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COGNITIVE COMPLEXITY: ISSUES AND IMPLICATIONS FOR COMMUNICATION RESEARCH

by

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INTRODUCTION TO COMPLEXITY

Variable Components of Complexity

Cognitive complexity concerns the structures used by an individual to interpret environmental stimuli in order to anticipate future events. This approach to complexity assumes that persons make judgments about their environments by employing systems of bipolar dimensions. The number of dimensions available to the person or differentiation, how finely the dimensions are divided or discrimination, and which dimensions are most important all work together to determine a person's level of complexity or integration.

Differentiation is the term associated with the number of dimensions available to persons for construing environments. Highly complex persons are assumed to possess greater numbers of dimensions with which to construe environments. For instance, a person considering economic, social, ethical, environmental, and political effects of a legislative act would probably demonstrate greater differentiation than a person only considering political expedience.

Discrimination is the term used to describe the number of points at which a person may make judgments along a dimension. In the most simple form, a dimension may be divided into two. Consider the dimension hot-cold. The addition of gradations such as tepid,
luke warm, body temperature, chilly, icy and freezing increase the number of points at which judgments may be made. Beyond this, one could use thermometers of increasing accuracy to demonstrate increasingly fine gradations. In the academic setting, this idea might be demonstrated by considering the difference between evaluation systems reporting pass-fail, A-B-C-D-F, and those which report numerical averages. The latter are more finely articulated than the former. Persons high in complexity are assumed to have more finely discriminated dimensions.

Integration is the term associated with the relative importance of structures and their relationships one to another. Some are relatively important and assume superordinate position in a person's cognitive system. Some assume subordinate positions. Integration involves not only the hierarchy of dimensions but how many ways they may be connected "in order to generate new and discrepant perspectives about stimuli" (Schroder, Driver and Streufert, 1967, 25). To date, only the hierarchical portion of integration has been successfully measured (Smith and Leach, 1972).

The three components of cognitive complexity are interwoven, each contributing to the overall level at which a person functions. Obviously, a person must differentiate dimensions before discriminating along them. It is equally obvious that constructs must exist before they may be integrated. A person who differentiates...
large numbers of constructs but does not discriminate well along them, or does not integrate them well may not be as complex as a person with fewer dimensions which are better discriminated and integrated.

Persons possessing highly complex cognitive systems are assumed to employ more dimensions in construing their environments. The dimensions they employ are assumed to be more finely discriminated than those of less complex persons. The more complex persons are assumed to have more highly integrated systems, more ways of connecting the dimensions which they differentiate for interpreting environmental stimuli.

The dimensions which a person differentiates, the degree of discrimination and the integration of these cognitive structures not only affect the perception of a person's environment, but are affected by perceptions of that environment. Kelly (1955) explained differentiation and integration in terms of a person making sense out of perceived repeated patterns in his environment. Bannister and Mair (1968) suggested that, if existing cognitive structures do not allow interpretation of recurrent perceptions, they are altered. New dimensions may be differentiated. Dimensions may be divided more or less finely. The integration of the dimensions may alter, shifting the relative importance of dimensions and altering their interconnections.
Environmental factors not only affect the development of cognitive systems, but may also affect what portions of the cognitive system are brought to bear in interpreting stimuli. Schroder, et al. (1967) presented several key variables which contribute to environmental impacts upon complexity. The first factor, noxity-eucity, described the perceived potential for the environment to promote unfavorable or favorable outcomes of actions. For example, persons may process information less complexly in frustrating environments, or in environments which they perceive as hostile. They may demonstrate higher complexity in more favorable environments.

The second factor concerned the nature of the information within an environment. Information load concerned the quantity of information presented. If too much or too little was presented, a person was assumed to engage less of his structure, being either bored with, or overwhelmed by the stimuli. Rate of delivery was also assumed to affect complexity. If the information was delivered too slowly, a person might have become bored. If it were too fast, he might have been unable to interpret it and quit trying. Novelty of the information also affected the level at which it was processed. If the situation was extremely new, the person might lack the structures for making sense out of it. If the event were extremely common, the person might attend less.
The final factor concerned whether the organizational context in which the stimuli were presented fostered engagement of more or less complex structures. For instance an educational setting which promoted original or inductive answers to problems was assumed to promote use of more complex structures. A deductive or rote memory learning setting was assumed to promote less use of complex structures.

Based upon the approach to complexity outlined above, this paper will examine the importance of cognitive complexity to the investigation of communication variables. This will be accomplished by examining studies of the correlations of cognitive complexity, measured in several ways, to primacy-recency effects, interpersonal attraction, assumed similarity with others, perspective taking, and the ability to generate persuasive messages.

After examining the interaction of cognitive complexity and selected communication variables, the measures available to assess level of complexity will be examined. Attention will be paid to the theoretical basis for the instruments, the administration and scoring of the instruments, and the kinds of information which may be derived from the instruments. The open ended formats of Schroder et al. (1967) and Harvey (1974) will be examined. Problems with Harvey's objective form (1971) will be discussed. Then Crockett's (1965) measure of complexity and the format proposed by Bieri,
Atkins, Briar, Leaman, Miller and Tripodi (1966), which are the two most commonly employed by investigators of communication variables will be described and compared.

After reviewing the instruments available, a study will be described which proposed to assess the ability of the Bieri, et al. (1966) instrument to provide information regarding subjects' level of discrimination; and to assess generality of Bieri's instrument across content areas. The study involved development of a second grid designed to test complexity in viewing relationships. It incorporated methodological changes designed to increase the accuracy of the Bieri format. Results and implications of the study are presented in the final section of the paper.

Complexity in Communication Research

Mayo and Crockett (1964) examined the relationship between cognitive complexity and primacy-recency effects in the formation of impressions. To assess levels of complexity, the 80 subjects were given a modified version of Kelly's (1955) Rep Test. This procedure asks subjects to consider triads of persons with whom they have relationships and to note significant ways in which two of them are similar and different from the third. The number of constructs elicited is used as the complexity score.

Having assessed complexity in the initial pool, 24 male and 24 female subjects were selected representing equal numbers
demonstrating high and low complexity. These subjects were then presented messages about fictitious persons. One group received negatively valenced messages followed by favorable messages. The other group received the messages in reverse order.

Subjects were asked to rate the fictitious persons using an interpersonal judgment scale. Results demonstrated that persons with high complexity showed ambivalence, or were able to integrate discrepant information about the rated persons, while persons showing low complexity showed "recency effects nearly as extreme as their initial primary effects" (Mayo and Crockett, 1964, 337). This finding indicates interaction between cognitive complexity and persuasion variables such as primacy-recency.

Johnston and Centers (1973) attempted to examine the relationship between cognitive complexity and interpersonal attraction. The Bieri, et al. (1966) modification of the Rep Test was employed to assess complexity levels. This instrument uses a grid format in which subjects evaluate ten stimulus persons drawn from their experience using ten bipolar adjective pairs, provided by the experimenter. Complexity scores are derived by assessing the number of exactly similar response in each column and totalling across columns.

Johnston and Centers (1973) had 44 female subjects fill out the grid format and then examine a grid supposedly filled out by
another member of the group. They were then asked to fill out interpersonal judgment scales.

Results indicated that complex persons rated other complex persons more favorably on the judgment scales than did less complex persons. Simpler persons were rated more favorably by simple subjects than by complex subjects. Cognitively simple persons showed greater attraction to other simple persons than to complex persons. Complex persons demonstrated no difference between attraction to complex or simple persons (Johnston & Centers, 1973, 98-99).

A methodological problem prevents generalization from this study to other experiences. The problem involved not using real persons as stimuli for attraction. Subjects formed impressions based upon examining grids, with which they were unfamiliar, filled out by the experimenters. Results could have been generalized if the authors had assessed levels of complexity and allowed persons to interact with other persons, and then had measured attraction based upon the interactions. If real person-to-person interactions had been studied, implications for communication scholars would be clear. Not controlling for levels of complexity could increase error in research examining interpersonal attraction.

Honess (1976) investigated the relationship between complexity, as measured by the Bieri et al. grid, and the tendency to assume similarity with others. His results indicate that highly complex
persons tend towards greater accuracy in perception of differences between self and others ($r = .27, p < .05$). They were no more accurate than persons with lower complexity in predicting actual similarity. There was a negative correlation between level of complexity and assumption of similarity, ($r = -.37, p < .025$) (Honess, 1976, 28).

The low, negative correlation found by Honess (1976) could account for part of the error variance found in studies of initiating behavior. This could be especially true in studies based upon Cicourel's (1974) discussion of reciprocity of perceptions, which assumed that initiating behavior was based partially upon perceived similarity between self and others.

The finding that highly complex persons do not seem to inaccurately ascribe similarity does not suggest that they cannot. Honess (1976) found that they were not significantly better than less complex persons in noting actual similarities. However, Hale and Delia (1976) reported findings that complexity, as measured by a variation of Crockett's instrument, correlated significantly ($r = .61, 47$ df, $p < .01$) with the ability to take another person's perspective in construing social situations. This suggests a possible relationship between cognitive complexity and ability to predict and explain behavior of others. Such an ability clearly impacts upon the kinds of messages one constructs.
Clark and Delia (1977) assessed levels of complexity in children by having them write descriptions of persons they liked and persons they didn't like, which is a variation of Crockett's (1965) instrument. Children were then asked to create persuasive messages to be delivered to adults. These messages were examined to determine perspective taking and persuasive effectiveness. Findings indicated significant correlations between level of complexity and perspective taking ($r = .48$) and communication effectiveness ($r = .53$, Clark & Delia, 1977, 131).

Although problems exist with this study in terms of rating the effectiveness of messages generated by children, the authors claimed relationships between complexity and persuasive abilities. As seen above, complexity may interact with effects of persuasive messages upon subjects (Honess, 1976). The combination of these findings suggests complexity levels could be assessed in subjects of persuasion research to further specify results.

The increased investigation of interaction between complexity and communication variables has yielded findings which, although not conclusive, suggest the importance of complexity to the outcome of communication research. Relationships appear to exist between complexity and primacy-recency effects; between complexity and assumed similarity; between complexity and perspective taking; between complexity and interpersonal attraction; and between complexity and
message preparation. Complexity impacts upon the variables investigated by communication scholars. Measuring complexity may help to explain results of studies in these areas by reducing error variance, and more clearly specifying results.
INSTRUMENTS FOR ASSESSING COMPLEXITY

Since complexity may interact with communication variables, it is important to consider the instruments available for assessing levels of complexity. Consideration should be given along two lines. One should consider the construction and scoring of the instrument. More importantly, one should consider what kinds of useful information are provided by the instrument.

As Honess (1976) pointed out, research efforts in communication have largely employed the grid development by Bieri, et al. (1966) or Crockett's (1965) instrument. Before examining the relative merits of these instruments, two other instruments bear consideration.

Information Processing Measures

Schroder, et al. (1967) and Harvey (1974) approached complexity as one of several variables in what they called information processing. Both based their work on personality theory. Both employed open ended response tests to assess level of processing.

Schroder, Driver and Streufert (1967) employed three sentence stems: one about doubt; one about rules; and one about criticism. Subjects were allowed two minutes to complete each. Raters examined responses and classified subjects into one of seven categories.
Reliability and validity work on this instrument is scant. Beyond that, the subjective scoring of responses necessitates the training of raters, increasing difficulty of scoring as opposed to objectively scored instruments. The instrument provides relatively little useful data when compared to the lengthy and complex theoretical position assumed by its proponents (Schroder, et al., 1967). Persons are categorized as to level of complexity, but this does not provide information to assess which of the variables of complexity contribute most to the categorization. Differentiation, discrimination, and integration are all lumped together.

Many of the problems discussed above equally apply to Harvey's instruments. Harvey (1974) also employed a timed, sentence completion test. He asked subjects to respond to stems such as "This I believe about the American way of life," or "This I believe about revenge" (Harvey, 1974). Responses were rated in terms of abstractness and subjects were categorized into one of four levels of processing. Subjective rating and relatively small amounts of useable data mitigate against use of this instrument.

To circumvent the problems of subjective rating, Harvey (1971) attempted to develop an objectively scored form of his instrument. To do so, he extracted responses from previous subjects which he felt were representative of the four categories and from detailed case histories of subjects as to beliefs and developments. Subjects
were asked to indicate agreement with the statements using five point scales. Harvey found this unable to distinguish well between persons in the upper levels of complexity. He believes that persons at lower levels of processing can select responses typical of higher processors, but could not generate the statements in an open answer form.

**Measures Applied to Communication**

The two most frequently used measures by communication scholars are relatively easy to administer. Both grew out of personal construct theory. Crockett's (1965) still relies on subjective rating, while the Bieri et al. (1967) instrument is objectively scored. Significant differences in format and yielded information exist.

The Crockett (1965) instrument required the generation of written descriptions of persons liked and disliked. The number of constructs visible in the descriptions was totalled and used as a complexity score. The procedure was simple. Interrater reliability and test retest reliability coefficients were reported beyond the .90 level (Crockett, 1965; Hale and Delia, 1976; Clark and Delia, 1977). The test was developed out of Kelly's (1955) works and strong links between the two have been claimed (Crockett, 1965). In sum, there are arguments available to those wishing to use this instrument.

There are also arguments available to opponents of its use.
Honess (1976) asserted that the test was confounded by verbal facility. This awaits experimental verification but seems reasonable in a test asking subjects to generate verbal descriptions of others.

Even if the instrument were not confounded by verbal facility, the dearth of information provided by results makes its use questionable. Responses are examined for number of constructs. This approaches a measure of differentiation. It provides no measure of how the dimensions or constructs are employed. It provides no measure of how well these constructs are discriminated, or at how many points a person makes judgments using the construct. It provides no useable information in regard to the integration of the constructs, or which are subordinate and which superordinate. The rank ordering of subjects in terms of this procedure would be risky since it has the potential of measuring only one of the complexity components described by Crockett (1965).

The Bieri et al. (1966) instrument has the potential of providing much more useable information. Subjects are asked to fill out the grid as described previously. Scores of differentiation are derived by assessing the number of paired ratings within the columns of the grid. Unlike the Crockett instrument, the differentiation score is not the only score derived from the Bieri grid. Since the grid analysis can provide several kinds of useable information, it warrants thorough consideration.
This instrument was developed out of Kelly's (1955) Rep Test, to serve the needs of experimenters dealing with larger experimental populations. Kelly's test elicited constructs from the subjects. Bieri's provides them. This variation is deemed justified by the finding that the tests correlate significantly at the .05 level. This correlation represents evidence of convergent validity. Until the reliability of the measure is established, no adequate interpretation of this correlation may be made.

It is unclear that test retest reliability procedures are appropriate to Bieri's instrument. This approach assumes temporal stability of the quality measured. Complexity may be developmental (Crockett, 1965) and may vary with environmental factors and subject matter (Crockett, 1965; Schroder, et al., 1967). It is possible that asking subjects to rate persons with whom they relate stimulates reflection about the persons which could alter ratings of the persons.

To determine whether test retest reliability is an appropriate procedure for measures of complexity, one would have to directly assess the impact of environmental factors upon complexity. One could assess the impact of noxity-eucity, information load, and organizational setting by varying these factors and measuring the correlations of tests administered under different conditions. If tests correlated highly, one could assume that complexity is
a stable variable. Then test retest procedures would be appropriate. If complexity were found to vary with environmental factors, one could assess which combination of factors correlated with optimal complexity. Then one could design a setting to control those environmental factors in both the test and retest situation.

Alternate form measures of reliability seem virtually impossible for this measure. It would be extremely difficult to derive for each subject role types which would cause them to generate nearly similar persons. For instance, the provided role type "Mother" (Bieri, et al., 1966) would be impossible to duplicate for most subjects.

Internal consistency measures suffer from the same difficulty. The test was designed to assess constructs employed in construing a variety of types of persons with whom the subjects interacted. In no way are the role types assumed to contribute equally to the total scores for complexity. Since this assumption is not met, internal consistency measures are inappropriate.

If one were interested in attempting to modify the grid method to assess reliability from an internal consistency basis, one would have to alter the elements or role types presented for rating. One could present equal numbers of intimates, persons liked, persons disliked, and persons subordinate and superior. One could then separate these elements and measure their contribution to the total score.
Having questioned the appropriateness of applying the three prominent means of assessing reliability of the existing format, it remains problematic as to whether or not the reliability of the measure may be directly assessed. Until reliability may be directly and adequately assessed, validity may not be directly assessed. There is, however, some evidence for the validity of the measure.

The correlation of the Bieri instrument to Kelly's instruments was noted above. Contradictory evidence was proposed by Bavelas, Chan and Guthrie (1976), who reported correlations of around .22. The problems of this study were massive. In terms of convergent validity, the chief problem was the attempted correlation of a 19x19 Kelly test with a 10x10 Bieri grid. As noted above the stimuli persons presented in the Bieri format are not assumed to contribute equally to the total score. There was no indication that all ten stimuli persons from Bieri's test appeared on the Kelly test, and there were at least nine persons appearing on the Kelly test who were not rated on the Bieri instrument. Such a procedure cannot be claimed as a test of convergent validity.

It is insufficient to assume validity of an instrument by assessing convergent validity alone. It must also be demonstrated that the instrument discriminates between what it measures and other traits or qualities. There is evidence suggesting discriminate
validity of Bieri's test. It has been shown to have low correlations with verbal intelligence and verbal facility (Bavelas, et al., 1976; Smith and Leach, 1972).

Evidence for the predictive validity of the instrument was reviewed in the first section of this paper. Results of reviewed articles suggest that Bieri's test correlates as it should with other variables.

Evidence of the validity of Bieri's instrument is by no means conclusive and will remain inconclusive until appropriate means of testing reliability are developed. The decision to employ the measure would rest, then, upon whether the test provided information about various components of complexity.

Several kinds of information may be derived from the Bieri test. Like Crockett's, it provides information regarding differentiation. It goes beyond to provide information on how the constructs are used, and several other measures, such as hierarchy, liked and disliked persons, information complexity, and discrimination.

Smith and Leach (1972) have developed a measure of hierarchy which may be derived from responses on the Bieri grid. Low correlations between differentiation scores and hierarchial scores indicate independently functioning components of complexity.

Seaman and Koenig (1974) reported means of deriving information about how persons perceive liked and disliked persons based on the
grid. They advocated the use of Fiedler's most preferred and least preferred measure, which assesses dissimilarity of ratings of liked and disliked persons. Such information could be useful to those studying attraction or dyadic communication between intimates.

Seaman and Koenig (1974) also suggest application of Scott's methodology for measuring information complexity based on the grid. Such a procedure yields information regarding information used in rating each of the stimuli persons.

Finally, discrimination scores may be derived from the grid. One simply applies the matched pair technique used in assessing differentiation to the rows of constructs instead of the columns. Once again, it would be assumed that identical ratings indicate functional equivalence. Seaman and Koenig (1974, 380) suggest the possibility of scoring the grid in this manner and note low, positive correlations between differentiation and what they term person complexity. No reference was made to studies from which this correlation was drawn. It was clear that the authors did not recognize the measure as one of discrimination, as Pettersen (1977) suggests. They did not analyze it in their study or mention it beyond a brief footnote.

The Bieri instrument offers considerable information to the communication scholar. It can yield information regarding
differentiation, integration, discrimination, information complexity, and the different ways we rate those liked and disliked. Beyond information advantages, the Bieri test has been shown to be adaptable across target populations and subject matter.

Vaac and Vaac (1973) modified the instrument for use with children. Role persons were modified to approximate children's experiences. Constructs were worded in a manner felt appropriate to the reading level of the subjects. The test was correlated with Bieri's in a test of college students who filled out both forms. Correlations were significant but low (r's = .51 to .55) (Vaac and Vaac, 1973, 775).

Epting (1972) met with less success in attempting to modify the grid to a different content area. He developed a grid to test complexity in viewing social issues. He provided the social problems to be evaluated as well as the constructs with which to evaluate them. While standardizing stimuli which allows comparison across, this eliminated the guarantee that subjects were aware of or had considered the stimuli. It would seem more appropriate to have elicited stimuli from the subjects, thereby having them rate issues with which they were familiar rather than such topics as "Establishing a United States of Europe", or "Increasing teachers' salaries" (Epting, 1972, 123).
The failure to elicit relevant stimuli may account for the low correlation (.39) between Epting's measure and Bieri's. It is possible but cannot be claimed that the low correlation indicates different complexity levels for different content areas, as has been theoretically suggested (Crockett, 1965; Schroder, et al., 1967). Careful investigation of the difference of complexity associated with content domain should be based on stimuli elicited from subjects and, as Gibson (1975) noted, and should employ constructs representative of those used by the target population. Epting suggested that his constructs were representative of those used in construing social situations, but failed to say by whom. They may have been derived from students of social science and not applicable to the general college population.

Based on the discussion above, two questions arise in regard to the Bieri format. First, what is the correlation between discrimination scores derived from rows and differentiation scores derived from columns? Second, can alternative forms of the instrument be developed for the study of other communication variables?

The first question is intended to determine whether discrimination can be measured from the grid format. As noted, Seaman and Koenig (1974) footnote a correlation of .35 between column and row scores, but do not recognize that row scores represent a test of discrimination, or how well articulated the dimensions are which a person uses.
The correlation between these scores would have two components. First, shared methods variance would contribute to the correlation. This problem has been noted as a distinct disadvantage of Kelly's (1955) test (Bavelas, et al., 1976). The second component would be actual interaction between differentiation and discrimination. Low correlations would indicate depressed shared methods variance and functional independence of the complexity variables. High correlations would indicate the opposite and suggest that one need not separately investigate discrimination.

Answering the second question should yield information as to the generality of the Bieri format. An alternate form would have to tap domains different from person perceptions which are tapped by Bieri. It would have to elicit the stimuli from the subjects in the manner employed by Bieri. It would have to provide constructs relevant to the target population.

If these criteria were met and low correlations between the alternate forms were found, the following would be suggested. First, shared methods variance would be minimized as a source of error. Second, the notion that level of complexity varies with content area would be supported. Finally, it would suggest that researchers concerned with complexity should develop measures of complexity relevant to the content domain of other measures they wish to employ. For example, an adaptation of Epting's (1972)
work might be appropriate for measuring complexity if one were interested in political communication.

Bieri's instrument has the potential for providing several kinds of information regarding cognitive complexity of subjects tested. The information regarding discrimination scores needs formal testing which will be provided in this study. Bieri's test seems adaptable to different populations. It may be adaptable across content domains. This question will be examined by this study.
Modification and Development of Instruments

To test the research questions presented, a second form of Bieri's instrument was developed. Four changes were made in the original Bieri instrument to bring it into line with current literature. The changes were also incorporated in the alternate form.

The first change was to add a midpoint to Bieri's six point scale. This modification was suggested by Bavelas et al., (1976) who noted that the lack of a midpoint prevented indication of neutrality on or irrelevance of the construct. It is recognized that inclusion of midpoints does not separate the intended use of that point. However, it represents a significant improvement over the form without it. Without a midpoint, irrelevance and neutrality were lumped in with other scores which may have been placed in adjacent spaces. This tended to increase error variance and decrease the reliability of the instrument, since subjects may well mark neutrality in different places and do so differently on subsequent administrations of the instrument. Scoring based on exact pairs compounds this problem.
Figure 1. Person Perception Grid
The second change was to substitute letters a-b-c-d-e-f-g for numbers +3 to -3. It was felt by Pettersen (1977) that indication of valence preference of the experimenter might bias response patterns of subjects. Letters were substituted in an attempt to circumvent this problem.

A third change was to modify Bieri's list of role types. Changes were made to include types felt to be more relevant to college populations. Changing the stimuli persons is sanctioned by Kelly (1955) and Seaman and Koenig (1974). Self was eliminated from the list of role types for this study to allow comparison of ratings of persons and ratings of relationships. Ratings of relationship with self was felt to pose interpretive problems.

Finally, the constructs provided to rate the stimuli persons were altered. The constructs used by Bieri, et al. (1966) were said to have been derived from a group of sociology students. Bieri did not elaborate on the method of eliciting them. Half were maintained. The rest were drawn from the ten most commonly indicated on adjective check lists by college students (Pettersen, 1977).

The alternate form of the grid employed the features described above with the exception of the constructs provided for construal of relationships. Role persons were identical.

Instead of constructs for evaluating person perceptions, the second form included constructs designed to test construal of the
Figure 2. Relationship Perception Grid
relationships of the subjects to the stimuli persons. To select constructs for the alternate form, literature on relationships was reviewed, and a list of 29 constructs was extracted. The list was presented to a class of undergraduates studying helping relationships. They were asked to indicate the five felt most important in describing relationships. They then were asked to use the five in rating the ten role persons from complexity tests they had previously completed.

To be included, constructs had to be used by one quarter of the class. In their use, ratings had to fall on both sides of the midpoint. There had to be a three point difference between the positive and negative extreme ratings.

By this procedure of selecting constructs, it was felt that they would be characteristic of the population as Gibson (1975) suggested. It was further felt that the constructs had demonstrated useability in a grid format.

Subjects

Subjects were 58 undergraduate students at the University of Montana enrolled in one of two sections of a beginning public speaking class or one section of an introductory human relations class. These courses are required by many departments at the university and draw students from a variety of academic disciplines and academic levels.
**Procedures**

Subjects were presented with both forms of the grid at the same time and asked to place the initials of real persons from their experience by the description of the stimuli persons. The initials were placed on both forms. This ensured that subjects rated relationships and person perceptions of the same individuals. The subjects all completed the grids on the same day during class time. Having the grids completed at the same time in classroom settings was an attempt to control environmental factors. Information load, rate and novelty were assumed constant. The organizational setting was assumed to be similar. The noxious-eucity dimension was not controlled or measured. Subjects first completed the person perception grid. This was collected before they began completing the relationship grid to prevent reference between the forms.

All tests administered were correctly filled out. No subjects had to be eliminated.

Tests were scored in the manner suggested by Bieri, et al. (1966) to assess differentiation levels for subjects on each test. Discrimination was assessed by applying the same exact pair procedure to the rows of the grids. Subjects were rank ordered in terms of these scores.

The Spearman rho was used to calculate the correlations between differentiation scores to determine content independence. Correlations
were calculated between differentiation and discrimination scores to determine shared methods variance and interaction between the variables. Correlations between discrimination scores were calculated to assess whether discrimination generalized across content domains.

The Spearman rho was selected due to the nature of the data. The scores of the Bieri instrument do not meet the criteria for interval data. The rho was selected over Kendall's tau because Kendall's tau tends to be more conservative. In an instance where low correlations would be desirable results, a conservative instrument might increase the possibility of erroneous findings.
RESULTS AND IMPLICATIONS

Results

Spearman rho correlations for the variables studied are presented in the table below. All correlations were statistically significant beyond the .05 level. The correlation between discrimination scores on the person perception grid and the relationship perception grid described above was .35. The correlation between differentiation on the two grids was .33. The correlation between discrimination and differentiation within the person perception grid was .54. Differentiation and discrimination within the relationship grid were correlated at .46.

| Table 1. Spearman rho correlations within and between differentiation and discrimination on person and relationship perception grids. |
|---------------------------------|-----|-----|
| df                             | r   | p   |
| Differentiation of persons to  | 56  | .33 | .01 |
| differentiation of relationships|     |     |     |
| Discrimination of persons to   | 56  | .35 | .005|
| discrimination of relationships|     |     |     |
| Differentiation of persons to  | 56  | .54 | .0005|
| discrimination of persons       |     |     |     |
| Differentiation of relationships to discrimination of relationships | 56  | .46 | .0005|
Implications

The low correlations between discrimination and discrimination, and between differentiation and differentiation, measured on the two tests, suggests that these components of complexity operate independently across content domains. The common variance as measured by the square of the correlations is .11 for differentiation and .12 for discrimination. This finding suggests that persons investigating relationships between complexity and communication variables should operationalize complexity in terms of the content domain relevant to the communication variables studied. A person perception format would be appropriate to investigations of complexity and perspective taking (Clark and Delia, 1977) or impression formation (Crockett, 1965). A relationship format might be more appropriate to social prediction research (Honess, 1976). A modification of Epting's (1972) work might be appropriate to the investigation of political communication research.

The correlations between discrimination and differentiation within each form of the test present problems in interpretation. If the correlations were caused by shared methods variance, they should have approximated the correlations of the variables across forms. The results may have been caused by a real relationship between the two variables. An alternative interpretation is that the grid format does not specify the difference between the variables.
Further investigation is needed to determine which of these possible explanations is correct. To test alternatives, one could administer the grid format, and another measure of discrimination. Several were described by Schroder, et al. (1967, 174-179). Correlations could then be calculated between the discrimination scores and between the grid differentiation score and each of the discrimination scores. These correlations would yield information about the sensitivity of the grid to the measure of discrimination, and the actual relationship between discrimination and differentiation. Until such work is done, it is premature to answer the question of whether the grid measures levels of discrimination.

Scoring Problems

Although this study has produced evidence that suggests that complexity may vary across content domains, and evidence that it is somewhat sensitive to the measure of discrimination, further refinements could be made to improve the accuracy of the information it provides. While scoring the grids, the author noted that the exact pairs method allows persons to achieve the same score for a column in several ways. For instance a score of 12 could result from a person having rated a role type "A" on four constructs, "B" on four constructs, "C" on one construct and "D" on one construct. The same score could have been derived from a column in which the person rated a role type "A" on five constructs, "B" on two constructs, "C" on
Figure 3. Scored Grid
two constructs and "D" on one construct. Further examples are contained in the grid on the preceding page.

A possible alternative for scoring the columns might be to calculate the standard deviation of the scores within a column as suggested by Pettersen (1977). This would provide information about the dispersal of ratings, but would still not provide adequate distinctions among subjects. A column using the first three elements would be scored in the same manner in which the last three or the middle three were used. In some manner, that difference needs to be identified. Adding a mean would specify which portion of the scale was employed but would present problems in deriving a total score for complexity.

The original scoring procedure was predicated upon the assumption that constructs rated the same in a column are functionally equivalent. When one alters the scoring method to determine the deviation of the scores, this assumption is violated, which raises an issue of validity.

Perhaps some combination of exact pair rating and measure of dispersal could provide a scoring method which more finely specifies results. The issue remains problematic and awaits further investigation.
SUMMARY

An approach to cognitive complexity was presented which is based upon an integration of the works of Kelly (1955), Bieri et al. (1967), Schroder, et al. (1967), Crockett (1965), and Harvey (1974). The approach assumed that differentiation, discrimination and integration were the three major variable components of cognitive complexity. The effects of environment upon complexity were discussed in terms of development and modification of cognitive systems, and in terms of the impact of environment upon the portions of the cognitive system used in interpreting stimuli.

Selected research aimed at identifying the relationships between complexity and several communication variables was described. The studies presented concerned such variables as primacy-recenty effects, interpersonal attraction, assumed similarity with others, perspective taking, and the ability to generate persuasive messages.

Instruments for measuring complexity were presented and criticized on the basis of method of scoring, and the kinds of data yielded by the scored. The information processing measures (Schroder et al. 1967; Harvey, 1971, 1974) and the measures commonly used in communication research were reviewed. The measure developed by Bieri et al. (1967) was selected for further investigation based upon a superiority
in terms of objective scoring and yielded information.

A study was described which was designed to approach two questions. Did the grid format measure variance of differentiation and discrimination across content areas? Was the format designed by Bieri et al. (1967) able to separately assess levels of differentiation and discrimination within content areas? A second form of the grid was developed based upon perceptions of relationships to test these questions.

Results indicated that differentiation and discrimination correlated at low levels across content areas. Higher correlations were found between discrimination and differentiation within the two forms of the grid. The first result was interpreted as suggesting that research into the relationship of complexity and communication variables should employ measures of complexity designed to measure complexity in terms of the communication domain with which it was to be correlated. The need for further investigation to specify the actual relationship between differentiation and discrimination was discussed.

The problems of scoring the grid format were presented. These centered around the exact pairs method employed yielding identical scores from different ratings. A possible alternative and its shortcomings were presented.
BIBLIOGRAPHY


