to go through seven pictures and observe the small details therein. As pointed out by Kuder (1960) individuals with artistic interests prefer work that has "eye appeal" involving attractive design, color and material.

Table 23
Correlations Between Behavioral Cognition Scores and
Personality Variables for Girls (N=100)

Personality Variable	Behavioral Cognition				
	1. Missing Cartoons (CBS)	2. Expression Grouping (CBC)	3. Social Translation (CBT)	4. Cartoon Prediction (CBI)	5. Composite
18. Extraversion-Introversion	148	277 ^b	222 ^b	207 ^a	251 ^a
19. Sensing-Intuition	258 ^b	028	193	201 ^a	249 ^a
20. Thinking-Feeling	141	044	073	168	199 ^a
21. Judging-Perceiving	290 ^b	147	204 ^a	208	235 ^a
50. Expressed Inclusion	-168	-124	-029	117	-185
51. Wanted Inclusion	-180	-028	033	-136	-126
52. Expressed Affection	-234 ^a	-109	029	-038	-149
53. Wanted Affection	-101	058	104	088	016
54. Expressed Control	-088	-195	-134	082	-123
55. Wanted Control	054	191	-020	214 ^a	166

^aSignificant at p = .05 level, non-directional test

^bSignificant at p = .01 level, non-directional test

Decimal points have been omitted.

Table 24
Correlations Between Behavioral Cognition Scores and
Personality Variables for Boys (N=100)

Personality Variable	Behavioral Cognition				
	1. Missing Cartoons (CBS)	2. Expression Grouping (CBC)	3. Social Translation (CBT)	4. Cartoon Prediction (CBI)	5. Composite
18. Extraversion-Introversion	054	033	038	-.063	023
19. Sensing-Intuition	285 ^b	078	047	152	170
20. Thinking-Feeling	030	-.055	010	054	-.007
21. Judging-Perceiving	109	-.065	021	-.050	007
50. Expressed Inclusion	141	096	057	235 ^a	162
51. Wanted Inclusion	-.029	077	016	105	046
52. Expressed Affection	113	068	028	240 ^a	191
53. Wanted Affection	081	-.005	069	071	064
54. Expressed Control	013	020	-.039	-.022	-.007
55. Wanted Control	-.228 ^a	-.181	-.156	-.151	-.217 ^a

^aSignificant at p = .05 level, non-directional test

^bSignificant at p = .01 level, non-directional test

Decimal points have been omitted.

Table 25
Correlations Between Behavioral Cognition Scores and Scores
on Personality Variables for the Total Sample (N=200)

Personality Variable	Behavioral Cognition				
	1. Missing Cartoons (CBS)	2. Expression Grouping (CBC)	3. Social Translation (CBT)	4. Cartoon Prediction (CBI)	5. Composite
18. Extraversion-Introversion	107	155 ^a	096	040	113
19. Sensing-Intuition	255 ^b	041	124	168 ^a	198 ^b
20. Thinking-Feeling	027	-031	081	098	080
21. Judging-Perceiving	189 ^b	033	107	054	101
50. Expressed Inclusion	-015	-020	057	110	033
51. Wanted Inclusion	-116	011	047	013	-023
52. Expressed Affection	-070	018	111	127	050
53. Wanted Affection	-020	020	086	077	046
54. Expressed Control	001	-042	-115	013	-046
55. Wanted Control	-101	-010	-058	008	-045

^aSignificant at p = .05 level, non-directional test

^bSignificant at p = .01 level, non-directional test

Decimal points have been omitted.

Thus individuals who enjoy working with designs and pictures have an advantage on the behavioral cognition tests used in this study. Considering in terms of variance it can be said that 19 percent of the variance of the Missing Cartoons (CBS) can be predicted from the variance of the artistic interests scores of the Kuder Preference Record. Unlike the Missing Cartoons (CBS) and Cartoon Prediction (CBI), the other two measures of behavioral cognition, Expression Grouping (CBC) and Social Translations (CBT), are correlated with the social service interests (preference for helping people). In other words those who enjoy helping others also recognize sets of items of behavioral information grouped by virtue of their common properties (CBC) and realize changes in interpretation or in mood or attitude (CBT). As pointed out by Guilford (1967), flexibility in dealing with people depends upon the ability to realize behavioral transformation. It may, however, be noted that only four percent of the variance of CBC and CBT measures is predictable from the variance of social service interests.

Considering the relationship of behavioral cognition scores with values one finds that for boys there are only two significant correlations. Economic values (interest in the useful or material) have a low negative correlation with Social Translations (CBT). Thus individuals who describe themselves as interested in useful or material are low on cognition of behavioral transformation. They perhaps do not consider this kind of test as useful or material. Social values (interest in social welfare) have a significant but

negative correlation with Missing Cartoons (CBS). This is to some extent confirmed by a very low negative correlation of social service interests with the CBS measure. The nature of the task in Missing Cartoons (CBS) test is such that it does not appeal to individuals who are interested in social welfare.

In case of the girls (Table 26) the pattern of correlations of artistic interests with behavioral cognition measures is similar to that of boys but the magnitude of the correlation is rather low. As in the case of boys, artistic interests show a statistically significant correlation with Missing Cartoons (CBS). Unlike the correlation in the boys' sample, the correlation between literary interests and Missing Cartoons (CBS) is significant at .05 level. As the literary and artistic interests are not correlated ($r=.025$) these two interests combined account for 25 percent of the variance of the CBS measure. Another difference from the boys' sample is seen in the correlation of aesthetic values with the Missing Cartoons (CBS). Since the artistic interests and aesthetic values are correlated ($r=.463$) it can be considered as replication of the finding regarding the relationship of artistic interests and Missing Cartoons.

Summary

This chapter reported the relationship of behavioral cognition measures with interpersonal perception, personality variables, and interests and values. Pearson Product Moment Correlation was used as a measure of relationship. The main findings include:

1. There are important sex differences in the relationship of behavioral cognition with the variables included in this study.

Table 26
Correlations of Behavioral Cognition Scores with Scores on
Measures of Interests and Values for the Girls Sample (N=100)

Interests and Values	Behavioral Cognition				
	1. Missing Cartoons (CBS)	2. Expression Grouping (CBC)	3. Social Translation (CBT)	4. Cartoon Prediction (CBI)	22. Composite
8. Persuasive Interests	-093	-124	-154	-031	-132
9. Artistic Interests	288 ^b	096	066	144	190
10. Literary Interests	208 ^a	105	061	039	178
12. Social Service Interests	-194	-024	-114	-225	-170
14. Economic Values	-138	-035	021	007	-052
15. Aesthetic Values	232 ^a	056	112	055	163
16. Social Values	-012	-050	-022	-109	-032
17. Political Values	-022	-024	-178	-002	-082

^aSignificant at $p = .05$ level, non-directional test

^bSignificant at $p = .01$ level, non-directional test

Decimal points have been omitted.

Table 27
Correlations of Behavioral Cognition Scores with Scores on
Measures of Interests and Values for the Boys Sample (N=100)

Interests and Values	Behavioral Cognition				
	1. Missing Cartoons (CES)	2. Expression Grouping (CBC)	3. Social Translation (CBT)	4. Cartoon Prediction (CBI)	22. Composite
8. Persuasive Interests	-126	-128	-233 ^a	-192	-203 ^a
9. Artistic Interests	438 ^b	134	044	248 ^a	260 ^b
10. Literary Interests	026	003	006	-041	-018
12. Social Service Interests	-035	201 ^a	228 ^a	103	-169
14. Economic Values	-047	-154	-205 ^a	-179	-174
15. Aesthetic Values	122	-024	-073	005	009
16. Social Values	-272 ^b	-018	042	069	-105
17. Political Values	-069	042	041	040	013

^aSignificant at p = .05 level, non-directional test

^bSignificant at p = .01 level, non-directional test

Decimal points have been omitted.

Table 28
Correlations of Behavioral Cognition Scores with Scores
On Measures of Interests and Values for the Total Sample (N=200)

Interests and Values	Behavioral Cognition				
	1. Missing Cartoons (CBS)	2. Expression Grouping (CBC)	3. Social Translation (CBT)	4. Cartoon Prediction (CBI)	22. Composite
8. Persuasive Interests	-.095	-.111	-.202 ^b	-.163 ^a	-.168 ^a
9. Artistic Interests	.318 ^b	.084	.090	.193 ^b	.214 ^b
10. Literary Interests	.077	.045	.034	-.011	.057
12. Social Service Interests	-.115	.042	.121	-.033	.013
14. Economic Values	-.052	-.061	-.151	-.100	-.114
15. Aesthetic Values	.125	-.021	.054	.024	.062
16. Social Values	-.157 ^a	-.065	.059	-.077	-.067
17. Political Values	-.010	.041	-.095	.020	-.022

^aSignificant at p = .05 level, non-directional test

^bSignificant at p = .01 level, non-directional test

Decimal points have been omitted.

2. Cognition of behavioral implications was not found to be correlated with measures of interpersonal perception. Only in the male sample, scores on Adjective Checklist F were significantly correlated with scores on Cartoon Predictions (CBI).

3. Behavioral cognition is related to some of the personality variables included in this study. These relationships are, however, different in the two samples. Also, the pattern of relationship varies from one factor to another. For example, in the female sample CBS has statistically significant correlation with SN and JP, Expressed Affection scales while in the male sample CBS is related only to SN scale.

4. The correlation between artistic interests and the Missing Cartoons (CBS) is statistically significant both in the male and the female samples. Artistic interests are also correlated with scores on Cartoon Predictions (CBI) in the male sample.

The correlational technique used for the analyses presented in this chapter does not take into consideration the inter-correlations between the various independent variables (personality, interests and values, etc.). Therefore, most of the correlations are rather low. It is likely that by combining these variables one may be able to predict a significant portion of the variance of the dependent variables. The next chapter deals with the result of this approach. It may, however, be pointed out that multiple correlation is logically similar to the product-moment correlation: a measure of linear relationship between two variables. One of these is the dependent variable and the other is a composite of the

scores of the various independent variables, each weighted in such a fashion that the correlation is a maximum. It is only for the convenience of presentation that the results pertaining to multiple correlation are given in a separate chapter.

Chapter IV

Results and Discussion II

This chapter describes the results obtained by using the stepwise regression procedure described in Chapter II. This procedure was employed to study how far it is possible to predict the scores on each of the dependent variables (CBS, CBC, CBT, and CBI) by using the weighted sum of the independent variables. The computer program used for regression analysis computes a sequence of multiple regression equations in a stepwise manner. Only one variable is added to the regression equation at each step. This variable is the one that makes the greatest reduction in the error sum of squares. This variable equivalently has the highest partial correlation with the dependent variable partialled on the variables which have already been added and, therefore, when added, has the highest F value.

The stepwise regression procedure was used to predict the scores on each of the dependent variables in the two samples and also in the total sample of boys and girls. The significance test for total regression was performed at each step ($\alpha = .01$) in the three samples. Independent variables entered into the regression by the stepwise procedure were evaluated by the partial F test at each step considered. ($\alpha = .10$).

Missing Cartoons (CBS) as Dependent Variable

Tables 29, 30, and 31 present the summary tables of the regression predicting the performance on Missing Cartoons in the female, male, and the total sample respectively. The significance test for the total regression at each step indicated that in all cases the multiple correlations were significant at the .01 level.

For the female sample the multiple correlation coefficient ranged from .2897 at the first step to .5535 at the 13th step. R^2 , the proportion of criterion variance explained, ranged from .0839 to .3235 over the 13 steps. For the male sample the values of the multiple correlations ranged from .4224 to .6574 and the values of R^2 from .1784 to .4321 for the first 13 steps. Thus the multiple correlations for the male sample were generally higher than those for the female sample. In the total sample the values of the multiple correlation ranged from .3010 at the first step to .5267 at the 13th step which accounts for about 28 percent of the variance of the dependent variable.

Partial F-Tests and the Variables in the Regression

Partial F-tests were done at each step to assess the increased amount of criterion variance explained by including the additional predictors in the stepwise regression procedure predicting the performance on the Missing Cartoons (CBS) test. The results of these tests are included in Tables 29, 30, and 31.

In the female sample only five variables had partial F-values significant at .10 level. These were Judgment-Perception, Artistic Interests, Behavioral Postdiction F, Adjective Checklist F, and

Extraversion-Introversion. The multiple correlation coefficient at the step (5) which included all these variables was .4725 and R^2 was .2233. Thus eight additional variables raised the multiple correlation to .5688 but accounted for only 10.02 percent more of the criterion variance over that already explained by the five independent variables mentioned above.

In the male sample only six variables had partial F-values significant at the .10 level. These were Artistic Interests, Behavior Postdiction M, Adjective Checklist M, Extraversion-Introversion, Sensing-Intuition, and Social Values. The multiple correlation at the step (6) which included all these variables was .6027 and R^2 was .3632. When seven additional variables were entered by the stepwise procedure the multiple correlation was raised to .6623 but they accounted for only 6.89 percent more of the criterion variance over that explained by the six independent variables mentioned above.

In the total sample the first seven and the tenth variable had partial F-values significant at the .01 level. The first seven variables were: Artistic Interests, Sex, Sensing-Intuition, Adjective Checklist M, Extraversion-Introversion, Behavior Postdiction M, and Adjective Checklist F. It may be noted that though variables at Step 8 and 9 do not have significant partial F-values the one at Step 10, Expressed Inclusion, does have a significant partial F-value. This indicates that Expressed Inclusion is functioning as a suppressor variable. It was not picked up at Step 8 because the variables with which it is related had not yet been

selected. In other words, Expressed Inclusion, though not related to the dependent variable, is related to Behavior Postdiction F and Expressed Affection which correlate with the dependent variable. This suppressor variable takes out the irrelevant portions of the Behavior Postdiction and Expressed Affection measures and thus increases the multiple correlation. It may be noticed that a similar role was played by Social Values and Literary Interests in the female sample. Their partial F-values are, however, not significant at the .10 level.

Considering the independent variables which enter in the regression equation for predicting the scores on Missing Cartoons one finds that there are some similarities in the male and female samples in this respect. Artistic Interests, Behavioral Postdiction for the objects of the same sex, Adjective Checklist for the objects of the same sex, and Extraversion-Introversion entered in the stepwise regression procedure in both samples before that step at which the inclusion of more predictors did not significantly increase the amount of criterion variance explained.

In the total sample sex variable entered in the regression equation at Step 2 with its partial-F value being significant at .0005 level. This variable accounted for 4.6 percent more of the CBS variance over that explained by artistic interests. It is, therefore, important to include sex as a variable in behavioral cognition studies.

Table 29
Stepwise Regression Predicting the Missing Cartoons (CBS) Scores for Girls (N=100)

Step Number	Variable Entered	Variable Removed	Number of Predictors	Multiple R	R ²	Increase in R ²	Partial F Test	Total F Test
1	Judgment-Perception		1	.2897	.0839	.0839	8.9750 ^a	8.975 ^b
2	Artistic Interests		2	.3621	.1311	.0472	5.2738 ^a	7.320 ^b
3	Behavior Postdiction F		3	.4118	.1696	.0384	4.4437 ^a	6.535 ^b
4	Adjective Checklist F		4	.4443	.1974	.0278	3.2886 ^a	5.840 ^b
5	Extraversion-Introversion		5	.4725	.2233	.0259	3.1332 ^a	5.403 ^b
6	Thinking-Feeling		6	.4862	.2364	.0132	1.6037	4.799 ^b
7	Opinion Prediction M		7	.4986	.2486	.0122	1.4974	4.349 ^b
8	Adjective Checklist M		8	.5116	.2618	.0131	1.6160	4.033 ^b
9	Literary Interests		9	.5299	.2803	.0190	2.3829	3.904 ^b
10	Opinion Prediction F		10	.5376	.2890	.0082	1.0291	3.618 ^b
11	Political Values		11	.5455	.2976	.0086	1.0719	3.389 ^b
12	Social Services Interest		12	.5535	.3063	.0088	1.0992	3.202 ^b
13	Social Values		13	.5688	.3235	.0172	2.1854	3.164 ^b

^aSignificant at the .10 level.

^bSignificant at the .01 level.

Table 30
Stepwise Regression Predicting the Scores on Missing Cartoons (CBS) Scores for Boys (N=100)

Step Number	Variable Entered	Variable Removed	Number of Predictors	Multiple R	R ²	Increase in R ²	Partial F Test	Total F Test
1	Artistic Interests		1	.4224	.1784	.1784	21.2862 ^a	21.286 ^b
2	Behavior Postdiction M		2	.4816	.2319	.0535	6.7506 ^a	14.643 ^b
3	Adjective Checklist M		3	.5313	.2823	.0504	6.7442 ^a	12.588 ^b
4	Extraversion-Introversion		4	.5694	.3242	.0419	5.8929 ^a	11.395 ^b
5	Sensing-Intuition		5	.5869	.3445	.0202	2.8984 ^a	9.878 ^b
6	Social Values		6	.6027	.3632	.0188	2.7415 ^a	8.841 ^b
7	Expressed Inclusion		7	.6167	.3804	.0171	2.5449	8.068 ^b
8	Opinion Prediction M		8	.6290	.3956	.0153	2.2993	7.446 ^b
9	Political Values		9	.6355	.4038	.0082	1.2401	6.774 ^b
10	Aesthetic Values		10	.6416	.4166	.0078	1.1736	6.226 ^b
11	Economic Values		11	.6499	.4224	.0108	1.6485	5.851 ^b
12	Adjective Checklist F		12	.6551	.4292	.0068	1.0297	5.451 ^b
13	Judgment-Perception		13	.6574	.4321	.0030	0.4477	5.034 ^b

^aSignificant at .10 level.

^bSignificant at .01 level

Table 31
Stepwise Regression Predicting the Score on Missing Cartoons (CBS) Scores for the Total Sample (N=200)

Step Number	Variable Entered Removed	Number of Predictors	Multiple R	R^2	Increase in R^2	Partial F Test	Total F Test
1	Artistic Interests	1	.3010	.0906	.0906	19.6271 ^a	19.726 ^b
2	Sex	2	.3696	.1366	.0460	19.4981 ^a	15.585 ^b
3	Sensing-Intuition	3	.4096	.1678	.0312	7.3370 ^a	13.170 ^b
4	Adjective Checklist M	4	.4371	.1911	.0233	5.6160 ^a	11.514 ^b
5	Extraversion-Introversion	5	.4604	.2120	.0209	5.1537 ^a	10.438 ^b
6	Behavior Postdiction M	6	.4759	.2265	.0145	3.6231 ^a	9.420 ^b
7	Adjective Checklist F	7	.4909	.2410	.0145	3.6680 ^a	8.710 ^b
8	Behavior Postdiction F	8	.5006	.2506	.0096	2.4460	7.984 ^b
9	Expressed Affection	9	.5048	.2548	.0042	1.0652	7.218 ^b
10	Expressed Inclusion	10	.5156	.2659	.0111	2.8576	6.845 ^b
11	Political Values	11	.5194	.2697	.0038	0.9885	6.313 ^b
12	Political Values	12	.5234	.2740	.0042	1.0913	5.880 ^b
13	Judgment-Perception	13	.5267	.2774	.0034	0.8876	5.493 ^b

^aSignificant at .10 level.

^bSignificant at .01 level.

Expression Grouping (CBC) as a Dependent Variable

Tables 32, 33, and 34 present the summary tables of the regression analysis for the male, female, and the total sample respectively.

Looking first at the multiple correlation coefficients in the female sample one finds that only ten out of the thirteen multiple correlations are significant. R^2 , the proportion of the Expression Grouping's variance explained, ranged from .0767 to .2051 over the thirteen steps.

For the male sample, all of the multiple correlations are significant and the proportion of variance explained ranged from .0532 to .2082. In the total sample though all of the multiple correlations are significant, the proportion of variance explained is only .1405.

Partial F-Tests and the Variables in the Regression

Partial F-values were computed at each step to assess the increased amount of CBC variance explained by the inclusion of additional independent variables. The results of these tests are included in Tables 32, 33, and 34.

In the female sample only three variables had partial F-values significant at the .10 level. These were Extraversion-Introversion, Adjective Checklist F and Opinion Prediction F. The multiple correlation coefficient at the step (3) which included all these variables was .3681 and R^2 was .1355. The additional ten variables raised the R to .4528 but accounted for only 9.96 percent more of the criterion variance over that already explained by the three predictors mentioned above.

In the male sample also there were only three independent variables which had significant partial F values. They were Adjective Checklist F,

Adjective Checklist M, and Wanted Control. It may be noticed that these variables did not enter at the first three steps. They entered at Steps 1, 2, and 5 respectively. This happened because the variables with which these variables were related were not selected as the first three predictors.

In the total sample four of the independent variables had significant partial F-values. They were Extraversion-Introversion, Behavior Postdiction M, Sensing-Intuition and Social Service Interests. The multiple correlation at the step in which all of these were employed in the regression equation was .3381 and R^2 was .1143. The variables added after this step increased the amount of criterion variance explained by only 2.62 percent over that accounted for by the six variables.

Both in the male and the female samples Adjective Checklist F and Opinion Prediction F entered in the regression equation at an early stage. However, the partial F-value of Opinion Prediction F is significant only in the female sample. This may be due to the difference in the patterns of intercorrelations of this variable in the two samples. Though artistic interests had entered the regression equation for the prediction of Missing Cartoons scores in the very beginning, this did not happen in the present case. In the female sample the artistic interests entered at Step 9 while in the male sample they did not enter at all. Wanted Control entered at Step 5 in both samples. However, it was significant only in the male sample. It is interesting to note that measures of interpersonal perception which did not seem to have enough of common variance with Expression Grouping

(shown by low product-moment correlations reported in the previous chapter) have played such an important role in the regression equations for predicting the performance on this dependent variable. As in the case of Missing Cartoons (CBS), the sex of the student again entered the prediction equation in the beginning of the regression procedure.

Social Translations (CBT) as a Dependent Variable

When Social Translations was considered as a dependent variable the multiple correlation coefficient at the 13th step was .5162 and .4563 for the male and female samples respectively (Tables 35 and 36). In each case the multiple R was significant at .01 level. In the total sample the multiple R was .3659 which is also significant at .01 level (Table 37).

In the male sample the multiple correlation coefficients ranged from .3143 at the first step to .5162 at the 13th step. The proportion of criterion variance explained (R^2) ranged from .0988 to .2664 over the 13 steps. For the female sample the values of the multiple correlations ranged from .2224 to .4563 and the values of R^2 from .0495 to .2082 over the 13 steps. Thus the multiple correlations for the male sample were generally higher than those for the female sample.

Partial F-Tests and the Variables in the Regressions

Partial F-tests were done to see whether the addition of an independent variable makes a significant contribution in explaining the criterion variance. The results of these tests are included in Tables 35, 36, and 37.

Table 32
Stepwise Regression Predicting the Expressions Grouping (CBC) Scores for Girls (N=100)

Step Number	Variable Entered Removed	Number of Predictors	Multiple R	R^2	Increase in R^2	Partial F Test	Total F Test
1	Extraversion-Introversion	1	.2770	.0767	.0767	8.1465 ^a	8.146 ^b
2	Adjective Checklist F	2	.3279	.1075	.0308	3.3473 ^a	5.844 ^b
3	Opinion Prediction F	3	.3681	.1355	.0279	3.1034 ^a	5.015 ^b
4	Opinion Prediction M	4	.3971	.1577	.0222	2.5050	4.447 ^b
5	Wanted Control	5	.4151	.1723	.0146	1.6635	3.915 ^b
6	Judgment-Perception	6	.4285	.1836	.0113	1.2854	3.487 ^b
7	Adjective Checklist M	7	.4343	.1886	.0050	0.5685	3.056 ^b
8	Literary Interests	8	.4417	.1951	.0065	0.7319	2.758 ^b
9	Artistic Interests	9	.4448	.1979	.0027	0.3079	2.467 ^b
10	Sensing-Intuition	10	.4473	.2001	.0022	0.2491	2.226 ^b
11	Behavior Postdiction M	11	.4495	.2020	.0019	0.2120	2.025
12	Social Service Interests	12	.4513	.2037	.0016	0.1793	1.854
13	Thinking-Feeling	13	.4528	.2051	.0014	0.1514	1.707

^aSignificant at .10 level

^bSignificant at .01 level

Table 33
Stepwise Regression Predicting the Expressions Grouping (CBC) Scores for Boys (N=100)

Step Number	Variable Entered Removed	Number of Predictors	Multiple R	R ²	Increase in R ²	Partial F Test	Total F Test
1	Adjective Checklist F	1	.2305	.0532	.0532	5.5013 ^a	10.746 ^b
2	Opinion Prediction F	2	.2748	.0755	.0223	2.3447	7.645 ^b
3	Adjective Checklist M	3	.3192	.1019	.0264	2.8191 ^a	6.761 ^b
4	Behavior Postdiction F	4	.3521	.1240	.0221	2.3980	5.745 ^b
5	Wanted Control	5	.3872	.1499	.0259	2.8681 ^a	5.175 ^b
6	Social Service Interests	6	.4040	.1633	.0133	1.4811	4.591 ^b
7	Persuasive Interests	7	.4225	.1785	.0153	1.7113	4.334 ^b
8	Expressed Affection	8	.4319	.1865	.0080	0.8958	3.862 ^b
9	Extraversion-Introversion	9	.4381	.1919	.0054	0.6006	3.480 ^b
10	Thinking-Feeling	10	.4420	.1954	.0034	0.3797	3.144 ^b
11	Economic Values	11	.4482	.2009	.0055	0.6081	2.851 ^b
12	Expressed Inclusion	12	.4523	.2046	.0037	0.4015	2.613 ^b
13	Aesthetic Values	13	.4563	.2082	.0036	0.3962	2.403 ^b

^aSignificant at .10 level

^bSignificant at .01 level

Table 3⁴
 Stepwise Regression Predicting the Score on Expression Grouping (CBC)
 Scores for the Total Sample (N=200)

Step Number	Variable Entered Removed	Number of Predictors	Multiple R	R ²	Increase in R ²	Partial F Test	Total F Test
1	Extraversion-Introversion	1	.2137	.0457	.0457	9.4769 ^a	9.477 ^b
2	Behavior Postdiction M	2	.2484	.0617	.0160	3.3626 ^a	6.476 ^b
3	Sensing-Intuition	3	.2793	.0780	.0163	3.4684 ^a	5.528 ^b
4	Sex of the Student	4	.2957	.0874	.0094	2.0104	4.670 ^b
5	Artistic Interests	5	.3127	.0978	.0104	2.2255	4.204 ^b
6	Social Service Interests	6	.3381	.1143	.0165	3.6038 ^a	4.151 ^b
7	Adjective Checklist F	7	.3522	.1241	.0098	2.1392	3.885 ^b
8	Literary Interests	8	.3571	.1275	.0034	0.7536	3.489 ^b
9	Behavior Postdiction F	9	.3618	.1309	.0034	0.7351	3.179 ^b
10	Expressed Inclusion	10	.3661	.1340	.0031	0.6817	2.924 ^b
11	Thinking-Feeling	11	.3696	.1366	.0026	0.5650	2.704 ^b
12	Persuasive Interests	12	.3726	.1388	.0022	0.4868	2.512 ^b
13	Political Values	13	.3748	.1405	.0016	0.3542	2.338 ^b

^a Significant at .10 level

^b Significant at .01 level

In the male sample only three variables had partial F-values significant at .10 level. These were Adjective Checklist F, Persuasive Interests and Social Service Interests. The multiple correlation coefficient at the Step (3) which included all these variables was .4176 and R^2 was .1744. The additional ten variables entered by the stepwise procedure through the 13th step raised the multiple correlation to .5162 but accounted for only 9.20 percent more of the criterion variance over that already explained by these three predictors.

In the female sample also only three of the independent variables had significant partial F-values. They are Extraversion-Introversion, Sensing-Intuition, and Political Values. These variables are, thus, not only different from those used in the male sample but also quite different from those used in predicting the scores on the other dependent variables considered so far. The multiple correlation at the step in which all of these variables were used as predictors was .3447 and R^2 , the proportion of criterion variance explained, was .1188. Ten additional variables entered after this step increased the amount of criterion variance explained by only 8.94 percent over that accounted for by the three variables.

As in the boys' sample, in the total sample also persuasive and social service interests had significant partial F-values. Sex of the student entered the regression equation as a predictor at Step 7. The total regression was significant at each of the 13 steps of the regression procedure.

It may be noted that the independent variables used for predicting the score on Social Translation Test are different from those used in predicting the scores on the other behavioral cognition tests considered so far. Also, a different set of predictors had significant partial F-values in the male sample than that in the female sample. This may be due to the different patterns of intercorrelations which were seen in the two samples. On the basis of data collected with the instruments employed in the present study it can be said that girls with high scores on introversion, intuition and political values tend to do better on the Social Translations while boys with high scores on interpersonal perception and with Social and Persuasive interests give a good account of themselves in Social Translations test. In view of different results in the two samples, it is important to consider the sex of the student in studies pertaining to the prediction of performance on behavioral cognition measures.

Cartoon Predictions (CBI) as a Dependent Variable

Tables 38, 39, and 40 show the results of regression analysis with Cartoon Predictions as a dependent variable for the male, female, and the total sample respectively. The major finding of these analyses was that it is possible to predict 28 percent of variance of the Cartoon Predictions test in the male sample, 32 percent in the female sample, and 22 percent in the total sample. The multiple correlation coefficients were found to be statistically significant at each of the first 13 steps in the stepwise regression procedure in the three samples.

Table 35
Stepwise Regression Predicting the Social Translations (CBT) Scores for Girls (N=100)

Step Number	Variable Entered Removed	Number of Predictors	Multiple R	R ²	Increase in R ²	Partial F Test	Total F Test
1	Extraversion-Introversion	1	.2224	.0495	.0495	5.1004 ^a	5.100 ^b
2	Sensing-Intuition	2	.2983	.0890	.0395	4.2059 ^a	4.737 ^b
3	Political Values	3	.3447	.1188	.0298	3.2516 ^a	4.315 ^b
4	Economic Values	4	.3725	.1387	.0199	2.1977	3.826 ^b
5	Judgment-Perception	5	.3981	.1585	.0198	2.2093	3.542 ^b
6	Behavior Postdiction M	6	.4103	.1683	.0098	1.0958	3.137 ^b
7	Expressed Affection	7	.4233	.1792	.0109	1.2166	2.869 ^b
8	Opinion Prediction M	8	.4337	.1881	.0089	0.9976	2.635
9	Wanted Control	9	.4402	.1937	.0057	0.6331	2.403
10	Persuasive Interests	10	.4457	.1987	.0049	0.5467	2.207
11	Opinion Prediction F	11	.4503	.2027	.0041	0.4503	2.034
12	Behavior Postdiction F	12	.4548	.2069	.0041	0.4511	1.891
13	Thinking-Feeling	13	.4563	.2082	.0014	0.1495	1.740

^aSignificant at .10 level

^bSignificant at .01 level

Table 36
Stepwise Regression Predicting the Social Translations (CBT) Scores for Boys (N=100)

Step Number	Variable Entered Removed	Number of Predictors	Multiple R	R ²	Increase in R ²	Partial F Test	Total F Test
1	Adjective Checklist	1	.3143	.0988	.0988	10.7457 ^a	10.746 ^b
2	Persuasive Interests	2	.3690	.1362	.0374	4.1946 ^a	7.645 ^b
3	Social Service Interests	3	.4176	.1744	.0382	4.4476 ^a	6.761 ^b
4	Adjective Checklist M	4	.4413	.1948	.0204	2.4029	5.745 ^b
5	Behavior Postdiction M	5	.4646	.2159	.0211	2.5264	5.175 ^b
6	Aesthetic Values	6	.4780	.2285	.0127	1.5258	4.591 ^b
7	Economic Values	7	.4980	.2480	.0195	2.3800	4.334 ^b
8	Sensing-Intuition	8	.5034	.2535	.0055	0.6678	3.862 ^b
9	Opinion Prediction F	9	.5081	.2582	.0047	0.5738	3.480 ^b
10	Behavior Postdiction F	10	.5109	.2611	.0029	0.3471	3.144 ^b
11	Thinking Feeling	11	.5126	.2627	.0017	0.2001	2.851 ^b
12	Social Values	12	.5147	.2649	.0022	0.2608	2.613 ^b
13	Opinion Prediction M	13	.5162	.2664	.0015	0.1764	2.403 ^b

^aSignificant at .10 level

^bSignificant at .01 level

Table 37
Stepwise Regression Predicting the Social Translations (CBT) Scores for the Total Sample (N=200)

Step Number	Variable Entered Removed	Number of Predictors	Multiple R	R ²	Increase in R ²	Partial F Test	Total F Test
1	Persuasive Interests	1	.1982	.0393	.0393	8.0919 ^a	8.092 ^b
2	Social Service Interests	2	.2354	.0554	.0162	3.3684 ^a	5.779 ^b
3	Judgment-Perception	3	.2611	.0682	.0128	2.6850	4.780 ^b
4	Extraversion-Introversion	4	.2816	.0793	.0111	2.3528	4.198 ^b
5	Expressed Affection	5	.3015	.0909	.0116	2.4823	3.881 ^b
6	Wanted Control	6	.3185	.1015	.0106	2.2667	3.633 ^b
7	Sex of the Student	7	.3288	.1081	.0067	1.4337	3.326 ^b
8	Adjective Checklist M	8	.3397	.1154	.0072	1.5649	3.114 ^b
9	Behavior Postdiction M	9	.3528	.1245	.0091	1.9689	3.001 ^b
10	Expressed Inclusion	10	.3573	.1277	.0032	0.6952	2.766 ^b
11	Opinion Prediction	11	.3618	.1309	.0032	0.6950	2.574 ^b
12	Sensing-Intuition	12	.3647	.1330	.0022	0.4642	2.391 ^b
13	Adjective Checklist F	13	.3659	.1339	.0008	0.1798	2.211 ^b

^aSignificant at .10 level

^bSignificant at .01 level

In the male sample the multiple correlation coefficients ranged from .2284 at the first step to .5261 at the 13th step and the proportion of criterion variance explained (R^2) ranged from .0522 to .2768 over the first thirteen steps. For the female sample the values of the multiple R ranged from .2246 to .5699 and the values of R^2 from .0505 to .3248. Thus a greater proportion of criterion variance could be explained in case of the female group. In the total sample the value of R^2 was .2267 which is less than those in the male and female samples.

Partial F-Tests and the Variables in the Regression

In the female sample the variables included in the regression equation at the first five steps were statistically significant at the .10 level. These were Social Service Interests, Opinion Prediction M, Thinking-Feeling, Adjective Checklist M, and Behavior Postdiction F. It may be noted that only one of these independent variables viz, Behavior Postdiction F had significant partial F value in predicting the performance on Missing Cartoons (CBS). Thus, this set of five variables includes a number of variables which were not included in the other three regression analyses. The multiple correlation at Step 5 in which all of these were used as predictors was .5068 and R^2 was .2568. Eight additional variables increased the amount of criterion variance explained by only 6.8 percent over that accounted for by the eight variables.

In the male sample only three variables had significant partial F values. They were Persuasive Interests, Expressed Inclusion and Wanted Control. It may be noted that Wanted Control which had a

correlation of $-.142$ with the dependent variable entered in the regression equation at Step 3 and had a significant partial F-value while artistic interests which had a correlation of $.227$ with the dependent variable entered in the regression equation at Step 9 and did not have a significant partial F-value. This is due to the correlation of artistic interests with Expressed Inclusion and with Adjective Checklist M both of which had entered in the regression equation in the earlier stages reducing thereby the partial correlation value of artistic interests. Wanted Control, on the other hand, was not significantly correlated to the variables included in the regression equation in the first four steps. The additional ten variables included in the equation after the third step increased the value of multiple correlation coefficient from $.4162$ to $.5261$ and that of R^2 from $.1732$ to $.2768$. These variables thus increased the amount of criterion variance explained by only 10.36 percent over that accounted for by the first three variables (only the first three variables had accounted for about 15 percent of the criterion variance).

In the total sample there were five independent variables with significant partial F-values. These variables entered at Steps 1, 2, 3, 6 and 10. They were Adjective Checklist F, Persuasive Interests, Behavior Postdiction F, Aesthetic Values and Thinking-Feeling. The last two of these variables were functioning as suppressor variables. Their correlations with the dependent variable (CBI) were very low ($.044$ and $.098$ respectively) but they did make a significant increase in R^2 because they were correlated with the independent variables included in the regression equation and thus took out that portion of the other predictors variance that was not related to the dependent variable.

As in the case of prediction of other dependent variables, a different set of explainers was used to predict the performance of boys than that employed in case of girls. For example, the first three independent variables in the girls' sample were Social Service Interests, Opinion Prediction M and Thinking-Feeling while those in the boys' sample, Persuasive Interests, Expressed Inclusion, and Wanted Control, were employed in the first three steps. It may be noted that in each case the three variables come from three different instruments. This can be considered as a good indication. If the first three explainers would have come from the same or similar instruments, one would have concluded that cognition of behavioral implications is nothing different from the already existing constructs measured by the instrument used in the study.

Though Adjective Checklist M has significant partial F-value in only female sample but it does get included in each of these analyses at the fourth or fifth step. This shows the relationship of cognition of behavioral implications and interpersonal perception.

Discussion

The major finding of the analyses reported in this chapter was that the total regressions were significant at all steps considered in the stepwise procedures for each of dependent variables in the three samples with only two exceptions. These two exceptions were the prediction of scores on (a) Expressions Grouping (CBC) and (b) Social Translations (CBT) where the total regressions were significant only at the first nine and first seven steps respectively. This

Table 38
Stepwise Regression Predicting the Cartoon Predictions Scores for Girls (N=100)

Step Number	Variable Entered Removed	Number of Predictors	Multiple R	R ²	Increase in R ²	Partial F Test	Total F Test
1	Social Service Interests	1	.2246	.0505	.0505	5.2068 ^a	5.207 ^b
2	Opinion Prediction M	2	.3293	.1084	.0580	6.3099 ^a	5.899 ^b
3	Thinking-Feeling	3	.4309	.1857	.0773	9.1020 ^a	7.295 ^b
4	Adjective Checklist M	4	.4828	.2331	.0474	5.8742 ^a	7.218 ^b
5	Behavior Postdiction F	5	.5068	.2668	.0238	3.0070 ^a	6.498 ^b
6	Extraversion-Introversion	6	.5242	.2748	.0180	2.3049	5.874 ^b
7	Wanted Control	7	.5323	.2834	.0085	1.0954	5.197 ^b
8	Sensing-Intuition	8	.5453	.2973	.0140	1.8107	4.813 ^b
9	Aesthetic Values	9	.5540	.3069	.0096	1.2431	4.428 ^b
10	Judgment-Perception	10	.5599	.3135	.0066	0.8585	4.065 ^b
11	Political Values	11	.5647	.3188	.0053	0.6858	3.745 ^b
12	Adjective Checklist F	12	.5671	.3216	.0027	0.3845	3.436 ^b
13	Opinion Prediction F	13	.5699	.3248	.0033	0.4170	3.183 ^b

^aSignificant at .10 level

^bSignificant at .01 level

Table 39
Stepwise Regression Predicting the Cartoon Predictions Scores for Boys (N=100)

Step Number	Variable Entered	Variable Removed	Number of Predictors	Multiple R	R ²	Increase in R ²	Partial F Test	Total F Test
1	Persuasive Interests		1	.2284	.0522	.0522	5.3940 ^a	5.394 ^b
2	Expressed Inclusion		2	.3464	.1200	.0678	7.4719 ^a	6.611 ^b
3	Wanted Control		3	.3871	.1499	.0299	3.3781	5.641 ^b
4	Economic Values		4	.4162	.1732	.0233	2.6809	4.975 ^b
5	Adjective Checklist M		5	.4374	.1913	.0181	2.1086	4.448 ^b
6	Behavior Postdiction M		6	.4615	.2130	.0217	2.5585	4.195 ^b
7	Opinion Prediction F		7	.4710	.2218	.0088	1.0462	3.747 ^b
8	Artistic Interests		8	.4779	.2284	.0065	0.7685	3.366 ^b
9	Aesthetic Values		9	.4903	.2404	.0121	1.4289	3.165 ^b
10	Extraversion-Introversion		10	.5008	.2508	.0104	1.2299	2.979 ^b
11	Opinion Prediction M		11	.5099	.2600	.0092	1.0990	2.811 ^b
12	Adjective Checklist F		12	.5176	.2679	.0079	0.9347	2.653 ^b
13	Behavior Postdiction F		13	.5261	.2768	.0089	1.0633	2.532 ^b

^aSignificant at .10 level

^bSignificant at .01 level

Table 40
Stepwise Regression Predicting the Cartoon Predictions Scores for the Total Sample (N=200)

Step Number	Variable Entered Removed	Number of Predictors	Multiple R	R ²	Increase in R ²	Partial F Test	Total F Test
1	Adjective Checklist F	1	.3782	.0774	.0774	16.6161 ^a	16.616 ^b
2	Persuasive Interests	2	.3177	.1009	.0235	5.1481 ^a	11.056 ^b
3	Behavior Postdiction F	3	.3576	.1279	.0270	6.0624 ^a	9.581 ^b
4	Adjective Checklist M	4	.3727	.1389	.0110	2.4933	7.864 ^b
5	Artistic Interests	5	.3878	.1504	.0115	2.6256	6.869 ^b
6	Aesthetic Values	6	.4030	.1624	.0120	2.7584	6.235 ^b
7	Sensing-Intuition	7	.4143	.1716	.0093	2.1480	5.683 ^b
8	Expressed Inclusion	8	.4235	.1793	.0077	1.7865	5.217 ^b
9	Social Service Interests	9	.4346	.1889	.0095	2.2355	4.915 ^b
10	Thinking-Feeling	10	.4507	.2031	.0143	3.3839 ^a	4.818 ^b
11	Social Values	11	.4594	.2111	.0080	1.8968	4.573 ^b
12	Artistic Interests	12	.4696	.2205	.0094	2.2622	4.409 ^b
13	Thinking-Feeling	13	.4761	.2267	.0062	1.4873	4.194 ^b

^aSignificant at .10 level

^bSignificant at .01 level

indicates that the variables added thereafter do not make any significant contribution and though the number of predictors increases there is not a proportional increase in the value of R^2 which results in reducing the F-ratio. Thus out of the 21 independent variables used in this study only nine were utilized for predicting the performance on Expressions Grouping and seven for Social Translation in the female sample. If one wants an increase in the value of R , he should replace the unutilized independent variables by variables from some other areas (for example, general intelligence and verbal ability).

Table 41 gives the summary of results obtained in predicting the performance on each of the four behavioral cognition variables in the three samples. In the female sample the value of R^2 ranged from .1188 for CBT to .2568 for CBI while in the male sample it ranged from .1499 for CBC and CBI to .3632 for CBS. In the total sample the proportion of variance explained ranged from .0554 for CBT to .2659 for CBS.

Missing Cartoons Test (CBS)

It is in case of Missing Cartoons (CBS) that the largest proportion of variance (.3632 for males and .2233 for females) can be explained by the independent variables employed in this study. Though there is a great similarity in the set of explainers used in the two samples there is a significant difference in the magnitude of multiple correlations obtained therein. This shows that there are sex differences in the magnitude of relationship between these variables and the dependent variable (CBS). This fact is further confirmed when one finds that in the total sample sex of the student entered as a predictor in the regression equation at Step 2. It may be noted that as compared to other dependent variables a larger number of predictors

Table 41
Variables with Significant Partial F Values in the Multiple Regression
Analyses for the Four Behavioral Cognition Factors

Dependent Variable	Girls (N=100)			Boys (N=100)			Total Sample (N=200)		
	Independent Variable	R	R ²	Independent Variables	R	R ²	Independent Variables	R	R ²
Missing Cartoon (CBS)	Judgment-Perception Artistic Interests Behavior Postdiction F Adjective Checklist F Extraversion-Introversion			Artistic Interests Behavior Postdiction M Adjective Checklist M Extraversion-Introversion Sensing-Intuition Social Values			Artistic Interests Sex of the Student Sensing-Intuition Adjective Checklist M Extraversion-Introversion Behavior Postdiction M Adjective Checklist F Expressed Inclusion		
		.4725*	.2233		.6027*	.3632		.5156*	.2659
Expressions Grouping (CBC)	Extraversion-Introversion Adjective Checklist F Opinion Prediction F			Adjective Checklist F Adjective Checklist M Wanted Control			Extraversion-Introversion Behavior Postdiction M Sensing-Intuition Social Service Interests		
		.3681*	.1355		.3872*	.1499		.3381*	.1143
Social Translations (CBT)	Extraversion-Introversion Sensing-Intuition Political Values			Adjective Checklist F Persuasive Interests Social Service Interests			Persuasive Interests Social Service Interests		
		.3447*	.1188		.4176*	.1744		.2354*	.0554
Cartoon Prediction (CBI)	Social Service Interests Opinion Prediction M Thinking-Feeling Adjective Checklist M Behavior Postdiction F			Persuasive Interests Expressed Inclusion Wanted Control			Adjective Checklist F Persuasive Interests Behavior Postdiction F		
		.5068*	.2568		.3871*	.1499		.3576*	.1279

*These values of multiple correlation coefficient (R) were obtained at the end of the last step where the additional predictors entering into the equations were significant. In each case the Multiple R was significant at .01 level.

has significant partial F-values for Missing Cartoons Test. This may perhaps be due to the fact that this test is factorially complex. Besides the primary loading on CBS it has been found to have secondary loading on CBU and CBI (O'Sullivan et al, 1965). It may be due to its loading on CBI that Behavior Postdiction and Adjective Checklist have significant partial F-values in the male as well as in the female sample. Artistic interests entered the regression equation for predicting the performance on Missing Cartoons in each of the three samples. This variable, however, does not make any significant addition in the value of multiple R for the other dependent variables (CBC, CBT, and CBI). This is due to (a) the high correlation of artistic interests with Missing Cartoons and (b) low correlation of artistic interests with the other independent variables. It is interesting to note that judgment-perception (JP) scale of the MBTI entered into the regression equation for the girls as the first predictor showing thereby its highest contribution in explaining the CBS variance. However, even after the JP scale was entered, artistic interests was included in the regression equation indicating that a composite of student's self description of his preference for judgment-perception, and artistic interests gives a significant multiple R with the Missing Cartoon Scores. In the male sample the correlation of artistic interest and Missing Cartoons was so high (.422) that the JP dimension did not get included in the set of predictors.

Expression Grouping Test (CBC)

When Expression Grouping Test (CBC) was considered as a dependent variable it was found that at the end of the last step where the

additional predictors entering the regression equation were significant, the proportion of the criterion variance explained was .1355 for girls, .1499 for boys, and .1143 for the total sample. Adjective Checklist F had significant partial F-value in both the samples. There may be two reasons for this relationship: (a) In the Adjective Checklist Ss are given a list of paired adjectives. Out of each pair they are required to select one adjective which best describes the interviewee they have seen in the filmed interview. It is possible that in answering this instrument the Ss are trying to group the items together by seeing whether the adjectives they are checking go together in a group or not. This task thus becomes quite similar to that given in the Expression Grouping Test; (b) It is also likely that the task in both of these instruments require verbal mediation. In the Expressions Grouping Test when the S sees the given three expressions he says to himself, "These three expressions are similar because each shows . . ." and then goes to find out the fourth which shows an expression with a similar meaning. In the Adjective Checklist also, verbal mediation is required. Given a pair of adjectives the subject says to himself, for example, "The interviewee is/is not courteous because in the interview he/she did . . ."

In the female sample other variables with significant partial F-values for predicting the scores on Expressions Grouping are Extraversion-Introversion EI and Opinion Prediction F. The EI variable has been found to be interacting with the general intelligence variables (Eysenck, 1964). Since the test items employed in the

Expressions Grouping test are similar to those used in the general intelligence tests¹ this relationship is in the expected direction. Eysenck has pointed out that since extraverted subjects are liable to greater accumulation of inhibition they show work curves different from those produced by introverted subjects. The present writer plans to do some further analysis of data to see whether "the extraverts show greater work decrement . . . by taking longer to obtain correct solutions toward the end of the test, as compared with introverts, and by giving up more easily toward the end." (Eysenck, 1959, p. 592).

Opinion Prediction also makes a significant addition to the multiple R in the female sample. This may be happening because of similar mental processes involved in Expressions Grouping and Opinion Prediction. In each case the student has to draw inferences on the basis of materials presented to him. In the Expressions Grouping he examines the given expressions and selects another expression conveying the same idea. In the Opinion Prediction he views the filmed interview, draws inferences about the interviewee and selects which of the given statements are related to what was shown in the movie. In both cases the S is to educe the correlates of the given material.

In the male sample Wanted Control which has a low negative correlation with Expressions Grouping (-.186) has a significant

¹For example, in the Kuhlman-Anderson Intelligence Test (1952) items similar to Expressions Grouping items are:

1. Find the three things which are alike:
robin, winter, horse, song, squirrel, fence
2. Find the one that does not belong with the others:
top, rattle, doll, sled, playing

partial F value. In view of its significant positive correlation with Behavior Postdiction F, the variable selected just prior to Wanted Control, it can be said that it increased the value of multiple R significantly by functioning as a suppressor variable. In other words the variable took out the redundant portion of Behavior Postdiction F variance which led to an increase in the multiple correlation coefficient.

It may be noted that unlike the Missing Cartoons, the Expressions Grouping Test does not have any interest variable as one of its predictors. This is perhaps due to the different kind of test content and the mental process involved in this test.

Social Translations (CBT)

For explaining the variance on this factor Extraversion-Introversion EI again enters the regression equation for the female sample in the very beginning. The remarks made for the EI variable in connection with the discussion of its relationship with Expressions Grouping are applicable here also. It may be noted that as in case of Expressions Grouping it is only in the female sample that the EI variable is used in the Stepwise Regression. Though there are no significant sex differences on this variable itself ($t=1.361$ for $df = 198$) its relationship with the behavioral cognition factors is different in the two samples. This is why it enters the regression equation for the female sample and not for the male sample. As pointed out in Chapter II it was Wedeck (1947) who had indicated that individuals with high "psychological ability (behavioral cognition) are like instruments in perpetual state of vibration and their life is for the most part inward . . .". The present study thus provides empirical evidence in support of Wedeck's statement.

Sensing-Intuition and political values also make significant additions in the composite of independent variables for predicting the scores of female Ss on Social Translations. These relationships are in the expected direction. Intuition as defined by Myers (1962) is "indirect perception by way of the unconscious, accompanied by ideas or associations which the unconscious tacks on to the perceptions coming from outside." Thus Ss with reported preference for intuition seem to do better on cognition of behavioral transformation. The Social Translations test perhaps requires an intuitive approach. Political values (interest in prestige and power) has negative correlation with CBT but it is not related with other independent variables employed in this study. Therefore when multiplied by a negative regression coefficient it raises the level of multiple correlation significantly.

In the male sample the value of multiple R (.4167) at the end of Step 3 where variables with significant partial F-values were added is much larger than its counterpart (.3447) in the female sample. The variables entered in the two regression equations are quite different. In fact, none of the first three variables in common in both the samples. Adjective Checklist F, Persuasive Interests, and Social Service Interests are the variables with significant partial F-values for the male sample. As contrasted with the explainers for the female sample, each of these variables pertains to "dealing with others." It may be noted that only Adjective Checklist F (and not Adjective Checklist M) has a significant F-value. Not only that, it is the predictor which goes in the regression equation to start with. Persuasive interests which had a significant negative correlation (-.234) with the Social

Translations entered the regression equation at Step 2 by taking a negative regression coefficient. Social Service Interests with a correlation of .178 is included at the next step. It is interesting that though Economic Values had a correlation of .210 with the CBT they were entered in the regression equation at Step 7 and that too with a negative regression coefficient. Thus Economic Values play the role of a suppressor variable by taking out the redundant portion of the variance of Aesthetic Values (the correlation between these two variables is .374 in the male sample).

Cartoon Predictions (CBI)

As in case of other dependent variables, a different set of predictors had significant partial F-values for this variable in the male and female samples. These sets were also different from those used for predicting the other three dependent variables. This is due to the different patterns of relationship that exist between each of the dependent variables and the independent variables employed in this study. It is interesting that most of the variables in these two sets have negative correlations with the criterion. In the female sample Social Service Interests, Opinion Prediction M and Behavior Postdiction F have negative correlations with CBI while in the male sample Persuasive Interests and Wanted Control are negatively correlated with the dependent variable. Therefore, for each of these a negative regression coefficient was used which resulted in a significant increase in the multiple correlation coefficient. It may be noted that although Thinking-Feeling (TF) scale of MBTI has a correlation

of only .168 with the CBI measure, it has the highest partial F-value. That is, it makes the greatest addition in the value of multiple R. This happens because it has a significant positive correlation (.194) with the Opinion Prediction M which was entered in the regression equation in the previous step and its partial correlation (partialled on the basis of variables already entered in the equation) was very high. Though Adjective Checklist M and Behavior Postdiction F do not have statistically significant correlations with CBI scores they do make a significant addition in the value of multiple R. This is an indication of the usefulness of multiple regression analysis in predictive studies. Though very few of the Pearson Product Moment correlations were significant, the multiple correlation in the female sample at the end of Step 5 is .5068 which is significant at .01 level indicating that 25.68 percent of the variance of cartoon prediction scores can be explained by the five independent variables.

In the male sample, however, the multiple R at the end of the last step where the additional predictor had significant partial F value is .3871 which is comparatively smaller than its counterpart (.5068) in the female sample. The variables with significant partial F-values are Persuasive Interests, Expressed Inclusion, and Wanted Control. Thus no interpersonal perception measure enters the regression equation with significant partial F-value.

The finding that the proportion of criterion variance explained is high must be cautiously interpreted for at least two reasons. First, the stepwise regression procedure itself is designed to select those independent variables which will give the largest multiple

correlation coefficient. This procedure does not guarantee that the best set of predictors has been chosen or that the same set will prove most useful in other studies. Secondly, the present samples were small with respect to the number of variables involved. It is possible that the multiple correlations obtained in this sample may shrink when a larger sample of persons is used.² It is in view of this argument that the multiple correlations presented in Table 41 are based on a smaller number of variables.

Although the multiple correlation coefficients for the four dependent variables were statistically significant at the .01 level, different variables accounted for the prediction in every regression equation. Except in case of Missing Cartoons (CBS), a different set of predictors was utilized in the prediction of the dependent variable in the male and female samples. Also, the proportion of variance that could be explained was different in each case.

In the female sample Extraversion-Introversion had a significant partial F-value in predicting performance on CBS, CBC, and CBT measures while in case of males this independent variable was significant only in the prediction of CBS scores. Though persuasive interests did not enter any regression equation for the female sample, this variable was used in the male sample for predicting CBT and CBI scores. This is due to the difference in the relationship of persuasive interests with behavior cognition variables in the two samples.

When regression analyses were done for the total sample sex of the student entered the regression equation as an independent variable in

²The present writer plans to do similar analyses with a larger sample of persons.

most of the cases. This indicates the need for considering the sex of the student as an important variable in studies pertaining to behavioral cognition.

Summary

This chapter reported the results of multiple regression analyses performed for each of the four dependent variables (CBS, CBC, CBT and CBI) for the female, male, and the total sample. Major findings include:

1. In most cases the total regressions were significant at each of the 13 steps considered in the stepwise procedure. The exceptions were CBC and CBT where the total regressions in the female sample were significant only at the first nine and first seven steps respectively.

2. In the female sample the value of R^2 , the proportion of criterion variance explained, ranged from .1188 for CBT to .2568 for CBI while in the male sample it ranged from .1499 for CBC and CBI of .3632 for CBS. In the total sample the proportion of variance explained ranged from .0554 for CBT to .2659 for CBS. These values are those which were obtained if only those steps were employed where the additional predictors entered into the regression equations were significant.

3. The set of predictors needed for predicting the performance of girls was generally different from that required in case of boys. The only dependent variable for which the two sets had similar predictors was Missing Cartoons (CBS). Its predictors were Artistic Interests, Behavior Postdiction, Adjective Checklist, and Extraversion-Introversion.

4. In the regression analyses for the total sample sex of the student entered the regression equation in most of the cases before the 13th step. In case of Missing Cartoons (CBS) this independent variable entered at Step 2 with a significant partial F-value.

5. In predicting the performance of girls on measures of behavioral cognition extraversion-introversion seems to be an important variable. In the present study the EI scale of MBTI and significant partial F-value in predicting CBS, CBS, and CBT scores.

Chapter V

Suggestions for Further Research

It was seen in Chapter IV that for Expressions Grouping (CBC) and Social Translations (CBT) the total regressions in the female sample were significant only at the first nine and first seven steps respectively and not on all the thirteen steps as was seen in case of other dependent variables. It is, therefore, suggested that some new independent variables be tried to see if it is possible to increase the proportion of predicted variance of CBT and CBC. In a study by Sechrest and Jackson (1961) cognitive complexity was found to be significantly correlated with the social intelligence which in that case was assessed through peer ratings. In view of the fact that the variable of cognitive complexity covers a different dimension than those used in the present study, it is likely that it may make a significant addition to the value of multiple correlation coefficient. Another variable which might be useful in multiple prediction is sense of humor. This variable seems to be appropriate for predicting scores on Expressions Grouping. In everyday life it is seen that individuals with a good sense of humor are very perceptive of expressions.

As the number of independent variables used in the present study was fairly large it is necessary that a cross-validation be conducted. This would enable the investigator to see whether it is

possible to predict a similar proportion of criterion variance in other samples. The battery of predictors may, then, be redesigned on the basis of results obtained in cross-validation studies.

It was stated in Chapter III that many of the correlations obtained in the present study were low perhaps due to the restricted range of the scores of subjects on certain variables. It was thought that since the subjects of the study came from the field of education they formed a fairly homogeneous group with respect to certain variables. It is, therefore, suggested that a similar study be conducted with subjects from different fields of study, for example business, nursing, medicine and natural sciences. Another possibility for overcoming the restriction of range problem is to include subjects from different age groups.

Results with measures of spatial ability and mechanical comprehension have shown that students in the fields of physics and engineering tend to have a higher mean score as compared to that of students in humanities and social sciences. This is perhaps indicative of the process of self-selection. Students with better spatial and mechanical abilities go to engineering and physics because they enjoy working with three-dimensional things and like to work in laboratories and workshops. Applying the same logic with behavioral cognition one may say that graduate students in social work and nursing would obtain higher scores on behavioral cognition measures as compared to the scores obtained by their counterparts in physics and mathematics. If it is possible to show this, the results would be useful in selection of students for graduate work in these areas. In that

case these tests can also be used for predicting success in practicums involving interpersonal interaction.

There is a need for conducting a thorough study to establish convergent validity of behavioral cognition tests. This can be done by using different methods for assessing the same behavioral cognition factors. In the present study, for example, an effort was made to determine the convergent validity of CBI by using two different methods: filmed interview and Cartoon Predictions. This can be extended by including other methods for measuring the same factor, for example, peer ratings after a series of group discussions, supervisor's rating, and questionnaire method.

Discriminant validity for the behavioral cognition test should also be demonstrated. This can be done by using test materials which use photographs and cartoons but actually measure some other constructs for example, artistic interests, mechanical comprehension, social interests, etc. If the tests have discriminant validity, their correlations with the above test purporting to measure different things should be low.

The present writer plans to do some further analyses of the data used in this study. These include:

(a) A comparative study of the work curves of the extraverted and introverted subjects. This will be done by dividing each of the behavioral cognition tests into four parts. The performance of extraverted and introverted will then be compared on each part separately. The hypothesis of this study, based on Eysenck (1959),

is that extraverts show decline in performance during the latter part of their performance.

(b) Analysis is already underway to study the influence of personality variables on behavioral cognition scores. This is being done by considering personality variables as independent variables and behavioral cognition scores as dependent variables. Analysis of variance technique is being used for these analyses. This, it is hoped, will also enable the investigator to study the interaction effects of the various personality variables on behavioral cognition factors.

(c) It is also planned to do analyses similar to those stated in the preceding paragraph by considering behavioral cognition factors as "treatment variables" and personality variables as dependent variables. This will be useful in making a comparison of the two approaches in terms of their results.

Chapter VI

Summary

This study was designed to determine the relationship of behavioral cognition factors as defined within Guilford's Structure of Intellect Model with interpersonal perception and some selected variables in the areas of personality, interests, and values. More specifically, the aim of the study was to find how much of the variance in behavioral cognition factors could be explained by the variance of (a) interpersonal perception, (b) personality types (Extraversion-Introversion, Sensing-Intuition, Thinking-Feeling, Judgment-Perception), (c) interests (Social Service, Persuasive, Artistic and Literary) and (d) values (social, political, aesthetic, and economic).

The behavioral cognition factors included in this study were: cognition of behavioral classes (CBC), cognition of behavioral systems (CBS), cognition of behavioral transformation (CBT) and cognition of behavioral implications (CBI). The instruments recently developed by O'Sullivan, Guilford and de Mille (1966) were used for assessment of these factors. They are: Expression Grouping (CBC), Missing Cartoons (CBS), Social Translations (CBT) and Cartoon Predictions (CBI). The accuracy of interpersonal perception was assessed by Opinion Prediction Test, Adjective Checklist and Behavior Postdiction Tests (Cline and Richards 1960). These judging instruments were completed

by the Ss after viewing filmed interviews. The other instruments used in the study include: The Myer Briggs Type Indicator (Myers, 1962), the FIRO-B (Schutz, 1967), the Kuder Vocational Preference Record (Kuder, 1942) and the Study of Values (Allport, Vernon, Lindzey, 1960).

The subjects were 100 male and 100 female college undergraduates enrolled in an undergraduate course in Educational Psychology at the Ohio State University.

Analysis of data was done by using Pearson Product Moment Correlation and Multiple Regression Analysis techniques. Sex differences were studied by using the t test for two independent samples. All analyses were done at the Ohio State University Computer Center using the IBM 7094 computer.

As suggested by O'Sullivan et al (1966) a composite behavioral cognition scores was obtained by adding each Ss scores on the four behavioral cognition measures. Intercorrelations among the five scores on measures of behavioral cognition were computed. In case of boys, all the ten coefficients were significant at the .01 level while for girls 8 coefficients were significant at the .01 level, one at the .05 level and one was not significant. These results suggested that the four behavioral cognition factors are not statistically independent of one another. The Social Translations Test which was the only test using verbal material was found to be minimally related to other measures of behavioral cognition. This was, however, true only in the female sample. The high intercorrelations were interpreted as indicative of mutual involvement of abilities in solving the problems with behavioral content.

Cognition of behavioral implications is by definition very similar to interpersonal prediction. However, the data obtained in the present study did not show significant correlations between these two variables. As two different methods were used to measure these variables this was considered as an indication of inadequate convergent validity. Possible reasons for these low correlations include restricted range of scores on each of these measures and their low reliability coefficients. When correction for attenuation was applied there was a significant increase in these correlations.

The pattern of relationship of behavioral cognition factors with the personality variables was different in the two samples. In the female sample CBS and CBI measures gave statistically significant correlations with Sensing-Intuition and Judging-Perceiving scales of the MBTI. The CBT measure was correlated only with the Judging-Perceiving while the CBC measure only with the EI scale of MBTI. In the male sample only the CBS measure correlated significantly with the Sensing-Intuition Scale. This difference in the pattern of relationships may be due to the homogeneity of the male sample.

The magnitude of correlations of behavioral cognition factors was generally lower with the FIRO-B Scales than that with the MBTI Scales. It was thought that this may partly be due to the small range of possible scores (only from 0 to 9) in each of the FIRO-B scales. In the female sample the significant correlations were (a) Missing Cartoons (CBS) with Expressed Affection (negative correlation) and (b) Cartoon Predictions (CBI) with Wanted Control. In the male sample

the scores on Cartoon Predictions (CBI) were significantly correlated with those on Expressed Inclusion and Expressed Affection Scale. Also, the scores on Missing Cartoons (CBS) had significant negative correlations with the Wanted Control Scale of FIRO-B. Most of these relationships are in agreement with those obtained between the behavioral cognition measures and the MBTI Scales. Introverted girls tend to get high scores on Expression Grouping (CBC), Social Translations (CBT) and Cartoon Predictions (CBI) and intuitive and perceptive girls on CBS, CBT, and CBI. Expressions Grouping (CBC) which is very similar to the classification and similarities items of the omnibus general intelligence tests is correlated only with the extraversion-introversion dimension in the female sample. A similar finding has been reported by Eysenck (1963) for problem-solving tasks in general. In the male sample high scorers on Expressed Inclusion and Expressed Affection obtained high scores on CBI. This finding is, however, not confirmed by the relationship of Extraversion-Introversion with CBI which is statistically not significant.

Turning now to the relationship of behavioral cognition with interests and values one finds that in both of the samples Missing Cartoons (CBS) and Cartoon Predictions (CBI) are correlated with artistic interests. The magnitude of the correlations is comparatively low in the female sample. This may, perhaps, be due to the fact that girls generally enjoy artistic activities and so the range of scores on artistic interests is rather small. In the male sample, CBC and CBT have low but significant correlations with Social Service Interests. This indicates that those who enjoy helping others also recognize a

set of items of behavioral information grouped by virtue of their common properties (CBC) and realize changes in interpretation or in mood or attitude (CBT). Since flexibility in dealing with people depends upon the ability to realize behavioral transformation the correlation of CBT with social interests can be considered as an indication of construct validity of the Social Translations Test.

Multiple regression analysis was performed for each of the four dependent variables (CBS, CBC, CBT, and CBI) in the female, male, and the total sample. In most of the cases the total regressions were significant at each of the 13 steps considered in the stepwise procedure. The exceptions were CBC and CBT where the total regressions for girls were significant only at the first nine and first seven steps respectively.

In the female sample the value of R^2 , the proportion of criterion variance explained, ranged from .1188 for CBT to .2568 for CBI while in the male sample it ranged from .1499 for CBC and CBI to .3632 for CBS. In the total sample the proportion of variance that could be explained ranged from .0554 for CBT to .2659 for CBS. These values for R^2 are those which were obtained if only those steps were employed where the additional predictors entering into the regression equations were significant. Since these values were obtained by using very few variables (3-5) and the sample size was 100 in the male and female samples and 200 in the total samples these values are not likely to shrink if this study is replicated with another similar group of subjects.

The set of predictors selected for predicting the performance of girls on behavioral cognition measures were generally different from that required in case of boys.

Extraversion-Introversion was found to be a significant contributor in predicting the scores of girls on CBS, CBC, and CBT measures. It is proposed to do some further analyses to investigate the relationship of this variable with behavioral cognition.

In the regression analyses for the total sample sex of the student played an important role in the regression equation. In predicting the performance of the total group on CBS this variable was selected at Step 2 and made a significant addition in the value of multiple R. This indicates the importance of taking sex of the student into consideration while conducting studies pertaining to behavioral cognition.

Appendixes

Appendix A

Guilford's Structure of Intellect Model

Appendix B

Reliabilities of Behavioral Cognition Tests

Table 42
Reliabilities of Behavioral Cognition Tests^a

Test Variable	Girls (N = 100)			Boys (N = 100)		
	Mean	SD	Reliability ^b	Mean	SD	Reliability
1 Missing Cartoons (CBS)	18.92	4.61	.738	20.09	4.37	.729
2 Expression Grouping (CBC)	18.71	3.74	.514	19.64	3.28	.382
3 Social Translations (CBT)	17.71	3.49	.646	16.69	4.30	.756
4 Cartoon Predictions (CBI)	22.09	3.23	.457	22.28	4.01	.664
22 Behavioral Cognition Composite	77.61	10.85	.810	78.63	12.44	.859

^aBased on the data obtained in the present study.

^bReliability coefficients for the first four variables were obtained by using the K-R 21 formula. The reliability estimate of the composite was obtained by using the formula for the reliability of linear combination (Nunnally, 1967).

Appendix C
Sex Comparisons

Table 43
Sex Comparisons on the Behavioral Cognition Variables

Variable	Boys (N = 100)		Girls (N = 100)		t	p
	Mean	SD	Mean	SD		
1. Missing Cartoons	20.090	4.372	18.920	4.610	1.832	< .10
2. Expressions Grouping	19.640	3.282	18.710	3.740	1.860	< .10
3. Social Translation	16.690	4.305	17.710	3.491	1.831	< .10
4. Cartoon Predictions	22.280	4.005	22.090	3.235	0.367	N.S.
22. Behavioral Cognition Composite	78.630	12.442	77.610	10.853	0.615	N.S.

Table 44
Sex Comparisons on Interests and Values

Variable	Boys (N = 100)		Girls (N=100)		t	p
	Mean	SD	Mean	SD		
5 Mechanical Interests	73.150	20.253	44.580	13.690	11.628	< .001
6 Computational Interests	35.110	12.039	27.780	11.940	4.301	< .001
7 Scientific Interests	65.040	16.832	51.650	13.821	6.117	< .001
8 Persuasive Interests	68.170	15.531	63.880	15.757	1.929	< .05
9 Artistic Interests	50.900	14.259	59.310	15.389	3.980	< .001
10 Literary Interests	43.860	17.363	45.370	15.439	0.647	N.S.
11 Musical Interests	16.220	9.375	22.430	8.289	4.938	< .001
12 Social Service Interests	80.820	17.203	95.520	19.156	5.681	< .001
13 Clerical Interests	46.650	11.940	52.220	14.530	2.947	< .01
14 Economic Values	42.920	7.177	38.190	6.775	4.767	< .001
15 Aesthetic Values	34.300	8.554	40.550	7.852	5.356	< .001
16 Social Values	38.810	6.373	43.790	7.687	4.963	< .001
17 Political Values	43.930	6.759	39.310	6.755	4.874	< .001

Table 45
Sex Comparisons on the Personality Variables

Variable	Boys (N = 100)		Girls (N = 100)		t	p
	Mean	SD	Mean	SD		
18 Extraversion-Introversion	97.180	28.266	91.960	25.654	1.361	N.S.
19 Sensing-Intuition	88.120	27.879	95.400	27.344	1.855	< .10
20 Thinking-Feeling	95.560	20.201	110.040	24.626	4.523	< .001
21 Judging-Perceiving	91.980	28.009	95.860	28.269	0.970	N.S.
50 Expressed Inclusion	4.910	2.001	5.730	1.574	3.205	< .01
51 Wanted Inclusion	3.910	3.228	4.980	2.977	2.425	< .05
52 Expressed Affection	3.670	2.400	4.530	2.282	2.584	< .01
53 Wanted Affection	5.150	2.574	5.300	2.110	0.448	N.S.
54 Expressed Control	3.580	2.507	2.100	2.076	4.524	< .001
55 Wanted Control	3.990	1.942	4.880	2.183	3.031	< .01

Table 46
Sex Comparisons on Interpersonal Perception

Variable	Boys (N = 100)		Girls (N = 100)		t	p
	Mean	SD	Mean	SD		
26 Opinion Prediction M	35.410	3.739	35.770	3.692	0.6816	N.S.
30 Adjective Checklist M	45.460	4.417	44.980	5.990	0.642	N.S.
34 Behavior Postdiction M	39.460	4.146	39.560	4.337	0.166	N.S.
35 Composite M	120.300	8.319	120.350	9.882	0.039	N.S.
39 Opinion Prediction F	33.910	3.066	34.360	2.617	1.111	N.S.
43 Adjective Checklist F	49.260	4.168	50.490	4.177	2.074	< .05
47 Behavior Postdiction F	39.200	4.191	41.410	3.787	3.893	< .001
48 Composite F	122.370	7.097	125.820	6.673	3.524	< .001

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