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The Generality of Cognitive Complexity Across Measures and Stimuli

Irene Moss Brennan

Loyola University Chicago

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THE GENERALITY OF COGNITIVE COMPLEXITY
ACROSS MEASURES AND STIMULI

by

Irene Moss Brennan

A Dissertation Submitted to the Faculty of the Graduate School of Loyola University in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

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1973
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Vita

Irene Moss Brennan was born in Los Angeles, California on July 11, 1937. She received her B.A. in 1961 from San Francisco College for Women, with majors in History and Education. She taught in private elementary schools, Grades 4 through 7 for two years in San Francisco, California. She also taught History and Social Problems to students at Mercy High School, San Francisco for four years. She also served as a counselor to students at this high school.

After completing a year of undergraduate prerequisites in psychology, she began graduate studies at Loyola University in social psychology in June, 1968, and received her M.A. from Loyola University in June, 1970.
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Chapter I
Introduction

A considerable amount of well articulated theory has been developed (Bierl, 1961; Bierl, Atkins, Briar, Leaman, Miller, & Tripodi, 1966; Harvey, 1966; Harvey, Hunt, & Schroder, 1961; Schroder, Driver, & Streufert, 1967; Schroder & Suedfeld, 1971) which relies on the concept of cognitive complexity to explain individual differences in perception and judgment of self, others, and events. Research supporting such theory links cognitive complexity with other personality and cognitive correlates such as person perception (Bierl, 1955; Tripodi & Bierl, 1964), perceived conflict (Crano & Schroder, 1967; Tripodi & Bierl, 1966), attitude change (Harvey, 1964; Lundy & Berkowitz, 1957; Suedfeld & Vernon, 1966), impression formation (Leventhal & Singer, 1964; Ware & Harvey, 1967), decision making (Harvey & Ware, 1967; Streufert, Streufert, & Castore, 1969), leadership (Streufert, Streufert, & Castore, 1968), religion, authoritarianism, dogmatism, rigidity, and others (Harvey, 1966). However, research which has attempted to establish the validity of the concept of cognitive complexity by assessing its generality across the usual measures of the variable (Gardner & Schoen, 1962; Vannoy, 1965) has generally resulted in a relatively low degree of test intercorrelations. It would seem then that either the validity of the generality studies is questionable, no such predisposition
exists, or that different measures of cognitive complexity are actually measuring different elements of cognitive style.

In dealing with the question of the validity of the generality studies, it becomes apparent that there is an inherent obstacle in determining the generality of most measures of cognitive complexity: the theories from which these measurements have come all either accept the possibility or the certainty that cognitive complexity is stimulus bound. Therefore, if a correlation of different measures of cognitive complexity, each using different stimuli, is low, it is not known whether the low correlations are due to the different stimuli that are used, to method variance, or to different elements of cognitive style.

Studies attempting to measure the generality of cognitive complexity across stimuli have used different measures for each stimulus (Bieri & Blacker, 1956; Caracena & King, 1962; Sechrest & Jackson, 1961; Suedfeld, Tomkins, & Tucker, 1969); those attempting to measure generality across measures have used a different stimulus for each measure (Gardner & Schoen, 1962; Hess, 1966; Little, 1969; Vannoy, 1965). What was needed to clarify the issue was a comparison of two or more measures which could be used with two or more kinds of stimuli. In the present research three measures of cognitive complexity were used, each one quite different: a Concept Span test (CS), Bieri's adaptation of Kelly's Role Concept Repertory Test (REP) for use in measuring cognitive complexity, and Schroder's Paragraph Completion Test (PCT). Identical stimuli could be used for each test. Bieri's
and Schroder's measures were chosen because they were the most commonly used measures in the literature. Concept span was chosen because it could be used with both kinds of stimuli, and could be scored for two elements of cognitive style, integration as well as differentiation.

If significant correlations were found between measures and between stimuli, then cognitive complexity would seem to be a unitary trait measured validly by both instruments, and not stimulus bound, that is, the individual would differentiate conceptual and interpersonal stimuli in the same way. This could be hypothesized from the descriptions of cognitive complexity-simplicity given by Bieri and by Schroder. Both view complexity as a structural variable which reflects the ability of the individual to differentiate dimensions of personal and social stimuli. Bieri, et al. (1966) stress differentiation:

"Cognitive complexity may be defined as the capacity to construe social behavior in a multidimensional way (p.185)." However, more than mere differentiation is included in this concept:

although cognitive complexity is closely related to the notion of differentiation, we consider a more complex structure to be a more differentiated structure in a particular sense. That is, we are concerned with the differentiation of dimensions of judgment, rather than with categories, concepts, or regions (p. 185).

Implied in this, and in Bieri's use of complexity measures to predict the accuracy of perception of others in clinical judgments, is the integration of the differentiated perception.

Harvey, et al. (1961) use the terms concrete and abstract
rather than complexity-simplicity to define a similar personality characteristic:

The more concrete end of the dimension represents the state of minimal differentiation within the concepts and little or no integration among them. The more abstract end of the continuum is represented by high differentiation and integration across a wide range of domains (p. 42).

The personality characteristic of concreteness-abstraction is considered by Schroder, et al. (1967) to be an information processing variable in which

the number of dimensions is not necessarily related to the integrative complexity of the conceptual structures, but the greater the number of dimensions, the more likely is the development of integratively complex connections or rules (p. 7)."

These theoretical definitions are operationalized by Bieri in the REP test and by Schroder in the PCT. The REP test consists of a 10 x 10 grid; each of the ten columns is identified by a different role type selected by the experimenter. Ten rows of bipolar constructs are provided. After the subject has listed the name or initials of each of the ten persons who best correspond to the ten role types, he is instructed to use a six-step Likert-type scale in rating all ten persons he has listed on the first provided construct. For example, if the first construct dimension is "outgoing—shy" each judge rates each of the ten persons on a scale of +3 (outgoing) to -3 (shy). Following this the judge rates all ten persons on the second construct dimension and so on through all ten rows. Cognitive complexity is measured by comparing each rating in a row with the rating directly below it (i.e. for the same person) in the other rows on the matrix. A
score of 1 is given for every exact agreement of ratings on any one person, and this matching procedure is carried out for all possible comparisons; the scores for each comparison are added to give one total score (Bieri, et al., 1966, pp. 190-191).

In the PCT, developed by Schroder (1971), the subject is presented with a selected set of items (e.g., "When I am in doubt," "Rules") and asked to use each stem as a basis for completing one sentence and writing at least two additional sentences. The stems in this test are selected to assess the abstractness of conceptual level primarily in regard to interpersonal stimuli. Each protocol is scored according to the level of cognitive structuring it reflects. Responses which could be generated by a single rule (perspective) are given a score of 1, those clearly indicating alternate but unconnected perspectives a score of 3, those indicating a relationship between two perspectives a score of 5, and those indicating multiple relationships a score of 7. Points 2, 4, and 6 represent intermediate judgments between these basic information processing structures.

The CS requires the subject to check which of five concepts/persons are related to each of 120 words. After each word the subject indicates the number of concepts or persons related to that word: none, one, all, or several. By adding the total number checked for all 120 words an equivalence range can be obtained. Since this has been related in the literature (Gardner & Schoen, 1962; Mayzner & Tresselt, 1955; Rokeach, 1951) to integrative complexity, and a concept span test can be used with
persons and concepts, it was thought that this would be a valuable instrument to compare with the results of the REP test and the PCT. In addition to its being scored for integrative complexity, the Concept Span test can be scored for differentiation: the number of words for which at least one and no more than four concepts/persons are checked is a score of differentiation, for if 0 or 5 are marked it means that all concepts are considered in the same way.

There has been a considerable amount of research undertaken in a attempt to find significant correlations between Schroder and Bierl's measures of complexity-simplicity, and between these and other measures of differentiation, with generally negative, although conflicting results.

Bierl and Blacker (1956) compared complexity in the perception of people and inkblots with significant results. The REP test was used to measure complexity in perceptions of people; the number of different responses from Rorschach cards was the measure used for inkblots. This would indicate that complexity is a unitary trait; however, when Caracena and King (1962) attempted to replicate Bierl and Blacker's findings, they found no significant intercorrelations of the same two tests.

Little (1969) compared three measures of cognitive complexity: that used by Bierl and Blacker on inkblots, a role category questionnaire, and the REP test. Spearman rank r's for the three comparisons ranged from -.04 to -.01, indicating a lack of convergence in these measures.
However, Hess (1966) compared the REP test and an object sorting task in which small household items were grouped; using Kendall's tau she found a positive correlation that was significant at the .05 level.

Doise and Zavalloni (1970) used the REP test to compare cognitive complexity in perceptions of familiar persons, famous people, and nations. All of the 24 intercorrelations were in the predicted direction, and all but 5 were significant beyond the .05 level.

In a study of the relation among perceptual and cognitive measures of information processing, Suedfeld, et al. (1969) compared three cognitive complexity measures: (a) Schroder's PCT; (b) the Interpersonal Topical Inventory (ITI), an objective form of the PCT, with forced choice items; and (c) a Polarity measure with two perceptual complexity measures: preference for stimuli high in variability and perceptual estimation of the number of angles in a figure. The only significant correlation was between the PCT and the ITI, and since one was developed from the other this was expected.

Both Gardner and Schoen (1962) and Vannoy (1965) undertook factor analyses of various measures of cognitive complexity. Each found three distinct and independent factors present. Their findings will be presented in greater detail later.

If the present research follows the above pattern and fails to find evidence supporting a unitary trait of cognitive complexity even when stimuli are identical, then it would seem
that such an hypothesis should be abandoned.

However, if significant correlations are found within each content area (persons or concepts) across measures then cognitive complexity would seem to be a trait that is stable within a single content area or domain, but varies with each domain. This would certainly be congruent with the theory of cognitive complexity developed by Bieri, et al. (1966):

If we wish to predict differences between cognitively complex and simple subjects on a given task, we think it is of value if the task itself can be analyzed in terms equivalent to those used in conceptualizing the variable of cognitive complexity. One result of this kind of coordinate analysis is that we begin to think of our structural variable as a more specific \textit{italics} cognitive ability, rather than as a general trait that will express itself in any given segment of social behavior (p. 17).

Schroder, et al. (1967) also indicate that differences between domains may result in differing levels of complexity for each:

Structural variables measure the nature of the relationship between a person and the objects in his world. Consequently, in any area—political, religious, interpersonal—of the life space we can measure the level, or the integrative complexity, of the conceptual rules for processing information (p. 9).

This carries the implication that levels will differ between areas, or domains. In the context of possible training to develop greater complexity, Schroder and Suedfeld (1971) state:

These long-term training effects in a domain (e.g., in the interpersonal or moral domain) result in the development of more or less stable dispositional information processing structures (p. 263).

Some research on the stimulus variable which would affect level of complexity has been done with Bieri's REP test. Miller
and Bierl (1965) compared complexity on two clusters of role models: socially distant models were differentiated more highly. Turner and Tripodi (1968) compared complexity of therapist's judgments of clients and friends, finding greater differentiation for clients. Irwin, Tripodi, and Bierl (1967) used the REP test as a measure of differentiation among persons with negative affect and those with positive affect. More differentiation was found among those perceived with negative stimulus values than among positively valued persons.

Since the Schroder test comes complete with stimuli, and these are all interpersonal, no research has been done using his test with stimuli from different domains--interpersonal and conceptual. This is a particular sense of "domain," somewhat different from content area; however, it is not possible to use a specific content area for Schroder's test since the scoring has only been validated on a limited number of sentence stems.

If significant correlations are not found within each content area across measures, but are found within each measure only, then either the scores reflect nothing more than method variance, or the instruments are measuring different process variables which are relatively independent of stimuli and of each other.

As Streufert and Driver (1967) point out in an article attempting to analyze the problems in measuring cognitive complexity, if method variance is the primary component of complexity scores, what explains the fact that the predictions of many
researchers have had significant results? Both the REP test and the PCT have successfully predicted significant differences between high and low complex subjects in attitude change (Harvey, 1964, 1965; Harvey, Reich, & Wyer, 1968; Lundy & Berkowitz, 1957; Streufert, 1966, Streufert & Streufert, 1969; Suedfeld, 1964 (a); Suedfeld & Vernon, 1966; Tuckman, 1965) in person perception (Bierl, 1955; Harvey & Ware, 1967; Leventhal, 1957; Leventhal & Singer, 1964; Rigney, Bierl, & Tripodi, 1964; Streufert, Bushinsky, & Castore, 1967; Tripodi & Bierl, 1964; Ware & Harvey, 1967) and in the study of decision making, both individual (Seiber & Lanzetta, 1964) and groups (Crano & Schroder, 1967; Stager, 1967; Streufert & Schroder, 1965; Streufert & Suedfeld, 1965; Streufert, Streufert, & Castore, 1968; Tuckman, 1964).

A review of this literature indicated a significant methodological difference between validity studies of complexity measures and studies of personality and cognitive correlates of these measures. In the validity studies, correlation and factor analysis were used to assess the generality of complexity. In the study of correlates, researchers using the REP test customarily divided their subjects into two groups, those above and below the median on the REP test and then compared the two groups' scores on what they hypothesized to be the cognitive correlates of complexity. The results of two dissertations point out the possible effects of this difference in analysis: Lloyd (1966) correlated the REP test and Pettigrew's category width, and found no significant intercorrelation; Morano (1965) used the REP test
to divide subjects into the 50 highest and 50 lowest in complexity; he found significant differences between his groups in Pettigrew's category width test.

There are important differences in subject determination in the use of the PCT. Validity studies used all the subjects who were scored on the measure, while most of those studying correlates of the PCT included only those with extreme scores: from 8% to 50% of the total, in most cases, 10%.

In summary, it seems that in order to determine the generality of cognitive complexity, it is necessary to compare the two most common measures, the PCT and the REP test with the same stimuli in order to eliminate the possibility that the low correlations usually found between the two measures are due to their being used with different stimuli (REP-persons, PCT-concepts). In this study the PCT was administered using five sentence stems in which concepts were the stimuli, and five sentence stems in which persons were the stimuli. The REP test was administered with both persons and concepts as stimuli. The Concept Span test, which can be scored both for differentiation and for integration was administered with both person and concept stimuli; since a possible explanation for the lack of correlation between the REP test and the PCT is that the REP test measures only differentiation and the PCT measures integration (Schroder & Suedfeld, 1971) the Concept Span test can test this possibility.

Six possibilities could have occurred:
(a) all measures positively intercorrelate (which would confirm
the position that cognitive complexity is a general, unitary trait, independent of stimuli);

(b) all person scores positively intercorrelate (which would confirm the position that cognitive complexity is stimulus bound and is a general trait in the area of judgment of persons);

(c) all concepts could positively intercorrelate (which would confirm the position that cognitive complexity is stimulus bound and is a general trait in the area of judgment of concepts);

(d) both (b) and (c) which would confirm that cognitive complexity is stimulus bound and is a general trait within each area of persons and concepts, or, to use Campbell and Fiske's (1959) terminology, both convergent (more than one instrument can be used to measure the trait in question) and discriminant (the instrument used discriminates between the trait it is supposed to measure and other traits) validity would be demonstrated;

(e) only methods could intercorrelate (which would indicate either that scores are principally method variance or that they are measuring different elements of cognitive style);

(f) nothing could correlate (which would indicate method variance and stimuli both strongly influence scores).

Should either "e" or "f" result it would be necessary to compare the scores on the REP test, Concept Span-Abstraction (CSA), and Concept Span-Differentiation (CSD) of those having extreme scores on the PCT, since that is the procedure followed by those
using Schroder's measure in research correlating complexity with other personality measures.

It would also be necessary to do additional analyses following the procedure of those using the REP test: subjects would be divided into two groups, those high (above the median) and those low (below the median) on the REP test and their scores on the PCT, CSA, and CSD would be compared.
Chapter II
Methodology

Description of the Measurement Instruments

The instruments used in the study will be described below. Modifications were made in some parts of the instruments to make them appropriate for both kinds of stimuli: person and concepts.

The Bieri Test of Cognitive Complexity. Bieri's modification of Kelly's Role Construct Repertory test was used (Bieri, et al., 1966). This test consisted of a 5 x 10 grid; each of the five columns was identified by a different role type selected to be representative of the meaningful persons in the subject's social environment, such as mother, spouse, etc. Listed at the side of the grid were several bi-polar traits or attributes. In Kelly's original test the subjects generated these traits themselves by considering three of the persons at the top of the grid at a time and deciding in what way two of them were alike and the third different. In Bieri's 1966 version the attributes were provided for the subject. Results highly comparable to those obtained in the free choice method have been obtained in research using the provided constructs version (Tripodi & Bieri, 1963), justifying this procedure. In the stimulus condition of persons each of the columns was identified by a different role type: "the most successful person you know personally," "yourself," "your closest friend of
the opposite sex," "your mother," "a person with whom you worked and you liked." In the stimulus condition of concepts each of the columns was identified by a different concept: "authority," "choices," "rules," "anger," "doubt." The ten rows of bipolar constructs which were provided for both persons and concepts were selected from those used by Bieri; some were reworded to make them appropriate for both persons and concepts. The Bieri and the reworded versions are presented on Table 1.

At the top of the grid, the subject listed the name or initials of the persons in his experience who were identified by each role type, e.g., "Mother I.M.," "Spouse Bill," etc. At the side were the ten bi-polar adjectives; the subject was instructed to place under each person's name the sign and number (+2) which would best describe each person's rating on that adjective continuum:

<table>
<thead>
<tr>
<th>noisy</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>+1</th>
<th>+2</th>
<th>+3</th>
<th>quiet</th>
</tr>
</thead>
</table>

Following this, the subject rated all five persons on the second dimension and so on through all ten rows. Thus each subject made ten ratings for each of the role types, for a total of 50 ratings. The same procedure was followed in the concept condition. Bieri makes use only of role type stimuli, the use of concepts was unique to this research. The concepts used were: "anger," "doubt," "rules," "choices," and "authority."

The preceding procedure yielded a matrix of numbers which represented how the subject perceived and differentiated a group of persons and a group of concepts. Each time a construct number
<table>
<thead>
<tr>
<th>ORIGINAL (BIERI) VERSION</th>
<th>REVISIED (BRENNAN) VERSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Considerate----Inconsiderate</td>
<td>Noisy------------Quiet</td>
</tr>
<tr>
<td>Indecisive-----Decisive</td>
<td>Same</td>
</tr>
<tr>
<td>Excitable------Calm</td>
<td>Stormy---------Calm</td>
</tr>
<tr>
<td>Self-absorbed--Interested in others</td>
<td>Unhelpful------Helpful</td>
</tr>
<tr>
<td>Ill-humored----Cheerful</td>
<td>Sad-------------Cheerful</td>
</tr>
<tr>
<td>Irresponsible--Responsible</td>
<td>Same</td>
</tr>
<tr>
<td>Maladjusted----Adjusted</td>
<td>Unusual--------Usual</td>
</tr>
<tr>
<td>Dependent------Independent</td>
<td>Same</td>
</tr>
<tr>
<td>Outgoing--------Shy</td>
<td>Exterior--------Interior</td>
</tr>
<tr>
<td>Dull----------Interesting</td>
<td>Same</td>
</tr>
</tbody>
</table>
was duplicated in a column it was given a score of 1. The total of these scores for the entire matrix yielded the subject's cognitive complexity score. Scores could range from a low of 20 (cognitively complex) to a high of 225 (cognitively simple). Samples of the REP test are presented in Appendices A and B.

The Schroeder Paragraph Completion Test of Integrative Complexity. The Paragraph Completion Test developed by Schroeder, et al. (1967) consists of stimulus stems such as "Rules...," "When I am criticized...," each of which the subject completes and adds two additional sentences to complete his thought. He is given two minutes to write the three sentences, after which he must turn to the next page. Completions are scored by judges who are trained to use a manual which focuses exclusively on the structural properties of the response. In the test used in this study the stems for concepts were those used by Schroder. They were: (a) "After I get angry...," (b) "When I am in doubt...," (c) "When I have a choice...," (d) "Authority is...," and (e) Rules...". The stems for persons were unique to this study, since it attempted to compare persons and concepts, and so cannot claim the same validity in scoring. However, an attempt was made in developing these stems to use concept stems (such as doubt) in generating each person stem (such as "Some of the things I see in ______ (closest friend of the opposite sex) are confusing.") The person stems were: (a) "I have conflicting views of ______ (the most successful person I know personally)...." (b) "Some of the things I see in _____ (closest friend of the
opposite sex) are confusing..." (c) "There's more than one side to my mother's personality..." (d) "When I think about myself it's not always clear...," (e) "When I got to know ____ (person with whom I worked and I liked) I found I liked some things and didn't like others...."

The person stems were written so as to suggest more than one point of view because pretesting indicated that subjects' responses to stems consisting only of the role type identification, e.g. "My mother..." were universally written from a single perspective, eliminating any individual differences in the scores. Person and concept stems were presented to the subjects in random order in the booklet, each subject receiving the same random order.

Responses were scored in the following manner: those which could be generated by a single rule (perspective) were given a score of 1, those clearly indicating alternative but unconnected perspectives a score of 3, those indicating a relationship between two perspectives a score of 5, and those indicating multiple relationships a score of 7. Points 2, 4, and 6 represented intermediate judgments between these information processing structures. The two highest scores from the group of sentences were added to give the subject's score in each area, persons and concepts. Scores could range from 2 (cognitively simple) to 14 (cognitively complex). Scoring of the protocols obtained in this research was done by trained personnel under the direction of H.M. Schroder, Southern Illinois University. A sample of the PCT is presented in Appendix C.
Conceot Span Test. The Concept Span test was designed by the experimenter following the model used by Mayzner and Tresselt (1955). The subject was presented with 120 words. Listed above the words were five persons: "yourself," "your mother," "your closest friend of the opposite sex," "the most successful person you know personally," "a person with whom you worked and you liked"; or five concepts: "doubt," "authority," "choices," "rules," and "anger." Each of the persons/concepts was identified by one of the letters "A," "B," "C," "D," or "E.

Accompanying the test was an answer sheet with 120 items, each item followed by spaces to mark "A" through "E." The subject was instructed that each of the 120 words listed may or may not have been included in his idea of each of the concepts or in his idea of each of the persons. On the answer sheet, after each of the 120 words, the subject blackened in the space under the letter of the concept(s)/person(s) if they were related in some way to the word. Any letter could have been blackened, a few of them, all of them, or none of them. Two scores were obtained from the test: one for abstraction, the other for differentiation. The Concept Span Abstraction (CSA) score was obtained by summing the total number of spaces blackened after each of the 120 words. This indicated the total number of words subjects saw as related to the five concepts/persons, which was a measure of equivalence range, or abstraction (Pettigrew, 1958). Abstraction scores could range from 0 (cognitively simple) to 600 (cognitively complex).

The Concept Span Differentiation (CSD) score was obtained
by counting the number of words after which 1, 2, 3, or 4 of the 5 spaces were blackened. The rationale for this as a measure of differentiation is as follows: if the subject marked either 1, 2, 3, or 4 of the spaces he was making some kind of differentiation of the relationship of the word to the person/concept—it applied to some, but not all of the person/concept. If none (0) or all (5) of the spaces was marked, no differentiation was indicated. Consequently, the number of words in which one to four spaces was marked was a reflection of differentiation. Differentiation scores could range from 0 (low differentiation) to 120 (high differentiation). Samples of the Concept Span tests for concepts/persons are presented in Appendices D and E.

The Testing Situation

The tests described above were administered in one testing session lasting approximately two hours. Each subject received a booklet containing all three tests and answer sheets in the following order: Schroder's Paragraph Completion Test, Bieri's Rep Test, and the Concept Span test. After preliminary orientation to the booklet, all subjects completed the PCT together as this required timing of each sentence completion; when this was finished each subject completed the REP test and the Concept Span test as his own speed.

Subjects

The sample consisted of 75 male and female subjects recruited from introductory psychology classes during the spring semester of 1972 at Loyola University. Responses of five subjects
were discarded due to incomplete answer sheets.
Chapter III
Results

The data were analyzed in four ways: (a) product moment correlations were computed between subjects' scores on each of the tests described above; (b) Chi square was computed using subjects' scores on the REP test, CSA, and CSD for those subjects with extreme scores on the PCT (extreme scores defined as the top 10 combined person and concepts scores, or those having the same scores as the top 10 scorers, the actual number varying between 12 and 18 subjects); (c) t tests were computed on scores on the PCT, CSA, and CSD between the two groups above and below the median on the REP-person test.

Table 2 presents the four by four matrix of intercorrelations of test by topic and person. Three of the four intercorrelations of the within-method scores, or the validity diagonal, to use Campbell and Fiske's (1959) term, are significant, indicating that, except for the REP test, whatever each test measures is independent of stimuli.

Tables 3 and 4 represent within-stimuli or "Monotrait-Heteromethod" intercorrelations; since only one of these twelve intercorrelations is significant, no convergent validity is demonstrated. Thus possibilities (a) cognitive complexity is a general, unitary trait independent of stimuli; (b) cognitive complexity is stimulus bound and is validly measured by both the
### TABLE 2

**INTERCORRELATIONS OF FOUR MEASURES: TOPIC x PERSON**

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<thead>
<tr>
<th></th>
<th>REP</th>
<th>PCT</th>
<th>CSA</th>
<th>CSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic</td>
<td>Topic</td>
<td>Topic</td>
<td>Topic</td>
<td>Topic</td>
</tr>
<tr>
<td>1</td>
<td>.16</td>
<td>.27*</td>
<td>.20</td>
<td>.14</td>
</tr>
<tr>
<td>2</td>
<td>.22</td>
<td>.24*</td>
<td>.02</td>
<td>.24*</td>
</tr>
<tr>
<td>3</td>
<td>-.11</td>
<td>.16</td>
<td>.59*</td>
<td>.12</td>
</tr>
<tr>
<td>4</td>
<td>-.14</td>
<td>-.36*</td>
<td>.02</td>
<td>.69*</td>
</tr>
</tbody>
</table>

- **Heterotrait-heteromethod Triangles**
- **Validity Diagonal**

*P < .05, two-tailed test.*
TABLE 3
INTERCORRELATIONS OF FOUR MEASURES:
WITHIN STIMULI: PERSON x PERSON

<table>
<thead>
<tr>
<th></th>
<th>REP Person</th>
<th>PCT Person</th>
<th>CSA Person</th>
<th>CSD Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>--</td>
<td>.00</td>
<td>-.01</td>
<td>.09</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>--</td>
<td>.15</td>
<td>.09</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>--</td>
<td>.02</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>--</td>
</tr>
</tbody>
</table>

1. Bierl REP-Person
2. Schroder PCT-Person
3. CSA-Person
4. CSD-Person
### TABLE 4

**INTERCORRELATIONS OF FOUR MEASURES WITHIN STIMULI: TOPIC x TOPIC**

<table>
<thead>
<tr>
<th></th>
<th>REP Topic 1</th>
<th>PCT Topic 2</th>
<th>CSA Topic 3</th>
<th>CSD Topic 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bierl REP - Topic</td>
<td>--</td>
<td>.05</td>
<td>-.17</td>
<td>.14</td>
</tr>
<tr>
<td>2. Schroder PCT-Topic</td>
<td>--</td>
<td>.06</td>
<td>-.07</td>
<td></td>
</tr>
<tr>
<td>3. CSA-Topic</td>
<td>--</td>
<td></td>
<td>.35*</td>
<td></td>
</tr>
<tr>
<td>4. CSD-Topic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Monotrait-Heteromethod Triangle**

*p < .05, two-tailed test.*
REP test and the PCT in the area of judgment of persons; (c) cognitive complexity is stimulus bound and is validly measured by both the REP test and the PCT in the area of the judgment of concepts; and (d) cognitive complexity is stimulus bound and is validly measured by the REP test and the PCT in both the area of judgment of persons and concepts are all eliminated. What is evidenced is that possibility (e) only methods intercorrelate is confirmed for three of the four methods.

A comparison of the heterotrait-heteromethod triangles in Table 2 with Tables 3 and 4, the within-stimulus intercorrelations which would, if significant, have demonstrated convergent validity, reveals that the heterotrait-heteromethod correlations are generally larger and more of them are significant. A surprising finding was the significant positive correlation ($r = +.27$) between PCT-person and REP-topic. These forms of the test are the unmodified versions used by all PCT and REP researchers, and since a high score on the PCT means high complexity and a high score on the REP means low complexity this significant positive correlation would indicate that whatever these two tests measure they are traits which correlate negatively. However, this finding of a negative correlation has not been supported by other studies; Vannoy (1965) for example, found no significant correlation ($r = +.05$) between the PCT and the REP test.

Since convergent validity was not demonstrated using all of the scores, the data were again analyzed following the procedure most commonly used by researchers using the PCT. This
was done in an attempt to discover the reason why measures of the same trait, cognitive complexity, consistently fail to correlate significantly, while researchers using these measures do find significant relationships with the same personality and cognitive correlates for both measures. The scores on the REP test (person), CSA (topic), and CSD (topic) of those subjects having extreme scores on the PCT were submitted to a Chi square test. Table 5 shows that a significant relationship exists between the PCT and the CSD. This supports the significant negative correlations found between PCT (topic) and CSD (person) \((r=-.36)\) and PCT (person) and CSD (topic)\((r=-.24)\).

Following the procedure used by researchers using the REP test, subjects in this study were divided into two groups of high (above the median) and low (below the median) scorers on the REP (person) test. Since the correlation of scores on REP person and topic \((r=+.16)\) did not reach significance, it was judged that the groups should be divided by their scores on the REP person tests alone, since this is the actual Bieri form. \(t\) tests were computed on the scores on the PCT (topic), which is the form used by Schroder, and CSA (person) and CSD (person). Table 6 shows that none of the tests reached significance.

In summary then, the pattern of intercorrelations indicates that the two most common measures of cognitive complexity, Bieri's REP test and Schroder's PCT do not seem to be measuring the same trait. The low correlation between persons and concepts of the REP test indicates that the trait measured by that test is stimulus


<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Score</th>
<th>X²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>1. REP-Person</td>
<td>54.5</td>
<td>53.78</td>
<td>.60</td>
</tr>
<tr>
<td>2. CSA-Topic</td>
<td>161.17</td>
<td>144.17</td>
<td>.23</td>
</tr>
<tr>
<td>3. CSD-Topic</td>
<td>81.25</td>
<td>90.72</td>
<td>5.83</td>
</tr>
</tbody>
</table>

TABLE 5
DIFFERENCES IN REP, CSA, AND CSD SCORES FOR THOSE WITH EXTREME SCORES ON THE PCT - TOPIC
**TABLE 6**

DIFFERENCES IN PCT AND CONCEPT SPAN SCORES OF THOSE ABOVE AND BELOW THE MEDIAN SCORES ON THE REP (PERSON) TEST

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Score</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High (n=35)</td>
<td>Low (n=35)</td>
<td></td>
</tr>
<tr>
<td>1. PCT-Topic</td>
<td>4.34</td>
<td>4.91</td>
<td>1.83</td>
</tr>
<tr>
<td>2. CSA-Person</td>
<td>191.37</td>
<td>188.82</td>
<td>.19</td>
</tr>
<tr>
<td>3. CSA-Person</td>
<td>63.00</td>
<td>62.60</td>
<td>.17</td>
</tr>
</tbody>
</table>
bound. Heterotrait-heteromethod correlations indicate a relationship between the PCT and CSD, and this finding is confirmed in the comparisons of the scores on the CSD of extreme scorers on the PCT. No other relationships were found using the extreme scores on the PCT or using a comparison of a high and low group on the REP test.
The data in this study seem to fit alternative "b" most fully. The negative correlation between the PCT and CSD in the heterotrait-heteromethod triangle and confirmed in the chi square would indicate that if the PCT is measuring integration, then the "differentiation" which is measured by the CSD might better be termed "compartmentalization"--a type of differentiation which is not open to integrating the separate elements into a complex whole.

From his factor analysis of several measures of cognitive complexity, Vannoy (1964) suggests that the differentiation factor in cognitive complexity may be (a) a tendency to "emphasize one or a few judgmental variables (e.g. competence, congeniality) to the exclusion of others as opposed to a tendency to be sensitive to many variables, or (b) a tendency to assign people to two or three positions on a variable as opposed to finer distinctions. It is possible that the first tendency Vannoy is describing is that which is measured by the CSD.

Both Schroder and Bieri discuss differentiation and complexity; however, Bieri does not seem to distinguish the two. Bieri's approach to cognitive complexity-simplicity is developed from the work of Lewin who, as Bieri (1961) points out, looks at two aspects of the structure of a cognitive system: the complexity of its units and its hierarchical organization.

In addition to the complexity of differentiation of a system, we may also speak of its organization. Here Lewin speaks of a more complicated interdependence of parts of the system, in which hierarchical relationships are involved. Thus, one region may exert controlling influence over another region which is not necessarily contiguous to it. This idea of hierarchically organized subsystems is kept distinct, by
Lewin, from the degree of differentiation of the system (p. 358).

Bierl adds that Lewin fails to delineate the relationship between these two major characteristics of a cognitive system. From there on, however, Bierl (1961) disregards the role of organization in the conceptual structure and focuses solely on differentiation both as a measure and a definition of complexity: "Cognitive complexity is a concept which is intended to reflect the relative differentiation of the person's construct system (p. 359)." Ten years later (Bierl, 1971) under the subtitle "Unresolved conceptual issues in cognitive structures" Bierl refers to the role of organization among cognitive structures, lamenting the absence of information regarding this variable.

When differentiation alone is measured and is termed complexity it would seem possible that persons high in complexity in Bierl's sense could be functioning quite differently--some may be able to distinguish differences and integrate those differences into a complex whole; others may merely be perceiving many unrelated, unintegrated, or compartmentalized groups.

Schroder's conceptualization of cognitive complexity has followed Lewin in maintaining the distinction between differentiation and integration, and the independence of these two processes has been increasingly stressed in the ten years since the original development of his theory. In Harvey, et al. (1961) differentiation and integration were discussed as if they varied together:
...the more abstractly functioning individual tends toward differentiating his world into many facets and integrating them holistically but interdependently, the more concretistically functioning person is more likely to make only few differentiations of his environment and to leave these cognitive "elements" in a greater state of isolation...(p. 25).

Six years later, Schroder, et al. (1967) distinguished three "basic aspects" of structure: (a) differentiation: the number of dimensions; (b) discrimination: a fineness of ordering of stimuli along a given dimension; and (c) integration: the complexity of the schemata that determine the organization of several dimensions. Differentiation is considered to occupy an undetermined role in the measurement of abstractness, although "...it is clear that the more dimensions one has the greater the potential for complex organization...(p. 166)." That is as far as Schroder has gone in specifying the relationship between differentiation and integration; unfortunately, a potential relationship cannot be empirically confirmed or disconfirmed.

The way in which the second "basic aspect of structure," discrimination, is related to differentiation or integration is not specified either. Evidently, Schroder is presenting what he considers to be different ways of processing information without specifying the way in which they are interdependent.

By 1971, Schroder and Suedfeld not only referred to differentiation and integration as independent aspects of cognitive structure, but specifically stressed the importance of distinguishing between the processes of organization and differentiation, citing Vannoy's (1965) finding of the factorial independence of
scores of differentiation such as the REP test and scores on the PCT. He offers as "...further evidence for the importance of distinguishing between measures of differentiation and the complexity of integrative factors" an unpublished thesis by Faletti (1968). Two effects were demonstrated: (a) increasing experimentally induced differentiation increased scores on tests of differentiation without changing PCT scores; (b) increasing experimentally induced organizational complexity while holding dimensional scale values of information constant increased scores on the PCT without increasing scores on differentiation. This emphasis by Schroder of the independence of differentiation scores and the PCT measure of integration makes the negative correlation of the PCT and the CSD score very interesting. It seems evident that not only is the term cognitive complexity poorly used to describe a group of independent elements of cognitive style, but that the term and measurement of differentiation is inadequate to describe different and at times negatively correlating elements.

Further research to more accurately delineate the specific cognitive element(s) measured by these instruments is needed, as well as studies of the consistency of these stylistic tendencies with different stimuli and under different demand conditions.
Chapter VI

Summary

The purpose of this research was to study the generality of cognitive complexity across measures and stimuli. Two widely used measures of cognitive complexity, the Bieri Role Construct Repertory test and Schroder's Paragraph Completion Test were used as well as a third measure, the Concept Span test, which was devised specifically for this study to measure two aspects of complexity, abstraction and differentiation. All three measures were administered under two stimuli conditions, and the results were intercorrelated. t tests were computed for the tests between those above and below the median on the REP test, and a chi square test was computed for the scores of those with extremely high and extremely low scores on the PCT.

The only consistent significant correlation found was between the Paragraph Completion Test and the Concept Span Differentiation test. The import of the results and suggestions for further research were discussed.
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Harvey, O. J. Some cognitive determinants of influencibility, Sociometry, 1964, 27, 208-221.


Little, B. Sex differences and comparability of three measures of cognitive complexity. Psychological Reports, 1969, 24, 607-609.


Tuckman, B. Personality structure, group composition, and group functioning. *Sociometry*, 1964, 27, 469-487.


APPENDIX A

INSTRUCTIONS

The persons described below represent specific individuals that you know personally. In each of the numbered spaces at the top of the grid on the following page, write the first name or initial of the person who is correspondingly numbered below on this page. For example, in space 1 at the top of the grid write the name or initials of someone you know personally who is the most successful person you know. Do not repeat any names. If a person is already listed select a second choice.

1. The most successful person you know personally.
2. Yourself.
3. Your closest friend of the opposite sex.
4. Your mother (or the person who has been most like a mother to you).
5. A person with whom you worked and you liked.

You will notice on the page containing the grid there are ten pairs of traits along the right side of the grid. Starting with the first pair (noisy-quiet) you are to decide for each person you have listed the number which corresponds to the degree of the adjective which describes your response to that person. For example, if the first person, the "most successful person you know personally" seems somewhat quiet to you, you would put a +1 in the section under 1. If he/she seems extremely noisy to you, you would put a -3. After you have rated all five individuals on the first pair of traits, repeat the process for the next pair (indecisive-decisive) and so on until you have rated every person on all the pairs of traits. Be sure to rate all persons listed on each pair of traits before proceeding to the next one. When you are finished, there should be a rating in each box. Do not leave any boxes blank.
<table>
<thead>
<tr>
<th>Success</th>
<th>Self</th>
<th>Friend</th>
<th>Mot</th>
<th>Like</th>
<th>her</th>
</tr>
</thead>
<tbody>
<tr>
<td>l.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>+1</th>
<th>+2</th>
<th>+3</th>
</tr>
</thead>
<tbody>
<tr>
<td>noisy</td>
<td>indecisive</td>
<td>stormy</td>
<td>unhelpful</td>
<td>sad</td>
<td>irresponsible</td>
</tr>
<tr>
<td>quiet</td>
<td>decisive</td>
<td>calm</td>
<td>helpful</td>
<td>cheerful</td>
<td>responsible</td>
</tr>
<tr>
<td>unusual</td>
<td>usual</td>
<td>dependent</td>
<td>independent</td>
<td>interior</td>
<td>dull</td>
</tr>
</tbody>
</table>
APPENDIX B

INSTRUCTIONS

The concepts listed below represent ideas with which you are familiar. In each of the numbered spaces at the top of the grid on the following page, write the word or initial of the concept which is correspondingly numbered below on this page:

1. Authority
2. Choices
3. Rules
4. Anger
5. Doubt

You will notice on the page containing the grid there are ten pairs of traits along the right side of the grid. Starting with the first pair (noisy-quiet) you are to decide for each concept listed the number which corresponds to the degree of the adjective which describes your response to that concept. For example, if "authority" seems extremely noisy to you, you would put a -3 in the section under 1. If it seems somewhat quiet, you would put a +1. After you have rated all five concepts on the first pair of traits, repeat the process for the next pair (indecisive-decisive) and so on until you have rated every concept on all the pairs of traits. Be sure to rate all concepts listed on each pair of traits before proceeding to the next one. When you are finished, there should be a rating in each box. Do not leave any boxes blank.
<table>
<thead>
<tr>
<th>Aut-</th>
<th>Chol-</th>
<th>Rules</th>
<th>Ang-</th>
<th>Doubt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hor-</td>
<td>ces</td>
<td>er</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
</tr>
</thead>
</table>

-3  | -2   | -1   | +1   | +2   | +3   |

noisy | quiet |
indecisive | decisive |
stormy | calm |
umhelpful | helpful |
sad | cheerful |
irresponsible | responsible |
umusual | usual |
dependent | independent |
exterior | interior |
dull | interesting |
APPENDIX C

Do not turn this page until you are given the signal

On the following pages you will be asked to complete certain sentences.

On each page you will find the beginning of a sentence and your task is to complete it.

For example: I like...

When you are given the signal turn to page 1. You will be given 120 seconds for each page. After 100 seconds, we will say "Finish your sentence", and at 120 seconds we will ask you to turn to page 2. Make sure you complete your last sentence. There are 10 pages in all. On each page complete the first sentence and write at least 2 more sentences.

Write your sentences as quickly but as clearly as possible. Be sure to write at least 2 more sentences on each page, after completing the sentence begun.
After I get angry
When I am in doubt
When I got to know (person with whom I worked and I liked) I found I liked some things and didn't like others.
When I have a choice
I have conflicting views of ______ (the most successful person I know personally)
Some of the things I see in _______(closest friend of the opposite sex) are confusing
Authority is
There's more than one side to my mother's personality
When I think about myself it's not always clear
APPENDIX D

DIRECTIONS: Below are 120 words. Each of them may or may not be included in the concepts:

A. Doubt
B. Authority
C. Choices
D. Rules
E. Anger

On your answer sheet, blacken in the space under the letter of the concept or concepts you think include(s) that word. You may blacken all the letters or none of them. For example, if the word was "taxes" you would

1. blacken D if you thought it was included in the concept "rules".
2. blacken B & C if you thought they both were included in the concepts authority and choices.
3. blacken all of them if you thought all of them were included.
4. blacken none of them if you thought none of them were included.

1. abnormal 31. art 61. certitude 91. exit
2. absolute 32. ass 62. chain 92. earth
3. abstract 33. baby 63. chance 93. education
4. absurd 34. bad 64. change 94. fear
5. abuse 35. balance 65. chaos 95. fame
6. action 36. beauty 66. child 96. foe
7. advance 37. bed 67. Christ 97. free
8. adventure 38. begin 68. class 98. friends
9. adversity 39. behave 69. clean 99. girl
10. advice 40. belief 70. cock 100. God
11. afraid 41. big 71. cold 101. good
12. afterlife 42. bitch 72. color 102. grow
13. age 43. bitter 73. combat 103. hard
14. aggression 44. black 74. comedy 104. home
15. agree 45. blame 75. command 105. hope
16. alien 46. bless 76. common 106. Jew
17. alone 47. blue 77. complex 107. know
18. ambition 48. body 78. complete 108. learn
19. America 49. book 79. comrade 109. love
20. anarchy 50. bottle 80. conceal 110. man
21. ancestor 51. bound 81. conquer 111. marriage
22. anguish 52. boy 82. contact 112. mind
23. answer 53. broken 83. cool 113. mortal
24. antagonism 54. brother 84. cost 114. nature
25. anxiety 55. build 85. create 115. nothing
26. apprehension 56. burden 86. curse 116. old
27. argue 57. business 87. dance 117. peace
28. Aristotle 58. care 88. death 118. perfect
29. armies 59. cause 89. enemy 119. pleasure
30. arms 60. celebrate 90. evil 120. poor
APPENDIX E

DIRECTIONS: Below are 120 words. Each of them may or may not be related to your idea of the following persons:

A. Yourself.
B. Your mother (or the person who has been most like a mother to you).
C. Your closest friend of the opposite sex.
D. The most successful person you know personally.
E. A person with whom you worked and you liked.

On your answer sheet, blacken in the space under the letter of the person or persons you think are included in that word. You may blacken all the letters or none of them. For example, if the word was "anger" you would

A B C D E
1. abnormal 31. art 61. certitude 91. exit
2. absolute 32. ass 62. chain 92. earth
3. abstract 33. baby 63. chance 93. education
4. absurd 34. bad 64. change 94. fear
5. abuse 35. balance 65. chaos 95. fame
6. action 36. beauty 66. child 96. foe
7. advance 37. bed 67. Christ 97. free
8. adventure 38. begin 68. class 98. friends
9. adversity 39. behave 69. clean 99. girl
10. advice 40. belief 70. cock 100. God
11. afraid 41. big 71. cold 101. good
12. afterlife 42. bitch 72. color 102. grow
13. age 43. bitter 73. combat 103. hard
14. aggression 44. black 74. comedy 104. home
15. agree 45. blame 75. command 105. hope
16. alien 46. bless 76. common 106. Jew
17. alone 47. blue 77. complex 107. know
18. ambition 48. body 78. complete 108. learn
19. America 49. book 79. comrade 109. love
20. anarchy 50. bottle 80. conceal 110. man
21. ancestor 51. bound 81. conquer 111. marriage
22. anguish 52. boy 82. contact 112. mind
23. answer 53. broken 83. cool 113. mortal
24. antagonism 54. brother 84. cost 114. nature
25. anxiety 55. build 85. create 115. nothing
26. apprehension 56. burden 86. curse 116. old
27. argue 57. business 87. dance 117. peace
28. Aristotle 58. care 88. death 118. perfect
29. armless 59. cause 89. enemy 119. pleasure
30. arms 60. celebrate 90. evil 120. poor
APPROVAL SHEET

The Dissertation submitted by Irene Moss Brennan has been read and approved by members of the Department of Psychology.

The final copies have been examined by the director of the Dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the Dissertation is now given final approval with reference to content and form.

The Dissertation is therefore accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

July 26, 1973
DATE

[Signature]
NAME