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# SIMILARITY OF ATTRIBUTE STRUCTURES AND FACILITY OF COMMUNICATION

Mark and Strangent

by

John W. Condon

## A DISSERTATION

Submitted to Michigan State University in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Department of Psychology



## ABSTRACT

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### SIMILARITY OF ATTRIBUTE STRUCTURES AND FACILITY OF COMMUNICATION

by

John W. Condon

The primary focus of this research was an exploration of the hypothesis that the effectiveness of communication between two people is a function of the degree of overlap in their phenomenal worlds. Scott's (1962, 1963, 1966, 1969, 1974) conception of cognitive structure was used as the basis for the development of an index of similarity of cognitive fields. In Scott's model, the principal elements of cognitive structure are a related set (domain) of objects and the attributes by which a person comprehends those objects. People can differ both in the number of distinct attributes needed to account for the objects and in the relatedness of particular attribute pairs. The index of similarity of attribute structures accounts for these two types of between person differences.

The domain of persons (acquaintances) was chosen for comparisons of attribute structures. This choice was dictated by evidence of both multidimensionality and a broad range of individual differences in this domain. Relevant literature on implicit personality structures was reviewed.

Two tests of the attribute similarity - communication



John W. Condon

hypothesis were accomplished. Each of these studies used 28 (acquaintance) by 20 (attribute) matrices which were completed by each subject as input to the structural similarity index. The index itself was the reflected profile difference between two intrasubject interattribute correlation matrices.

In Study I a communication situation common to the university setting -- classroom instruction -- provided the context for the first test of the primary hypothesis. Attribute structures of students were compared to those of their instructors. As predicted, students who were more structurally similar to their instructors received higher course grades. Two attitude scale measures of communication effectiveness were unrelated to structural similarity. A predicted relationship between the structural similarity by grade interaction and a measure of interpersonal attraction was not observed.

Study II was a more controlled laboratory test of the structural similarity - communication relationship. Female subjects who were paired on the basis of either extreme similarity or extreme dissimilarity of structure played a communication game. Structural similarity did not predict either length of time or number of trials to criterion in this communication task. However, overall success of communication was related significantly to the structural similarity of the dyads. N .. 1. 1.

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The combined results of Studies I and II provided a reasonable degree of support for the communication hypothesis.



In memory of my father who nurtured my curiosity and with whom I first shared explorations in cognitive space.

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#### ACKNOWLEDGMENTS

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If I had a nickel for each time I dropped in on Larry Messe', Neal Schmitt, and Ray Frankmann for "just five minutes" and then stayed for an hour, I would have no need for employment for a number of years. These conversations have been an important part of my education.

Hours spent with Vic Battistich discussing areas of common interest have helped to focus my thinking. The opportunity to converse with him frequently will be missed.

Paul Weisbord has provided unique and valued perspectives on many issues over the past few years. He has contributed much both to my professional education and to my personal growth.

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Thanks to John Sivacek for sharing so many unusual events, for his wit, and for teaching me a lot of social psychology.

Finally, a special thanks to Vicki Holmes for patience, understanding, and love during the months of long hours and little sleep it has taken to complete this research. and my construction of the second second

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## INTRODUCTION

## Communication and Social Behavior

Communication may be the most fundamental of all social acts. At a minimum, it provides the medium through which individual behavior acquires social relevance. For a long time, social philosophers have recognized the important implications of reciprocal understanding for social actions (Cooley, 1902; Mead, 1934; Weber, 1947). Weber (1947) even suggested that behavior is social only to the extent that communication is successful and intended meanings are exchanged. This does not imply that imperfect communication does not have social consequences. Rather, interaction which is not characterized by a state of mutual understanding has different connotations for, and induces divergent expectations in, each of the participants.

Given these considerations, it seems that a better understanding of social behavior might be gained by examining the antecedents of effective communication with an emphasis on the extent to which similarities and differences in the ways people construe events affect their interactions.

It is probable that an individual's own experience sets



an upper bound on that person's ability to comprehend the meaning of another. That is, in order to be able to understand completely the intent of another's statements, one must have some way of adopting that person's point of view. Therefore, <u>communication effectiveness should be a</u> <u>function of the degree of overlap in the phenomenal worlds</u> <u>of the communicators</u>. An exploration of this proposition is the primary focus of the present research.

### Cognitive Similarity and Social Behavior

A few psychologists have studied cognitive similarity and social interaction. Some have been concerned with the link between such similarity and interpersonal attraction (Bryson, 1977; Johnson & Tesser, 1972; Tesser, 1971, 1972). Both Runkel (1956, 1963) and Triandis (1959a, 1960a, 1960b) have dealt specifically with the relationship between cognitive similarity and communication processes. In fact, Runkel has asserted that the general form of the hypothesis that, "similarity of structure between two cognitive fields increases the efficacy of communication between them ... is no doubt as old as communication." (1956, p. 179).

Discussion of the work of these researchers will be delayed until some relevant definitions have been supplied and other areas of research have been explored for information that might help to provide a framework for coming to terms with the question at hand.

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## Cognitive Structure

If this investigation is to achieve its purpose, a clear delineation of what is meant by "the phenomenal worlds of the communicators" is required. Fortunately, partly in response to Abelson & Rosenberg's (1958) call for better specification of the various aspects of cognitive structure, psychologists have developed theoretical formulations which will help to provide an operational definition of phenomenal world.

Zajonc (1968) conceived of an individual's cognitive structure as specific to a particular referent at a single point in time. With that stipulation of temporal instability, he provided the following:

The components of cognitive structure are <u>attributes</u>. For purposes of analysis, it is assumed that a person perceives objects and events in terms of <u>psychological</u> <u>dimensions</u>. A psychological dimension is <u>one's</u> <u>capacity</u> to map consistently a set of responses onto a collection of stimuli that is itself ordered. A specific act of "perceiving" or "cognizing" a given stimulus object or event is regarded as involving the projection of the stimulus onto a set of psychological dimensions, and thereby attributing to it one value from each of these dimensions. These projected values, attributes, are the elements of the cognitive structure under analysis. They are what is commonly understood by the traits, characteristics, qualities, etc., of the object, event, or concept, as the person perceives them. (Zajonc. 1968, p. 328, empahsis in original.)

Zajonc also suggested that the attributes and organization of a cognitive structure might be explored through the use of free response techniques followed by more focused probing by the investigator.

A more comprehensive treatment of cognitive structure



are one that will provide the basis for much that is to follow -- is found in the work of Scott (1962, 1963, 1966, 1969, 1974). Scott has presented a well-developed model of the structure of cognition with precise explication of the types of operations required to quantify its components. Scott's conception differs from that of Zajonc in its assumption of relative stability of cognitions with respect to a particular domain of objects. According to Scott, "A cognitive domain consists of phenomenal objects which the person treats as functionally equivalent and the attributes by which he comprehends those objects." (1969, p. 262). Central to this formulation are the concepts of image, attribute, dimensionality, articulation, differentiation, and centrality.

## Object Images

Images or "phenomenal objects" (Scott, 1969) are points in multidimensional Euclidean space which reflect different quantities of the various attributes relevant to the domain under consideration. Although Scott was careful to distinguish between objects themselves and concepts of objects (images), it will be less cumbersome to refer hereafter to <u>objects</u> in the cognitive space, keeping in mind that the reference is really to the representations of those objects in the individual's cognitive structure. An object, then, is defined by specific quantities of each attribute of the domain. Two objects which are characterized by the same



quantities of each attribute cannot be discriminated (Scott, 1969, 1974).

## Attributes

Attributes or "attribute concepts" (Scott, 1962) are lines in this same multidimensional space. They are the structural dimensions representing the qualities which are assigned to -- and give meaning to -- the objects. The orientation of the dimensions depends on the distribution of the objects. The objects have projections on the attributes, and the relatedness of two attributes is simply the angle described by the two dimensional representations of these attributes. The more acute the angle, the closer the relationship, and meaning, of the attributes. This point will be important later in the development of an index of structural similarity. Scott did not state specifically that the attributes must pass through a common origin, but this seems to be a reasonable requirement. Also, it provides an opportunity to limit, operationally, membership in a domain to those objects which do not fall at the origin of the multidimensional space.

As is apparent from the definitions, objects and attributes are mutually dependent. In fact, Scott noted that, "one constitutes figure for the other's ground, depending on which is the focus of attention." (1962, p. 406)

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## Dimensionality

Scott defined dimensionality as, "the number of `dimensions worth' of space utilized by the attributes with which a person comprehends the domain" (p. 263). For both Bieri (1955, 1966) and Scott, dimensionality is the major aspect of the complexity of a cognitive structure. Since the relative complexity of two structures is an important element in their comparison, a more elaborate discussion of this aspect of cognitive structure will be undertaken in the next section of this review. However, to help clarify the definition at this point, it is worth noting that Scott once proposed the sum of the angles between all pairs of attributes as a way of conceptualizing dimensional complexity.

# Articulation

Articulation of an attribute refers to, "the number of reliable distinctions that a person makes on the attribute" (Scott, 1969, p. 263). At the extremes of articulation, an attribute would be either a category or a continuous dimension (Wegner, 1974). Articulation plays a major role in Bieri's model of cognitive complexity (Bieri, 1955, 1966, 1971; Bieri, Atkins, Briar, Leaman, Miller, & Tripodi, 1966). Wegner (1974, 1977) has shown an interesting age related progression of articulation and utility of attributes in children.

However, two related pieces of information suggest a



logical upper limit on the utility of this construct in considerations of adult cognition. First, although there is some disagreement about optimal length, test theorists have demonstrated repeatedly that additional reliable information gained by lengthening judgment scales asymtotes at somewhere between five and seven scale points (cf. Symonds, 1924; Lissitz & Green, 1975). Second, Miller (1956) has argued pursuasively that people are not capable of making many more than seven simultaneous discriminations. Hence, it is likely that differences in articulation do not account for much variability in the cognitive structures of adults.

There will be some allowance in the present investigation for individual differences in articulation. Certainly, an attribute which is well articulated for one person and unarticulated for another should have an effect on their communication.

# Differentiation

In most of Scott's writing, the term differentiation appears to be nearly synonymous with dimensionality. Where they are not wholly equivalent, there is broad definitional overlap, with the difference accounted for by the association of differentiation with articulation. As used herein, the terms dimensionality, dimensional or cognitive complexity, and dimensionality refer to the same "dimension" of cognitive structure. That is, they are "undifferentiated" attributes describing the degree of relatedness of attribute



dimensions within a domain.

## Centrality

Attribute centrality has been defined as, "the degree to which a particular attribute is used by [a person] in comprehending objects within the domain" (Scott, 1966, p. 391). Although much of the research on centrality has been directed at affective or evaluatively central attributes (e.g., Scott, 1969, 1974), there is no theoretical reason why a purely descriptive attribute cannot be central. Centrality may be thought of simply as the implication or inference value of an attribute for other attributes in the domain (Scott, 1966).

Each of these properties of cognitive structure -dimensionality, articulation, and centrality -- has been measured by a number of independent instruments across multiple domains and in different cultures (Scott, 1966, 1974). These tests have yielded more than adequate evidence of both convergent and discriminant validity (Campbell & Fiske, 1959).

Before closing the general discussion of cognitive structure, there is one final point which requires emphasis: That is, the content of cognition is not isomorphic with the structure of cognition. Scott (1962) observed that "The varieties of cognitive content are almost limitless, but they may be subsumed under such rubrics as attitudes, beliefs, values, etc." (p. 405). Cognitive contents

are the Cognitiv the cont tion to ity of c tude sim empirica Not ity than given tł since th importan central defense History The cognitiv would no ed (and (Ware, Barclay describ related 1966, 1 are the concepts of objects (images) and attributes. Cognitive structure refers to the set of relationships among the contents. The particular relevance of this discrimination to the present research lies in the fact that similarity of cognitive structure must not be confused with attitude similarity. Although the two constructs may be related empirically, they are theoretically and logically distinct.

# Cognitive Complexity

Nothing more is implied by the term cognitive complexity than has been defined above as dimensionality. However, given the controversy that has surrounded this construct since the appearance of Vannoy's (1965) review, and the importance of this aspect of cognitive structure to the central issue of this research, a thorough explanation and defense of its use is in order.

# History of Cognitive Complexity

The statement that there are as many conceptualizations cognitive complexity as there are researchers in the area would not be far from the truth. The term has been considered (and measured) variously as: diversity of semantic space (Ware, cited in Osgood, 1962), authoritarianism (Kelman & Barclay, 1963), the absolute number of attributes emitted in describing a domain (Crockett, 1965), both number and relatedness of domain relevant attributes (Bieri, 1955, 1966, 1971; Bieri et al., 1966; Scott, 1962, 1963, 1966,



1969, 1974), willingness to ascribe both "good" and "bad" traits to the same individual (Steiner & McDiarmid, 1957), an information processing continuum ranging from concrete to abstract (Harvey, Hunt, & Schroder, 1961; Schroder, Driver, & Streufert, 1966; Crano & Schroder, 1967; Tuckman, 1967), object differentiation (Crano & Bettinghaus, 1970), and the list could go on ad infinitum.

Vannoy (1965) sought a common thread in these varied conceptions of cognitive complexity, but was unable to find one. However, an analysis of Vannoy's research suggests that his failurs to find the "thread" may have resulted from its attachment to the proverbial "needle in the havstack". Vannov himself conceded that his study had something of the character of a fishing expedition. His 113 male subjects responded to twenty measures, some of which were designed explicitly to test cognitive complexity and others, "which in the view of the present writer may reflect such a variable" (p. 387, emphasis in original). Vannoy proposed that, "Failure to obtain any factors which suggest cognitive complexity may mean that no such predisposition exists or that none of the instruments included in the test battery is a valid measure of it" (p. 387). The fact that the largest factor accounted for only 26% of the total variance in the measures was interpreted as indication of such "failure" and, thus, as justification for just such a conclusion. Following Vannoy's logic to its absurd

extreme, one its lack of & Bettinghau number of nu a study near similar dif the same re-There present res are concept complexity senting the above), a " sure of Cog

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referred to ity". Insp would be of fact that W completely extreme, one would deny the existence of the needle due to its lack of commonality with the surrounding hay! As Crano & Bettinghaus (1970) noted, such a conclusion rests on a number of necessary, and probably untenable assumptions. In a study nearly identical to Vannoy's -- and characterized by similar difficulties -- Stewin (1966) reported essentially the same results.

There is, however, something of relevance to the present research in Vannoy's data. Four of his variables are conceptually similar to dimensionality or cognitive complexity as defined herein. These were measures representing the formulations of Bieri and Ware (both cited above), a "Semantic Differential Interaction Variance Measure of Cognitive Complexity", and something which Vannoy referred to as a "Modified Scott Test of Cognitive Complexity". Inspection of the common variance in these measures would be of immense value at this point were it not for the fact that Vannoy's "modification" of the Scott measure completely vitiated its meaning. Since the distribution of scores on the H statistic (Attneave, 1959; Scott, 1962) was negatively skewed, Vannoy simply substituted the number of groups of objects that a person made as a rough indicant of the number of dimensions.

While it is true that the number of dimensions that a person employs to come to terms with a set of stimuli is a component of complexity as defined in the present research

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(and by Scott). it is the relatedness of these attributes that actually determines complexity. Simply noting the number of attributes is not enough. Suppose, for example. that two people -- A and B -- are both capable of making distinctions among objects on each of three attributes. However, for person A, each attribute represents a relatively independent dimension of judgment (e.g., People who are helpful might be either responsible or irresponsible, and they may or may not be friendly.); while person B applies these three attributes in a very related fashion (e.g., Helpful people are always perceived as both responsible and friendly), A, who has multiple -- nearly orthogonal -dimensions, is more cognitively complex than B, who has provided evidence of only a single dimension. Indeed, since there is a tendency in our culture to equate numerosity with virtue. Vannov's "Modified Scott Measure" could very well be a hyperbolic function of Scott's own measure. It would be interesting to see the magnitude of a non-linear measure of association, such as the correlation ratio, between the two.

A reanalysis of Vannoy's reported correlations among the Bieri, Ware, and Semantic Differntial Interaction measures, performed by the present author, yielded a first factor which accounted for 56% of the total variance. Of course, with only three variables, this is not an appropriate analysis, but it does suggest some common element in these measures. Further, if we were to assume that the

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addition of a true Scott type measure to this set would not lower the average inter-measure correlation, then a linear combination of the four measures would have a degree of internal consistency -- Cronbach's (1951) alpha = 0.68 -certainly indicative of at least a moderate degree of underlying unity.

The other conceptions of complexity examined by Vannoy have each predicted theory-associated behaviors. Presumably, they each tap something of psychological import. However, concern here is with the utility of the structural dimensionality definition of complexity, and none of these other measures which Vannoy used relates to this particular formulation.

# Evidence of Construct Validity

More direct evidence of the construct validity (Cronbach & Meehl, 1955) of the present conception of dimensional complexity is available from a number of authors. Bieri (1955) reported test-retest reliability of 0.78 for his measure of dimensional relatedness. He also demonstrated that cognitive complexity was positively related to ability to perceive differences between self and others. Using an individual differences multidimensional scaling approach, Wish, Deutch, & Biener (1970) found evidence of higher dimensionality and greater judgmental flexibility among Vietnam war "doves" as compared to "hawks". More than once, Scott (1962, 1969) has shown that cognitively complex



subjects evidenced both more flexible environmental adaptation and more knowledge about the stimulus domain. Moreover, Scott (1963, 1974) has uncovered a propensity on the part of dimensionally complex persons to use more elaborate forms of cognitive integration than their less complex counterparts. (Affective structural balance is an example of a less elaborate -- primative -- form of integration.) Finally, in three different studies, characterized by diversity of both measuring instruments and subject populations, Scott (1966, 1969, 1974) has confirmed the robustness, predictive utility, and singular character of this aspect of cognitive structure.

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Lest the reader be left with the impression that all that is cognitively complex is desirable, it should be noted that in at least one study, those at the extremely high end of dimensional complexity evidenced a maladaptive state of cognitive diffusion. Bannister & Fransella (1966) found the combination of dimensional complexity and unreplicated (test-retest) structure to be a reasonably good discriminator of thought disordered schizophrenia.

#### Choice of a Domain

Multiple considerations entered into the selection of a cognitive domain for use in the present research. A high degree of common salience was the first requirement. That is, the domain had to be relevant, both in terms of knowledge and interest, to each of the participants. It had to be one wh the exist least a domain w existenc ences wi Giv easily t class of wealth o replete personal beginnir sions. authors individu tion, ar research suggest humans this se Th importa support Polefka





be one which was known to be multidimensional and, further, the existence of a body of literature which contained at least a rudimentary map of possible common dimensions of the domain was a desired quality. Finally, data indicating the existence of a broad range of individual structural differences with respect to the domain were considered essential.

Given these prerequisites, the choice was narrowed easily to the domain of persons. There exists no other class of objects about which humans display more concern and wealth of information. The psychological literature is replete with studies attesting to the multidimensionality of personality trait attributions, and there is at least a beginning of convergence on a set of relevant common dimensions. Add to these qualifications the fact that numerous authors have demonstrated the operation of a variety of individual differences in the structure of trait attribution, and clearly, this domain is ideally suited for this research on structural similarity. Osgood's (1969, p.196) suggestion that "human languages evolved mainly to enable humans to talk about other humans." serves to bolster this selection.

## Person Perception

The assertion that the cognition of persons defines an important stimulus domain for most individuals is easily supported. Reviews provided by Hastorf, Schneider, & Polefka (1970), Schrauger & Altrocchi (1964), Tagiuri



(1968), Warr & Knapper (1968), and Wegner & Vallacher (1978), among others, all attest to the psychological relevance of social perception. Additionally, the view that person perception is somewhat richer and more multifaceted than object perception is widely accepted. Neisser (1976) gave special consideration to social schemata. Bruner & Tagiuri (1954, p. 649) noted that both the "cue evoking power of the perceiver" and inferences about internal states are qualities unique to the perception of persons. Moreover. Newcomb (1958) has pointed out the theoretical necessity of viewing social perception as a special, more complex, case of object perception. Of particular significance to the present question is the well-replicated finding that differences in categorization of person-objects are more reasonably attributable to the perceiver than to the perceived. Nowhere is this more evident that in research reported by Dornbusch, Hastorf, Richardson, Muzzy, & Vreeland (1965). These investigators found that the perceptual categories used by a single child in describing two other children showed a significantly greater overlap than did descriptive categories used by two children describing the same child.

Suggestions by Bruner & Tagiuri (1954), Kelly (1955) and Cronbach (1955) of the operation of implicit "theories" of personality provided impetus for much research on the structure of person cognition. The review of some of this research below should furnish more than adequate confirma-



tion of both the multidimensionality of cognitive structure in this domain and the existence of individual differences therein.

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# Implicit Personality Theory: Consensual Stereotypes

The label "implicit personality theory" was used first by Bruner & Tagiuri (1954) to describe assumed patterns of trait co-occurrence in people's perceptions of others. The term has been applied both to cultural stereotypes of trait relatedness and to individual expectations of trait covariation.

The discussion in this section will concentrate on establishing four major points: (1) person perception is multidemensional; (2) there are some identifiable, commonly used, dimensions which account for much of the variance in perception of persons; (3) the observed multidimensionality can be attributed to the existence of measurable differences in inferential relationships among domain-relevant attribute pairs; and (4) the obtained patterns of trait inference are founded in more than just the linguistic association of terms; i.e., they reflect the perceivers' expectations/ observations of the manifestations of these trait terms.

The issue of individual structural differences in person perception will be considered in a later section.

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#### Multidimensionality

Hays (1958) presented empirical evidence of the multidimensionality of person cognition. In a simple, but elegant, study, he demonstrated that a unidimensional model could not account for subjective probabilities of trait co-occurrence. Hays used subjects' conditional probability estimates of trait relatedness to order a small set of traits. The residual distances from the first dimension were used as the basis for another ordering. The process was repeated a number of times. With only eight traits in the original set (warm, cold, generous, stingy, dominant, submissive, intelligent, stupid), Hays identified two fairly stable dimensions -- one bounded by intelligent and stupid, and the other by warm and cold.

In a well-known study of personality impression formation, Asch (1946) had suggested that the powerful effect exerted by certain traits (e.g., warm - cold) on overall impressions was due to the centrality of these attributes in peoples judgment systems. However, Wishner (1960) determined that "centrality" was a function of the relatedness of the stimulus traits to the impression judgment scales and not a characteristic inherent in any particular attributes. Specifically, Wishner first ascertained the relatedness of traits by having groups of students rate their instructors on bi-polar attribute scales and computing the correlations among these attributes. He was then able to show that the



presence of a trait (or its opposite) in a stimulus set only had impact on impressions of related traits. Indeed, even traits which Asch had identified as non-central (e.g., polite - blunt) were shown to exhibit "centrality" in Wishner's study when the judgment scales were correlated with these attributes. Such set-specific behavior of attributes argues strongly in favor of multidimensionality in this area. Additional support for the structural complexity of person perception may be found in Norman's (1963) attempt to develop a taxonomy of personality attributes. Norman's factor analyses of peer-nomination trait ratings from five different samples of college males revealed five stable interpretable dimensions. Rosenberg and his associates have provided a methodological extension of the original implication distance ideas of Hays (Rosenberg, Nelson, & Vivekananthan, 1968; Rosenberg & Olshan, 1970; Rosenberg & Sedlak, 1972a, 1972b; Rosenberg, 1977). Their research on implicit personality theory has capitalized on recent developments in multidimensional scaling (e.g., Kruskal, 1964) and individual differences multidimensional scaling (Carroll & Chang, 1970) to supply a wealth of information about the complex nature of perceived personality trait relations. Using scaling techniques, Rosenberg et al. (1968) found a three dimensional solution quite similar to the familiar evaluation, potency and activity separation so characteristic of semantic differential research (Osgood.



Suci, & Tannenbaum, 1957). However, in their study, these three dimensions were not orthogonal. One particularly interesting finding was a two dimensional solution with axes which they identified as <u>social good-bad</u> and <u>intellectual</u> <u>good-bad</u>. Inspection of the positions of attributes in this space led them to suggest an account of the Asch results very similar to the one proposed by Wishner.

Rosenberg & Sedlak (1972b) used a procedure designed to elicit traits which people typically used in describing others. They had some trouble fitting a meaningful solution to their data -- stress at five dimensions was still greater than 15%. (Stress is a measure of deviation from monotonicity in the relationship between observed distance -- input and distance described by the solution -- output.) In spite of this, the stress in their data did exhibit a degree of "lawfulness...substantially below that of a random input" (p. 156) and they were able to substantiate the presence of general evaluation, social evaluation, and, to a lesser degree, intellectual evaluation, among other factors in their subjects' responses. One of their conclusions was that the dimensionality of naturalistic trait attributions may be higher than that typically found with experimenterselected trait sets.

The studies cited above represent just a small sample of the literature attesting to the multidimensionality of person attribution -even in the absence of considerations of


individual variation. Although individual structural differences will be the subject of a later section of this review, it is worth noting at this point that the dimensionality of the group structure is not wholly attributable to individual idiosyncracies. While there is a considerable degree of person-specific variability, the general dimensions found in group solutions are present to some degree in a majority of individual solutions. Good examples of this relationship occur in the research of Wiggins and her colleagues, both with respect to person perception (Wiggins, Hoffman, & Taber, 1969; Snyder & Wiggins, 1970), and with judgment of objects other than persons (Wiggins & Fishbein, 1969; Shikiar, Fishbein, & Wiggins, 1974).

## Common Dimensions

One of the requirements set forth above for a domain appropriate for the present research was the existence of literature suggesting "at least a rudimentary map of possible common dimensions of the domain" (p. 14). This is necessitated by the fact that structural comparisons between persons will be possible only if initial judgments are made on the same sets of domain-relevant attributes. Certainly differences in degree of relatedness and extent of use of the attributes are expected -- and desired. But, in order to compare these cognitive analogs of apples and oranges, more common constructs such as "fruit" and "round shape" should provide helpful starting points.

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There has been some controversy in this area of research regarding the relative merits of supplied versus elicited attributes (cf. Rosenberg & Sedlak, 1972a; Hastorf, Richardson, & Dornbusch, 1958). The position taken in this investigation is that while there is an admitted loss of the richness and distinct character of each person's cognitive structure when attributes are supplied by the experimenter, a great deal is known about the most frequently elicited attributes (including some work with the present population), and there is considerable individual variation in the application of these attributes. Therefore, use of a representative set of these common trait terms should yield results with at least a moderate degree of generality.

Identification of the relevant dimensions of person perception has progressed gradually over the past several decades. Review of this work indicates that there is some consensus about the major continua on which people usually make judgments about others.

For quite some time, researchers have noted that judges tend to make lawful assumptions about trait relatedness. The terms "halo effect" (Thorndike, 1920) and "logical error" (Newcomb, 1931) refer to this phenomenon. However, Thurstone (1934) was probably the first to recognize the <u>psycho</u>-logic of the "error". His factor analysis of trait ratings provided the earliest empirical glimpse of the structure of lay personality theory. There is a good degree

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of commonness between the five factors reported by Thurstone and some of the dimensions identified in the research of Hays, Wishner, Norman, and Rosenberg's group. Exact comparisons are not possible due to differences in both trait selection and methodology but, at a minimum, there seems to be general agreement on dimensions something like social and intellectual evaluation; as well as some support for a dominance - submissiveness continuum, and a dimension referring to tolerance of others (Thurstone, 1934; Norman, 1963; Rosenberg and Sedlak, 1972b). Factors similar to these emerged in a study reported by Kuusinen (1969). In many of these cases, these were not the interpretations given to the factors/dimensions by the original authors but, on the basis of content, the reinterpretations are not unrealistic. Convergent evidence for two of these dimensions -- social evaluation and dominance (or control) -- may be found in the closely related literature on structural balance (Phillips & Thompson, 1978).

Additionally, the two preferred methods of data gathering -- implication distance and scale correlation -- have resulted in comparable structures. Todd & Rappoport (1964) demonstrated an impressive amount of overlap between dimensions derived from the Hays probability of co-occurrence measure and factor analytic solutions. Since their analyses were at the individual subject level, these authors did not report common dimension content.

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Finally, two of the strongest statements on the virtues of elicited attributes (Hastorf, Richardson, & Dornbusch, 1958; Beach & Wertheimer, 1961) include acknowledgement of the necessity of coming to some agreement on the relevant dimensions of person perception and, then directing that concensus toward more precise prediction of social behavior.

#### Trait Inference and its Measurement

Most research on the structure of lay conceptions of personality has been directed at the assessment of perceived patterns of trait co-occurrence. Some researchers have advocated measuring association directly by asking subjects question of the form: Given that a person possesses trait X, how likely is it that this person also possesses trait Y? (Hays, 1958; Jackson, 1962). Others have favored less obtrusive measures of association such as, the distance between traits in a multidimensional space constructed by having subjects sort the traits into groups which could represent actual people (Rosenberg et al., 1968), or the correlation between traits derived from subjects' judgments of persons on bi-polar trait scales (Wishner, 1960; Koltuv, 1962; Warr & Knapper, 1968).

It is likely that the indirect methods provide a truer representation of the structure of trait inference. Rommetveit (1960) reported that his subjects were unaware of the dimensions which they employed in person evaluations. The self-reported structures of Todd & Rappoport's (1964)

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subjects bore little resemblance to the structures derived through multidimensional unfolding and factor analytic techniques. Nevertheless, the derived structures were very useful in predicting the responses of these subjects to hypothetical stimulus persons. Thus, it is probable that people are not completely aware of the structures which guide their inferences about characteristics of others.

The indirect methods -- distance in multidimensional space and correlation -- have led to similar conclusions about common conceptions of trait relatedness. For example, Zanna & Hamilton (1972) used the structure reported by Rosenberg et al. (1968), which was derived from distance estimates, to demonstrate that trait centrality (Asch, 1946) could be manipulated by considering the relative positions of traits in multidimensional space. The parallel between this and Wishner's (1960) correlation findings is obvious.

The present research employed the correlational approach for two reasons. First, as Schneider (1973) has observed, the data which result in the correlations are supplied by subjects who are performing a "natural judgment task" (p. 297). That is, the subjects are simply judging the amount of an attribute present in a stimulus object. The second, and more important, reason for the use of correlations as indices of trait association lies in the close correspondence it allows between theory and method. Recall that in the present conception of cognitive struc-

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ture, attributes are lines in multidimensional space and the relatedness of any pair of attributes is defined by the angle between their lines. A correlation coefficient is simply the cosine of the angle described by two variable vectors in a standard-score n-dimensional space, where n is the number of observations in each vector. A discussion of this relationship may be found in a text by Thorndike (1978), and a formal proof was supplied by Harman (1967). This equality of angle cosine and correlation is extremely useful. Totally unrelated traits should be characterized by orthogonal dimensions, a 90 degree angle and, a correlation of 0.0. On the other hand, perfectly related traits would describe the same line, the angle would be zero and, the correlation. 1.0. Typically, in social science research, one does not find so clean a fit between construct and operation.

One problem with the use of correlations as measures of trait implication is that the actual implication from trait X to trait Y may not be the same as that from Y to X (Warr & Knapper, 1968; Schneider, 1973). This is a reasonable criticism, and there is evidence that for some person-attributes implication strength is not the same in both directions (Warr & Sims, 1965). However, Warr & Knapper (1968) observed that the close similarity of structures derived from a direct implication model and a factor analytic model in Todd & Rappoport's (1964) study might suggest that the occurre is rath researd Lingu D observ terms rated A fact in a s (1963) acqua Norma nomin for f lie s cal n not ; judg dent enti rity renc itie rese occurrence of implicative asymmetries in person attribution is rather rare. This conclusion is speculative and further research on this issue is needed.

### Linguistic Association versus Expected Co-occurrence

D'Andrade (1965) has suggested that the structures observed in this area of research are explainable purely in terms of semantic associations of trait words. His subjects rated the "similarity of meaning" of pairs of trait terms. A factor analysis of the meaning similarity scores resulted in a solution quite similar to the one reported by Norman (1963) which was based on peer nomination ratings of acquaintances. A similar result was reported by Passini & Norman (1966) who found the same factor structure in peer nomination ratings of individuals who had been acquainted for fewer than fifteen minutes.

D'Andrade's conclusion, that the obtained structures lie solely in the language and reflect little of psychological relevance, requires assumptions which his data simply do not allow. What were the processes by which his subjects judged meaning similarity? Is a language somehow independent of the psychological systems of its users? It is entirely possible that D'Andrade's subjects inferred similarity of meaning from their own observations of co-occurrence. However, there is no need to rely on these possibilities alone to refute D'Andrade's assertion. There is ample research evidence which supports an expected co-occurrence

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interpretation of observed implicit trait relation structures. Koltuv (1962) took great care in avoiding the use of traits which shared either synonyms or antonyms. Her subjects indicated both the personal relevance of each trait (i.e., the extent to which they typically used it in considerations of others) and, their ratings of several others (both well-known and relatively unfamiliar) on each trait. Although Koltuv's structural analyses were at the individual subject level, two of her findings are of interest at this point. First, the average intertrait correlation for ratings of unfamiliar others was higher than that for familiar others. Second, the average magnitude of correlations between traits decreased as a function of the personal relevance of the traits (i.e., the average correlation between pairs of personally relevant traits was greater than that between relevant - irrelevant trait pairs which, in turn was greater than that between personally irrelevant pairs). These results -- particularly the first -- suggest something more than the operation of linguistic association.

Rosenberg & Sedlak (1972a, 1972b) reviewed several multidimensional scaling studies of trait inference. They concluded that, "The possibility that synonymity alone accounts for the observed co-occurrences of trait names seems very unlikely...from a perusal of the co-occurrence patterns obtained in the various studies" (1972b, p. 147; see, for example, Rosenberg & Sedlak, 1972b, Figures 3 and

5). the s mirro chara judgm ed wi Jacks hood proba ity s of in succe then used degre infer rence infere not w: 1 import implic persor on beł format Lay & Jackson (1969) furnished compelling evidence that the structure of implict assumptions about trait relatedness mirrors that of the actual co-occurrence of personality characteristics. These researchers constructed trait judgment scales and personality statements which corresponded with the subscales of the Personality Research Form (PRF: Jackson, 1967). Their subjects indicated either the likeli-

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ed with the subscales of the Personality Research Form (PRF: Jackson, 1967). Their subjects indicated either the likelihood of co-occurrence of two traits in a person or the probability that the same person would endorse two personality statements. Similar structures were found in both types of inference data through a method of multidimensional successive intervals. These inferential structures were then compared to a factor analysis of the normative data used in development of the PRF (N > 2000). There was a high degree of correspondence between the dimensions of trait inference and the empirical structure of trait co-occurrence. Hence, if linguistic association accounts for the inferential structure, then this linguistic covariation is not without psychological relevance.

Finally, if linguistic factors, devoid of psychological import, account for a major portion of the variance in trait implication, then simply supplying trait information about a person should not be expected to have any predictable effect on behavior toward that person. Kelley's (1950) impression formation study stands as evidence contrary to this expecta-

tion. F person w trait " whereas place o also ac as cons The est occurre logical A from th stereot (2) the langua trait those ation Imp Ι shared rence attem Varia These sente tion. Fifty-six percent of those who heard a lecture from a person whose, previously supplied, description included the trait "warm" entered into discussion with that lecturer, whereas only 36% of those who had heard the trait "cold" in place of warm did so. Variation of warm versus cold was also accompanied by differential ratings on qualities such as considerateness, formality, sociability, humaneness, etc. The establishment of behavioral impact, such as that which occurred in Kelley's study, is the <u>sine qua non</u> of psychological validity.

A reasonable set of conclusions which might be drawn from these various findings is that; (1) there are cultural stereotypes regarding the association of personality traits, (2) these stereotypes are reflected in the common use of the language and, (3) inferences derived by individuals from trait descriptions of others do affect their behavior toward those others. Clearly then, the observed linguistic association patterns are psychologically relevant.

## Implicit Personality Theories: Individual Differences

In the preceding section it was argued that there are shared cultural conceptions of the likelihood of co-occurrence of personal characteristics. What follows is an attempt to support the existence of significant individual variation in the structure of personality trait inference. These differences in trait attribution structure are presented as a special case of the general individual struc-

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tural diversity which has been observed in multiple cognitive domains. Research which has demonstrated the relevance of cognitive complexity to the study of person perception also is discussed briefly. As a logical extension of Wishner's findings using aggregated data and Cronbach's (1955) observations on the study of implicit personality theories, it is proposed that the use of intrasubject intertrait correlations provides a solid basis for the assessment of cognitive structure differences in the persons domain. In the final part of this section, it is suggested that methods which assign individuals to types on the basis of degree of overlap in their dimensional structures result in a sacrifice of data which is both undesirable and unnecessary in the present investigation.

#### Individual Structural Differences in Other Domains

Structural differences between people in the application of attributes to objects have been observed in studies concerned with diverse issues and employing a variety of methodological techniques. Only a few studies, typical of these efforts, will be reviewed.

Wiggins & Fishbein (1969) used Tucker's (1966) three-mode factor analysis to identify ten separate clusters of "response homogeneous" individuals in a study of the generality of the evaluation (E), potency (P), and activity (A) factors of the semantic differential. In their study -as in most semantic differential research -- the objects and

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attributes (domain) were chosen to be generally representative of cognitive space. Wiggins & Fishbein reported that two clusters of judges showed evidence of two separate A factors. One cluster had no A factor. Two judge clusters were characterized by two different E factors. Even where the factor names (E,P, and A) were the same, the scales which best marked each factor (highest loading) differed from group to group.

Much of the research on which Scott based his theorizing dealt with peoples' conceptions of nations. This domain was also the focus of the multidimensional scaling analysis reported by Wish et al. (1970). These researchers identified four dimensions which accounted for judgments of similarity of nations. Their use of the INDSCAL model (Carroll & Chang, 1970) permitted a demonstration of the fact that individual subjects differed in the weights assigned to each of these dimensions in their judgments. In addition, differential use of the dimensions was associated with subjects' sex, country of origin, and opinions about the Vietnam war.

The widely acknowledged person by scale interaction in the use of the semantic differential provides further affirmation of the generality of individual differences in cognitive structure (cf. Heise, 1969; Maguire, 1973; Mann, Phillips, & Thompson, 1977). In most semantic differential research, this interaction has been considered a troublesome source 1963). phenome Fi Heise ( rating variati As conclu ting t consid will f struct Struc T percep review exhaus tion. Polefk Ί S have a source of error variance (e.g., Tanaka, Oyama, & Osgood, 1963). However, in the present context, this "error" is the phenomenon of interest.

Finally, in a review of semantic differential research, Heise (1969) estimated that, "as much as one-half of the rating variance may be due to individual and temporal variations among subjects" (p. 412).

As a summary of this section, it seems reasonable to conclude that there is abundant empirical evidence supporting the existence of individual structural variation in considerations of objects in general. The following section will focus specifically on individual differences in the structure of person cognition.

## Structural Differences in the Perception of Persons

The presence of common cultural dimensions of person perception was substantiated in an earlier portion of this review. However, these general dimensions are not nearly exhaustive in their account of the data of person perception. This fact has been noted by Hastorf, Schneider, & Polefka (1970):

The regularities in the inferences made by various perceivers about a given individual suggest that members of a given culture share an implicit theory of personality. Finally, there is evidence to suggest that individuals have stable implicit personality theories of their own, theories which are not necessarily derived from the common culture (p. 46).

Such differences in implicit personality structure can have a major impact on social perception. Dornbusch et al.

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(1965) concluded:

our findings indicate that the most powerful influence on interpersonal description is the manner in which the perceiver structures his interpersonal world (p. 440).

Of more direct concern to the present investigation is the position taken by Kelly (1955) in the development of his Theory of Personal Constructs:

it is possible for two people to be involved in the same real events but, because they construe them differently, to experience them differently. Since they construe them differently, they will anticipate them differently and will behave differently as a consequence of their anticipations (p. 90).

Although Kelly, in this particular instance, wrote of differences in construing "events", it is reasonable to substitute "people", since all of Kelly's work dealt with person attribution.

The discussion that follows is directed at establishing the existence of individual differences in the structure of person judgment analogous to those found with the general judgment of objects.

Three-mode factor analysis has also been used to isolate clusters of response homogeneous person perceivers. Wigins, Hoffman, & Taber (1969) reported eight such clusters which represented eight distinctive types of cue utilization in the judgment of a single person-attribute (i.e., intelligence). Shikiar, Fishbein, & Wiggins (1974) found nine different types of conceptual structures in perceptions of political candidates. A similar methodology was employed by Pedersen (1965) who indicated that "authoritarians" evidenced a non-au M ual di dant i V their subjed these that : showed tions of le clust of "h inter struc ted t dimen Were each area this (1973 ced a different implicit personality structure than non-authoritarians.

Multidimensional scaling studies attesting to individual differences in implicit personality structure are abundant in the social psychological literature.

Walters & Jackson (1966) identified six dimensions in their trait inference data and two "points of view" -subject clusters -- characterized by different weighting of these dimensions. Of particular interest was the finding that individuals exhibiting one of these points of view showed a higher average relatedness in their trait ascriptions, which led Walters & Jackson to suggest the operation of less cognitively complex structures. Persons in this cluster also seemed to be quite concerned with the dimension of "harmful - not harmful" in others. This provides an interesting parallel to Pedersen's (1965) authoritarian structure finding.

Two experiments performed by Sherman (1972) demonstrated the utility of applying individual differences multidimensional scaling to trait similarity judgments. Persons were found to vary considerably in their use ("salience") of each of the four dimensions uncovered by Sherman.

Some of the work of Rosenberg and his students in this area of research has been acknowledged in other parts of this review. Chapters contributed by Rosenberg & Sedlak (1972a, 1972b) and Rosenberg (1977) provide excellent

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summaries of this research and attest to the ubiquity of individual structural differences in person perception. One extremely interesting piece of work dealt with trait usage in the writings of the novelest, Theodore Dreiser (Rosenberg & Jones, 1972). This study provided compelling evidence of the dimensional richness of person cognition and the usefulness of multidimensional scaling in this area of research.

In spite of the impressive body of support for the use of individual differences multidimensional scaling in the study of implicit personality theories, it should be noted that the structural differences observed with this technique are of degree rather than kind. The INDSCAL model (Carroll & Chang, 1970) provides a group solution for both the dimensionality and trait associations of the structure. Individual differences arise not from the use of different structures, but from different emphases on the dimensions of the group structure. While it is true that an individual's weight for any of the group dimensions might be zero, there is no allowance for the possibility of individual structures characteristically different from that of the group. This is certainly not meant as a denial of the value of multidimensional scaling for understanding person cognition. Rather it is simply a suggestion that questions regarding the social effects of structural differences in person perception demand a different approach.

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interactions has also been noted in person perception research. Separate analyses of subject responses (Crockett & Nidorf, 1967) revealed marked individual differences in trait scale usage.

## Dimensionality in Person Perception

Individual variation in the complexity of person cognition has been the subject of a great deal of research. Scott (1969) observed dimensionality differences in the domain of persons (acquaintances) which exhibited predicted negative correlations with both affective balance and affective-evaluative consistency. That is, the person judgments of highly dimensional subjects were not predictable simply on the basis of either positive evaluation of stimulus persons or presence of desirable traits in stimulus persons.

Bieri (1955) reported that complex judges were better able to perceive differences between self and others. He suggested that, "cognitive simplicity reflects an incomplete differentiation of the boundaries between self and the external world, leading to unwarranted assumptions of similarity between self and others" (p. 267). In a similar vein, Bieri et al. (1966) noted the association of cognitive complexity with the ability to deal with incongruous information about people.

Both Crockett (1965) and Koltuv (1962) have documented a positive relationship between dimensionality and degree of



acquaintance with the person judged. The Koltuv study, in particular, presented evidence of person-specific variation in this relationship.

The demonstration by Walters and Jackson (1966) of complexity differences in "points of view" and Todd & Rappoport's (1964) report of individual differences in number and relatedness of elicited attributes both provide further support of dimensional complexity as an influential factor in person perception. The comparison of implicit personality structures employed in the present research recognizes the importance of individual differences in dimensionality.

# Intraperson Interattribute Correlations

Wishner's (1960) use of attribute by attribute correlations, to predict the effects of description variation on impression formation, demonstrated the utility of such correlations -- at the group level. That is, they are at least adequate indices of the implication strength or perceived relatedness between traits. It is reasonable to assume, in this instance, that what is true for the group, is also true for individuals. In one of the first articles on implicit theories of personality, Cronbach (1955) theorized that intrasubject trait covariances indicate, "the relationship [the judge] expects to find among the variates" (p. 186). He also pointed out another useful aspect of such a measure: "Such implicit relations are not subject to deliberate distortion and can reveal associations and norms
of which [the judge] himself is unaware" (p. 186).

Studies which have examined intrasubject correlations have supplied interesting, theory consistent results. These reports, by Koltuv (1962) and Todd & Rappoport (1964) have each been discussed in some detail in previous sections of this review. One finding worth reemphasizing from Koltuv's research is that the use of personally well-known others as objects of judgment probably provides a more valid account of personal idiosyncracies in trait attribution (i.e., less bound by cultural stereotypes). While it is true that the collection of data necessary for the computation of these correlations requires considerable effort on the part of both subject and investigator, this is balanced somewhat by a presumed moderately positive relationship between the cost of a set of data and its value.

Finally, intrasubject intertrait correlations are the preferred measures for this investigation because of the good fit between theory and method, mentioned above. An example of this association at the individual subject level is the use of the (reflected) average absolute intertrait correlation as a measure of dimensionality. This corresponds nicely to Scott's (1962) suggestion of the sum of the angles between attribute pairs as an index of the number of "dimensions worth" of information in the structure.



## Typologies versus Direct Comparison of Individuals

Given the nearly universal acknowledgment of a broad range of individual differences in the structure of person perception, it would appear that the level at which data are summarized is of utmost importance in research of this type. While the isolation of groups of "response homogeneous" individuals and the identification of characteristic "points of view" certainly provide valuable insight into social perception, the assignment of a person to one of these groups necessitates a loss of data considered intolerable in the present investigation.

Since the primary intent of this research was to demonstrate the association of structural similarity and the effectiveness of communication between two people, a method was needed which would summarize structural data at the dyad level. Such a method was employed, and its characteristics will be discussed at a later point. Now, however, it is necessary to take up a discussion which was delayed earlier.

#### Previous Research on Structural Similarity

Most of the research on similarity of cognitive structure and its relationship to social behavior can be traced, directly or indirectly, to a "set of assumptions" outlined by Newcomb (1953,1956,1958). Newcomb suggested the existence of a cyclical pattern from communication accuracy to attitude similarity to interpersonal attraction ... (see, in

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particular, Newcomb, 1958, p. 181). The logical necessity of a causal link between communication accuracy and attitude similarity is not obvious. If we accept -- for the purpose of this discussion -- that structural similarity, as outlined above, determines agreement not on the outcome of a conversation, but on the relevant points to be considered, then there is no reason why such conversation could not lead to extreme disagreement, even in the presence of a high degree of accuracy of communication. Given his commitment to a theory of structural balance (Newcomb, 1961, 1968), it is likely that Newcomb's conception of structural similarity would differ widely from the one proposed in the present investigation. However, this distinction has not always been evident in the research of those who followed his ideas (e.g., Triandis, 1960b).

Two research concerns have emanated from Newcomb's ideas about cognitive similarity. One has been directed solely at the relationship between structural similarity and interpersonal attraction (Tesser, 1971, 1972; Johnson & Tesser, 1972; Bryson, 1977). The other has focused less on attraction and more on the relationship between structural similarity and effectiveness of communication (Runkel, 1956, 1963; Triandis, 1959a, 1959b, 1959c, 1960a, 1960b).

## Cognitive Similarity and Attraction

Tesser's conception of cognitive similarity is congruent with the balance theory tradition (Tesser, 1971, 1972;

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Johnson & Tesser, 1972). He has demonstrated that both evaluative similarity (i.e., attitude similarity) and structural similarity affect attraction responses. Structural similarity. in Tesser's work, refers to the logical relatedness that a person perceives in the valence of a set of attitudes. That is, for a related set of two attitudes. change in the direction of evaluation of one attitude implies to a person that the other must also change, and it is difficult for the person to imagine otherwise. In order to assess this type of structural similarity, one must discover which attitudes are logically related for a person. Also, manipulation of Tesser's variable requires that the person and the other share at least one attitude in the set. Hence, this type of structural similarity is artificially related to attitude similarity at the extremes. Obviously, this is not the same construct which has motivated the present research.

Bryson (1977) used an individual differences multidimensional scaling approach to study the relationship between <u>perceptual similarity</u> and friendship patterns in two separate established groups. Although he cited Tesser's work as the conceptual basis of his own, Bryson's formulation was a bit more closely related to that of the present study. However, as with the other multidimensional scaling studies discussed in this report, the individual differences aspect of perceptual similarity was a function of differential use

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of dimensions of the common space rather than an indication of use of characteristically different spaces. In both tests, Bryson's hypothesis -- that friendship choice would be a function of overlap in dimensional salience -- was supported.

## Cognitive Similarity and Communication

In the earlier of two papers on this topic, Runkel (1956) showed that communication between two people was more effective when their orientations to the objects of communication were <u>co-linear</u>. That is, when their considerations of the object were along the same principal dimension. Non-co-linear attitudes obtain when two people think of the same object, each in terms of a different cardinal attribute.

Runkel's (1963) later theoretical paper is more closely related to the present conception of structural similarity. In it, he developed the idea of communication as "map-matching" or, the act of communication as successive attempts on the part of the participants to find the same cognitive space or "frame of reference". Runkel expanded the concept of co-linearity to several dimensions. Persons' cognitive fields were considered co-linear in proportion to their common ordering of importance of stimulus dimensions. There was also acknowledgment of the fact that matching would be limited by differences in dimensionality (defined by Runkel, as simply the number of relevant dimensions). Unfortunate-

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ly, Runkel never presented data in support of this theorizing.

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A research project carried out by Triandis and summarized in several reports (Triandis, 1959a, 1959b, 1960a, 1960b, 1960c) investigated the relationship between a number of different conceptions of cognitive similarity and communication effectiveness. In two of these articles, (Triandis, 1959a, 1960a) both his conceptualizations and his operations defining cognitive similarity clearly are derived from Newcomb's ideas and, therefore, relate only peripherally to the present effort. The variables he studied, which were called categoric similarity and syndetic similarity, were measured as similarity in the spontaneous use of attributes and similarity of object rating profiles respectively. In neither case was there any index of the relatedness of attribute ascriptions. Triandis did report some success in predicting communication effectiveness with these measures. However, it is quite possible in each case that communication was a function of prior agreement (attitude similarity) rather than structural similarity.

In a third paper Triandis (1960b) definitely was referring to something like the present conception of cognitive similarity. However, in this case, his operations failed to match his theoretical constructs. It can be demonstrated that none of the measures employed by Triandis was sensitive

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to dimensionality differences between persons, nor did any of these measures index intradyad differences in attribute pair implication relationships. In fact, all of Triandis' operations reduce ultimately to elaborate indices of either structural balance or attitude similarity.

The present research was the first to examine specifically the relationship between effectiveness of communication and a measure of similarity of attribute structure which is both sensitive to dimensional relatedness and computationally independent of attitude similarity.

### Summary and Hypotheses

It has been argued that similarity in the structure of cognitions should influence social behavior. The proposed definition of cognitive structure includes, as its major components, the concept of a cognitive domain as a Euclidean space , objects as points in this space, and attributes as lines which define the dimensions of the space. In order to study the relationship between individual structural differences and communication, the domain of persons was chosen because of its obvious relevance for social behavior and in light of abundant evidence of differences among people in its structure. Individual differences in dimensionality and in patterns of intertrait implications were noted as important aspects in the comparison of person perception structures.

Following the discussion of the structural aspects of

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person cognition -- implicit personality theories -- the limited body of literature related to structural comparison and social behavior was reviewed.

The theme throughout has been that knowledge of the extent of structural difference in two peoples' thinking about persons or events should be helpful in the prediction of relevant aspects of their interaction. The central importance of communication to social behavior has been assumed from the outset. These considerations lead to the primary hypothesis of this research.

Hypothesis 1. The success of communication between two people will be a positively increasing function of the similarity of their attribute structures.

Of course, the measure of structural similarity will reflect the components of structure discussed above and, therefore, it will be sensitive to differences in cognitive complexity. However, dimensionality is not the sole component of cognitive structure. Hence,

Hypothesis 2. Similarity of dyad attribute structures will be moderately negatively related to dimensionality differences within dyads.

If the structure of peoples' cognitions with respect to a given domain is rather ephemeral or, if structural similarity itself is not a unitary construct, then an index of

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structural similarity would be of questionable utility. The third hypothesis relates to the assumption of relative stability of cognitions in a domain.

Hypothesis 3. The measure of structural similarity will show acceptable levels of both temporal stability and internal consistency.

The use of supplied rather than elicited attributes was justified on the basis of knowledge gained from previous studies of the general of person perception. At least the most common of those dimensions should exist in the present data.

Hypothesis 4. The dimensions of the group structure will replicate previous findings in the area of person cognition.

Finally, no simple relationship between structural and interpersonal attraction is assumed. However, in a communication situation where the information being transmitted is of some tangible value to the receiver, effective communication should be accompanied by liking of the sender by the receiver.

Hypothesis 5. To the extent that successful communication is associated with extrinsic reward, there will be a positive relationship between structural similarity and interpersonal attraction.

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METHOD AND RESULTS

## Overview

While the specific goal of the present research was to gather empirical support for hypothesis one, there was a second, more general, purpose to be served, namely, the development of a method for comparing attribute structures in any domain. The index that was chosen, its psychometric properties, and its applicability to the present set of concerns provides the focus of the first part of this chapter. Tests of hypotheses two and three, which relate to different aspects of the measurement of structural similarity will precede tests of the major hypothesis.

In addition, it is necessary to support hypothesis four -- replication of the group structure found in previous studies -- prior to consideration of individual structural differences. Therefore, these data too, will precede the tests of hypothesis one.

Two separate tests of the communication hypothesis were accomplished -- one in a naturalistic setting, the other a more controlled laboratory study. The first of these studies examined the relationship between similarity of attribute structures and communication effectiveness in a

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few college classrooms. This study also contained a test of hypothesis five. In the second study, people were randomly assigned to a condition of either similarity or dissimilarity and then dyads were composed which fulfilled the respective condition requirements. Each dyad engaged in a task which required the communication of information relevant to the persons domain. In order to provide a coherent flow of information, findings of each study follow directly after the explanation of its design and procedures. General discussion is reserved until all data have been presented.

## Subjects

Students who contributed data to this research were allowed extra grade credit in their psychology courses. Each subject was a member of one of six undergraduate psychology classes at Michigan State University. The five people who were the instructors of these classes also participated as subjects in Study I. All subjects were given a description of the purpose of the investigation prior to their participation.

# Assessing Similarity of Attribute Structures Structure Data

The basic data gathered from all persons in this study consisted of judgments of 28 personal acquaintances on each of 20 bi-polar, domain-relevant attributes. Each subject was instructed to consider 28 different people who fit a



specified list of roles. Subjects were told explicitly not to use the same person twice. It was emphasized that the judgment of 28 different people was much more important than finding an exact fit for each role description. Each of these acquaintances was judged on 20, seven point, semantic differential type scales. The scale midpoint (4) was to be used in cases of ambivalence or irrelevance. Complete instructions for this task, including the 28 role descriptions and a sample judgment sheet, are provided in Appendix A. The list of bi-polar trait adjectives appears in Table 1.

TABLE 1

Bi-polar personality attributes for initial structure data

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\* These scales were reflected to reduce the possibility of scale checking biases.

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These particular attributes were selected because they represent the general dimensions uncovered in previous person attribution studies. In addition, they occur with some frequency in the free response descriptions of self, friends, and acquaintances provided by persons from this same subject population (E. G. Thompson, personal communication). The use of bi-polar scales was justified by the typical finding of unidimensionality of semantic opposites in judgment (Heise, 1969; Mann et al, 1977) and, in particular, with judgment in the persons domain (Russell, 1979).

Thus, as a basis for comparing structures, there was, for each subject, a 28 (acquaintances) by 20 (attributes) matrix of judgments, representing the way that subject employed those traits in considering others.

## Structural Similarity Index

The level of analysis for most of the present research is the dyad. The major focus of this investigation -- Hypothesis 1 -- is on the relationship between the structural similarity of two people and the ease with which they communicate. Hence, one necessary datum is a summary index of the degree of overlap in two people's attribute structures in a particular domain -- in this case, implicit personality structures. To meet this necessity, a 20 by 20 interattribute correlation matrix was computed from each person's acquaintance judgment matrix, and the attribute structure similarity between two people was defined by the following



formula:

$$\underline{S}_{ab} = -1 \quad \left\{ \begin{array}{cc} \left( \begin{array}{c} k & & 2\\ \Sigma & (\underline{z} & -\underline{z} & )\\ i \equiv 1 & ai & bi \end{array} \right) \\ \end{array} \right\}$$

where:

- "a" and "b" are any two subjects,
- the "i" are all possible non-redundant pairs of attributes (in the present case k = 190) and,
- the " $\underline{z}$ " are Fisher's  $\underline{z}$  transformations of the interattribute correlations.
- The multiplicative constant (first term on the right) is arbitrary. An index of structural <u>similarity</u> was considered more aesthetically pleasing -- and less confusing -- than a dissimilarity index.

<u>S</u> is simply a form of the general Euclidean index of profile distance -- in this case, closeness -- the mathematical properties of which have been discussed by a number of authors (Cronbach & Gleser, 1953; Sneath & Sokal, 1973). As Sneath & Sokal noted, distance coefficients, like correlation coefficients, are measures of association. <u>S</u> is well suited for the present purpose, since it is a measure of the association of two sets of associations. In general terms, S is an index of the degree of fit between one person's



interattribute correlation matrix and that of another. Frankmann (R. W. Frankmann, personal communication) has suggested considering each subject's correlation matrix as a surface in three dimensions (attributes by attributes by magnitude of correlation). S is then a measure of the extent to which two subjects' correlation matrices describe the same surface.

The following discussion of the statistical properties of <u>S</u> borrows heavily from Cronbach & Gleser (1953). Their <u>D</u> statistic is like <u>S</u> except that <u>D</u>, (1) measures distance rather than closeness, (2) is a sum rather than an average, (3) was not intended specifically to take correlations as input. The first two of these differences are trivial. The third difference may be resolved by reference to that property of statistics of which statisticians are so fond of providing reminders, i.e., ignorance of the source of the data. What is true for raw data points (x) in Cronbach & Gleser's argument must also be true for z coefficients in the present use. <u>S</u> is a measure of the similarity of profiles of the relationships among a set of variables rather than similarity in profiles of ratings on the variables themselves.

 $\underline{S}$  meets, in every detail, the requirements for comparison of attribute structures developed above. The  $\underline{S}$  index reflects differences in dimensionality, attribute centrality and, to some extent, articulation, between members of a



dyad. Also, it is sensitive to differences in intertrait implication values among the attribute pairs as employed by the two people. Finally, the index summarizes data at the appropriate point for this research (individuals rather than types) and is sensitive to the factor structure of trait pairs for the dyad. Each of these points is elaborated below.

<u>Dimensionality</u>. In one article, Cronbach (1958) argued that profile distance is inappropriate for the study of person perception, since elevation differences in profiles -- a major contributor to the variance in <u>D</u> or <u>S</u> -- could reflect different response styles. However, in the present case, elevation differences are of theoretical interest. The elevation of a single profile is the average interattribute correlation in that profile. Dimensional complexity is the average <u>absolute</u> interattribute correlation. Trait scales were reflected prior to analysis to minimize the occurrence of negative correlations (See Table 1). Therefore, the difference in dimensionality between members of the dyad is among the major contributors to S.

Attribute Centrality, Salience, and Articulation. The terms centrality, salience, and articulation actually refer to very similar aspects of structure -- i.e., the extent to which a person employs a particular attribute in object judgment. It is assumed that if a person makes discriminations on an attribute which has been supplied, then those



discriminations have meaning for that person. (Recall that an ambivalence/irrelevance option was provided.) The point of this argument is twofold: (1) attributes on which a person makes few discriminations will be uncorrelated with other attributes in the domain; and (2) these zero, or near zero, correlations are functionally equivalent to those occurring between well-used, but orthogonal, attributes.



Figure 1. Dimensional representation of the use of the attributes friendly (f) and responsible (r) by three persons.

An illustration should help to demonstrate this equivalence. Take, for example, the use of the attributes friendly and responsible by three people (A, B, & C: Figure 1). In person A's implicit personality structure, friendliness and responsibility are highly related. If A assumes -- as we so often do -- that person B shares this preconception, then their communication may suffer to some extent. A tells B that another person, D, is very friendly. A assumes that B will make an inference about D's level of responsibility. B

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draws no such inference. Information has been lost. B does employ a dimension of responsibility but, it is unrelated to considerations of friendliness. Had A's conversation been with person C, it would have resulted in the same loss of information. Person C makes neither inferences of nor inferences from responsibility. Hence, the statistical equivalence between the AB and AC relationships, which arises from different sources is, nevertheless, accompanied by theoretical equivalence in its consequences for the communication in these dyads.

Other than in this limited sense,  $\underline{S}$  is not sensitive to differences in articulation. However, as was suggested earlier, articulation may not be of major consequence in the comparison of adult attribute structures.

<u>Implication Value</u>. Each of the basic elements of <u>S</u>,  $2^{2}$ the  $(\underline{z} - \underline{z})$ , is an indication of difference in the implication relationship of a pair of traits for the two members of the dyad. If all of these differences are small, then the two people employ very similar implicit personality structures and <u>S</u> will be relatively high. With generally large differences, there is little overlap in the implicit personality structures and <u>S</u> will be low. Note that either high or low <u>S</u> may be obtained in the comparison of persons of similar dimensionality.

<u>Factor Structure of the Similarity Index</u>. Potentially, S has as many dimensions as there are attribute pairs --


i.e., there are k degrees of freedom in S (Cronbach & Gleser, 1953). This is ideal in that it obviates the usual necessity of assigning individuals to types. Related to this is the fact that for correlated input (such as each person's interattribute correlations), the elements of S are weighted according to their contributions to the factor structure of the correlations among attribute pairs (see Cronbach & Gleser, 1953, pp. 467 ff. for a discussion of this property). Thus, the recurring dimensions of difference between two people have a greater impact on the index. and the effects of fortuitous differences in specific trait relations are minimized. An interesting corollary of this property is that, over a set of these indices -- i.e., for a large number of dyads --, the principal contributors to S should be the dimensions of the common cultural implicit personality theory.

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#### Psychometric Considerations: Present Data

In order to support the third hypothesis, the structural similarity index must exhibit acceptable levels of both temporal stability and internal consistency. The former characteristic is desirable because it sets an upper limit on the predictive utility of the measure. The latter property is necessary to justify the use of structural similarity as a global construct. If the index itself is multidimensional, then interpretation of its relationship to other variates is problematic.



Temporal Stability. Fifty-four subjects provided complete acquaintance (28) by attribute (20) data on two separate occasions. Minimum time between testings for any subject was three weeks. Although the 28 role descriptions were the same for both testings, it was emphasized to these subjects that there was absolutely no necessity that they use the same 28 people for both occasions. Further, they were instructed explititly not to make any special effort to achieve consistency between time 1 and time 2 responses. They were told to, "Just treat this as if it were the first time you had seen these questions."

Subjects' time one data were assigned to dyads randomly and <u>S</u> was computed for each dyad (N = 27). <u>S</u> was also computed for these same pairs of subjects at time two. The correlation between administrations was 0.66. Thus, between persons differences in attribute structure are reasonably stable over time.

Internal Consistency. A total of 184 acquaintance by attribute matrices was available for this analysis. These did not include the time two data from the temporal stability analysis. The 20 attributes were split randomly into two sets and subjects were paired randomly.  $\underline{S}$  was computed twice for each dyad -- once for each set of 10 attributes. The Spearman-Brown corrected reliability coefficient for  $\underline{S}$  was 0.77. Therefore, attribute similarity, as measured by S, had an acceptable degree of underlying unity.



#### Dimensions of the Group Structure

The 184 acquaintance by attribute matrices were "strung out" into a single data matrix having attributes as columns and subject - acquaintance combinations as rows. The interattribute correlation matrix was computed and then factor analyzed via principal components analysis with varimax rotation. This is an accepted strategy in research of this type (Maguire, 1973; Mann et al., 1977). The loadings of each attribute on the varimax rotated factors are presented in Table 2.

Factor II, which is interpreted more easily, will be discussed first. The variables which have their highest loading on this factor are from friendly to interesting in Table 2. This is clearly a friendliness or sociability factor. The matrix of correlations between attributes which defined this factor was essentially flat within sampling error, and Cronbach's alpha for a linear composite of these attributes was 0.91.

Factor I -- responsible to independent in Table 2 -also evidenced a high degree of internal consistency (alpha = 0.93). However, inspection of the interattribute correlation matrix for these variables revealed the possibility of further decomposition of this factor into more easily interpreted subfactors. Subfactor Ia (alpha = 0.89) was com-



#### Varimax factor loadings for attributes from acquaintance by attribute matrices

Factor
II
. 35
.24
.26
. 34
.35
. 44
.27
.37
.45
. 56
. 39
.13
.07
.82
.82
.81
. 69
.63
.58
.58

posed, in order of contribution, of the attributes competent, clever, wise, intelligent, perceptive, skillful, creative, confident, and independent. Intellectual competence is not an unreasonable interpretation for this subfactor. Subfactor Ib (i.e., responsible, dependable, trustworthy, and hardworking -- alpha = 0.91) appeared to reflect the use of a dimension of responsibility dependability in people's judgments of others.

Two of these factors -- friendliness - sociability and intellectual competence -- are the most frequently occurring



dimensions in person perception research (see, for example, Rosenberg & Sedlak, 1972a, 1972b). Therefore, support for hypothesis four, which predicted replication of previous findings in this area, is unambiguous.

#### Structural Similarity and Dimensionality

Hypothesis two predicted a moderately negative relationship between structural similarity and dimensional complexity differences within dyads. The two measures needed for a test of this prediction are the structural similarity index (S) and an index of dimensional complexity. Dimensional complexity was defined operationally for each subject as the reflected average absolute interattribute Fisher z or; -1 [( $\Sigma$  | $\overline{z}$  |)/k] where i represents all nonredundant attribute pairs. Obviously, this index will always be negative. It should be apparent from previous discussions, that high values -- close to zero -- are indicative of cognitive complexity. That is, the sum of the angles between attribute pairs is high and traits are distinguishable in the person's cognitive structure. On the other hand, as this index departs from zero it suggests the operation of a more simple structure in which the traits do not represent distinct qualities which are perceived in people.

As a test of the second hypothesis, the structural similarity indices from the internal consistency analysis (N = 92) were correlated with absolute differences in dimen-



sional complexity for each dyad. The value of this correlation was -0.68. Intradyad differences in dimensionality accounted for less than half of the variance in  $\underline{S}$ , and hypothesis two, which predicted a moderate relationship between these variables, was supported.

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#### Communication: Study I

In this study a naturally occurring communication situation, common to the college setting -- that from instructor to student -- provided opportunity for tests of hypotheses one and five.

Since the classes involved were in undergraduate psychology courses representative of the social (vis à vis natural) side of the science, the occurrence of person attributes was a natural concomitant of course content. Specifically, the courses were: Introductory Psychology Personality and Social (2 classes, N = 54 & 27), Psychology of Personality (N = 55), and Introductory Social Psychology (N = 18). Even given the high probability of domain-relevant conversation, the amount of extraneous variation present in such a setting makes it essential that any relationships between structural similarity and criterion variables be rather robust if they are to be observed. This study provided a fairly rigorous test of the predictive utility of attribute structure similarity.





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The data required for structural comparisons -acquaintance by attribute matrices -- were provided instrucbors and a sample of students from each of the four classes. Swas computed between instructor and each student in his (all instructors were males) class. Later in the term (at least six and, in most cases, closer to nine weeks into the term), three indices of communication effectiveness mere obtained. The first, <u>lecture clarity</u>, was the sum of measure each student's reaction to the instructor's oral presentation (Cronbach's alpha = 0.80). The second there nating was a four item scale (also in Appendix B) mich measured students feelings about the olarity and mich measured students feelings about the olarity and

students' course grades were obtained -- with their permission.

For the third measure of communication effectiveness

As input to a measure of interpersonal attraction each subject rated the instructor on each of the 20 traits employed in the structural measures (Appendix B or Table 1). A factor analysis of these 20 attributes indicated the presence of three dimensions on which students judged instructors (Table 3).

Procedure



# Varimax factor loadings for student judgments of instructors

		Factor	
attribute	I	II	III
clever	.76	.25	.23
creative	.76	.24	.20
confident	.71	.13	.23
perceptive	.67	. 18	. 38
interesting	. 66	. 30	. 25
intelligent	.57	. 40	. 05
skillful	.50	.29	.23
dependable	.16	.77	.17
responsible	.29	.75	. 16
hardworking	.24	.71	.09
trustworthy	.23	.70	. 41
wise	. 39	. 55	.21
competent	.42	. 48	.26
independent	.24	.30	.24
sociable	.35	.09	.70
openminded	.15	.04	.69
kind	.10	.36	.68
friendly	.40	.24	.66
warm	.32	.24	.61
considerate	.14	. 42	.58

Interpretation intellectual dependability sociability capability

Coefficient alpha\* .89 .87 .87

\*For composite of attributes with highest loading on given factor

Since each of the factors could be considered a measure of liking for the instructor, three measures were computed.

Each was the unit - weighted sum of attributes with highest loadings on the factors shown in Table 3.



# Study I Results

Communication. Hypothesis one predicted a positive relationship between structural similarity and the various indices of communication. Correlations between the communication measures -- course grade, lecture clarity, and exam rating -- and S were computed within each class and then averaged using r to z transformations. Neither of the two attitude scale measures was significantly related to structural similarity. However, course grade was correlated with S (r = 0.23, p  $\leq$  0.005). Since grades are not subject to many of the biases which affect attitude measurement (e.g.. socially desirable response sets). they provide a good measure of communication effectiveness. This is particularly so given the myriad factors which certainly contribute to scholastic performance. The fact that structural similarity was related to this measure is interpreted as support for hypothesis one.

<u>Attraction</u>. Hypothesis five is somewhat more complicated than the first hypothesis. In the context of this study, communication effectiveness should, in itself, carry extrinsic reward (i.e., high grade). The specific prediction, therefore, is a significant interaction between  $\underline{S}$  and grade (G) on attraction scores (A) in a multiple regression analysis or, in other terms, a positive correlation between A and the <u>SG</u> product after both <u>S</u> and G have been statistically removed from A. Since there were three measures of



attraction available, this analysis was performed on each. However the three attraction measures (Table 3) were highly intercorrelated (0.75, 0.69, & 0.68). So, these three analyses should be viewed as a single test of this hypothesis.

In none of these analyses did the product of grade and structural similarity contribute to the prediction of attraction responses. Similar analyses using the attitude scale communication effectiveness measures also were unsuccessful. Therefore, there is no support in this study for hypothesis five.

#### Communication: Study II

Study I provided some indication that effective communication is related to similarity of attribute structures. However, these resultes occurred in the presence of numerous extraneous variables any of which could have either contributed to the observed relationship or hidden a stronger association between the variables. For this reason, a second, more controlled test of the first hypothesis was conducted. In this study, dyads composed of female students, who had been paired on the basis of structural similarity - dissimilarity, played a game which had as its object the communication of personality trait adjectives. In line with hypothesis one, superior performance at this communication task was expected from structurally similar dvads.



#### Procedure

<u>Subject Selection</u>. The first 80 female subjects who completed the acquaintance - attribute matrices were divided randomly into two groups. Then, within each group, <u>S</u> was computed for all possible pairs of subjects. For one group -- similar structure -- the pairs were ordered from high to low <u>S</u>. For the other group -- dissimilar structure -this ordering was reversed. Pairs were then sampled from the top of each of these orders, without replacement of any subject, until 15 dyads of each type had been selected. There was no overlap in S for these selected groups.

There is the possibility that it is easier (statistically) for two people to be structurally similar if they are both cognitively simple. Overrepresentation of cognitive simplicity in the similar group could operate against confirmation of the hypothesis. However, analyses of variance revealed no group related differences in either individual subjects' cognitive complexity scores, summed dyad cognitive complexity scores, or individual subjects' G.P.A.'s. Due to scheduling difficulties, only 25 dyads (13 similar, 12 dissimilar) completed the study. There were no obvious correlates of subject mortality.

<u>Communication Game</u>. Each dyad was to communicate, using as few clues as possible, each of 20 personality trait adjectives (Table 4). As each subject arrived, she was



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Trait adjectives used in communication game

1		11	interesting
1.	carm	11.	Incerescing
2.	ambitious	12.	skillful
3.	intelligent	13.	popular
4.	friendly	14.	shy
5.	persuasive	15.	considerate
6.	kind	16.	responsible
7.	independent	17.	generous
8.	gentle	18.	creative
9.	helpful	19.	confident
10.	serious	20.	honest

greeted by an experimenter and provided with a page of printed instructions which explained the game (Appendix C). Subjects alternated sender and receiver roles for each new word. The order of roles was determined haphazzardly (i.e., whoever happened to sit in front of the odd-numbered deck of word cards, which were face-down on the table, was the first sender). The list of words was comprised of 10 trait words from the set of 20 which had been used for the structural data (old words) and 10 other trait words of roughly equivalent difficulty (added words). An informal pilot study, using a group of student research assistants as subjects led to the selection of trait adjectives in a moderately easy to moderately difficult range. One order of the 20 words was used throughout the experiment, and each subject was sender and receiver for five of the old words and five of the added words. It had been at least three weeks since the acquain-



tance - attribute data had been gathered. So, the 10 old list words were probably not overly salient. The 10 added words were included as a test of the within domain generality of the structural similarity index.

The rules of the game which were read by the subjects and then explained by the experimenter were:

1. Try to communicate the word by using other words which have similar meanings or by using examples of behaviors that a person who possesses the trait might exhibit. Examples of each were provided. Homonyms and words containing the same stem as the target word were not allowed as clues.

 No more than seven clues were allowed for each word. Senders were instructed to give only one clue at a time.

3. Thirty seconds were allowed for each clue, and thirty seconds for each response. However,

4. No more than a total of four minutes were allowed for any word.

The experimenters -- student research assistants -indicated that subjects had little trouble understanding the rules. Since all sessions were tape recorded for later analysis, experimenters were instructed to call for the next word only in cases of flagrant violation of the homonym or common stem rules (scored as missing data), or because time had elapsed.

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Design. The design for this analysis is 2 (Structure {S}: similar-dissimilar) by 2 (Role {R}: sender-receiver) by 2 (List {L}: old - added) by 5 (Word {W}: nested in RL combinations). Dyads {D} were nested in levels of S and crossed with all other factors. Since D is the unit of analysis, the second factor, R, is a control factor. In addition, a simple one-way design -- similar vs. dissimilar -- will be used to compare overall communication success (i.e., number of correct responses).

Measures. The measures of communication effectiveness were: (1) time elapsed for each word, (2) number of clues for each word -- scored in reverse {0 = failure, 8 = correct on first clue} and, (3) success - failure, each word. In addition the total game time for each group was recorded. (Due to equipment failure, time measures were available for only 11 dyads in each condition.)

### Study II Results

An analysis of variance on number of clues (0 = failure, 8 = correct on first response) revealed no effects attributable to structural similarity. As may be seen in Table 5, the only determinants of number of clues per word were Words and Role.

Although the observed means for the similar (4.39) and dissimilar (4.78) groups appeared to differ in the predicted direction, they were well withing error of being the same



Analysis of variance on number of clues

Source	df	MS	F	p
Similarity (S) Dyads (D) error	1 20	16.809 6.594	2.549	.126
Words (W) S X W D X W error	16 16 320	37.386 4.210 5.290	7.062 .795	<.0005 .691
List (L) S X L D X L error	1 1 20	6.627 1.536 4.592	1.443 .335	.244 .569
Role (R) S X R D X R error	1 1 20	94.582 5.236 6.919	13.670 .757	.001 .395
L X R S X L X R D X L X R error	1 1 20	24.582 19.236 7.191	3.269 2.558	.086 .125

number. The pattern of results for elapsed time per word was identical in every detail to the number of clues analysis. Therefore it is not reported. Neither square root nor logarithm transformations of the elapsed time data revealed any differences in this pattern.

An explanation for the Words (W) effect was immediately apparent on inspection of the observed means. Some words (e.g., ambitious - 1.45) were more difficult than others (e.g., intelligent - 6.77). Since there was no temporal ordering of the clue means, success was not a function of practice. The Role (R) effect also may be explained in terms of word difficulty, since words were nested within levels of Role.



For reasons having to do with violations of the homonym and common stem rules, some dyads did not have scores for all words. Two words had to be eliminated for one dyad and five dyads were missing data for one word. In the analysis reported above, dyad by word means were substituted for these values. For the overall number correct analysis no such substitution was made. The score for each dyad was simply the ratio of the number correct to the number attempted. Further support for hypothesis one was found in this analysis. Table 6 shows the results of a one-way analysis of variance on ratio correct scores.

Structural similarity was a significant predictor of correct response in this study. Similar dyads communicated the correct word 83% of the time, while dissimilar dyads did so for only 75% of the words.

# TABLE 6

Analysis of variance on ratio correct scores

Source	df	MS	F	p
Similarity	1	.038	4.389	.047
error	24	.008		

While the results from the number of clues and ratio correct analyses seem, at first glance, to be contradictory, their implications for hypothesis one actually are rather clear and unambiguous. The solutions of the similar dyads to these communication problems were no more elegant than those of their dissimilar counterparts. They were, however,



more frequent. Since the natural analog of the first of these measures -- speed of communication -- is likely only to be important in rare instances (TV game shows come to mind immediately), it is not unreasonable to suggest that the second measure -- ultimate correctness of communication -- is the more ecologically valid of the two.



#### DISCUSSION

Taken together, the results of Studies I and II provide a reasonable degree of support for the communication hypothesis which was the central focus of this research. This support is not unqualified, but, given the subtlety of the principal variable, these findings should be viewed positively. At a minimum, similarity of attribute structures accounted for some portion of the variance in interpersonal communication. Moreover, this variable can be measured reliably and is not wholly attributable to differences in dimensionality.

Predicted correlates of structural similarity appeared in both the more natural environment of Study I and the more controlled laboratory setting provided in Study II. In each case, a significant relationship was obtained with at least one measure of communication effectiveness.

Within the classroom situation (Study I), there may be better criteria of communication success than those employed in this research. Yet the relationship between structural similarity and course grades is encouraging. Grades are probably, for most students, more serious matters than attitudinal measures of teacher effectiveness.


Furthermore, structural similarity between student and instructor was not expected to account for a very large portion of grade variance. Clearly, there are better predictors of academic performance. The intent of Study I was to demonstrate the relationship of similarity of attribute structure to efficacy of communication in a naturally occurring social situation, and this demonstration was successful.

As with any study, there also were many unmeasured variables which may have attenuated the results of Study II. In retrospect, it seems that a pre-measure of verbal fluency could have provided a valuable covariate. Students grade point averages were available and the groups had been matched on G.P.A. However, since the modal subject in this study was a second term freshman, the G.P.A. measure probably was not very reliable. The unobstructed vision of hindsight also has given rise to questions about the wisdom of criterion decisions in Study II. It probably would have been better to have allowed more than seven clues per word and to have removed completely any time restraints. As was mentioned previously, communication accuracy is likely to be of greater value than speed of communication. The clue and time limit rules were developed during pilot testing with student research assistants. Perhaps there were population differences between these assistants and the subjects in Study II.



Temporal constraints in both studies of the present investigation may have obscured a stronger relationship between structural similarity and communication. Now that it has been demonstrated that structural similarity can be measured reliably, it should be interesting to observe its operation in more naturally occurring groups of persons whose interactions take place over a longer time than those involved in these studies. Examples of questions that might be addressed abound: Are married couples more structurally similar than random pairs of persons? Does structural similarity predict success in a psychotherapeutic relationship -- if such is subject to reliable measurement? Are persons who choose a given profession structurally homogeneous?

The issue of domain generality also is important. The present research was restricted to the domain of acquaintances. However, the index employed might be applied to judgments of any class of objects. If the objects are constant across persons, then it should be possible to assess empirically the relationship between similarity of structure and similarity of judgment (i.e., attitude similarity). Such an analysis might contribute to knowledge about the basis of the attitude similarity - attraction relationship. Lack of support for hypothesis five in Study I certainly does not eliminate the possibility of a relationship between structural similarity and interper-



sonal attraction. More direct exploration of the joint effects of these two variables might be fruitful. If, over time. structural similarity is related to predictability and unrelated to attitude similarity, then a comparison between the relationships of these two variables to attraction could provide a good test of the reasonableness of Byrne's (1971) effectance - affect hypothesis which suggests that attraction comes about, in part, as a concomitant of predictability. For the first time, it may be possible to separate attitude similarity from the increased feeling of environmental control which is thought to be one of its effects. This would be a step beyond the work of Tesser (1971, 1972) since a complete orthogonalization of the two variables could be accomplished. The present conception of structural similarity would allow for a crossing of predictability and attitude similarity with more mundane realism than was present in Tesser's studies. It seems easier to imagine another person who agrees on the relevant dimensions of an issue but disagrees on outcome than it is to conceive of one who despises candy but loves chocolate bars.

The purpose of the present research was exploration. Communication was chosen as a general criterion because of its fundamental relationship to social acts. Replication of the structural similarity - communication findings is a necessary second step in the process of understanding the

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position of overlap in "phenomenal worlds" in the realm of social behavior. The conception of structural similarity developed in this research is novel. As with any new construct, multiple operations will provide the ultimate test of its utility. an the state of the second second

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APPENDIX A

Acquaintance by Attribute Instruments



For the first part of this study we will ask you to make judgments about people you know -- friends, and liked and disliked acquaintances. On the fourth page of this booklet there are 28 phrases, each describing a person in terms of that person's qualities or that person's relationship to you. For example:

"The most popular person you know"

In each case we would like you to think about a <u>particular</u> person, whom you know, who fits this description (at least, approximately). When you have thought of a person fitting the description, write this person's initials (or some other identification you will remember) in the blank next to the description. Please do not use the same person for more than one description. For example, if one description is "your younger sibling" and another is "the most popular person you know", those might make you think of the same person. If this happens, think of a <u>different</u> particular person to whom the second description could apply - in this case, the <u>second</u> most popular person you know - and list that person instead.

Please understand that it is much more important that you use 28 different people than that each discription exactly fit each person.

Once you have listed 23 people who fit the 23 descriptions, you will rate these people on a set of rating scales. There are 14 computer answer sheets. Each answer sheet has two of the person descriptions - one at the top of each side. Look at your list of the 23 descriptions with peoples' initials and copy each described person's initials from your list to the top of the appropriate computer page.

When you have a person's initials at the top of each computer page, you will use the boxes on the page to rate this person on a set of adjective scales. Listed under each person there are a number of scales which you are to use to indicate your feelings about this person. Each of these scales contains two opposite adjectives in this form:

smart /.1./.2./.3./.4./.5./.6./.7./ stupid

You will be indicating your feelings about the person by using the numbers 1 to 7 for each adjective scale. You will use these numbers to indicate which

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smart /.1./.2./.3./.4./.5./.6./.7./ stupid

end of the scale best applies to your feelings about the person.

For example, if you think that the person is very smart, you would indicate this by marking the box labled 1 for this scale. If you feel that this person is very stupid you would mark a 7 (just ignore the 0,8, and 9 boxes for the scales). Use the numbers between 1 and 7 to indicate <u>how close</u> to either end of the scale you feel the person is - use a 2 to indicate that you feel the person is moderately smart, a 5 to indicate that he or she is somewhat stupid, etc.

If you feel that the person you are rating is neutral on the scale or if both sides of the scale apply, or if the scale seems completely irrelevant to that person, then choose the number 4 (the middle of the scale) as your response.

PLEASE FILL IN THE STUDENT NUMBER BOXES AT THE TOP (FRONT) OF EACH COMPUTER ANSWER SHEET.

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28. -
1. Your closest friend (opposite sex)	1
2. Another close friend (opposite sex)	2
3. Scheene you know personally for whom you feel sorry	3
4. The relative you like the lesst	4
5. The person with whom you most like to party	5
<ol> <li>The person you've met recently whom you would least like to get to know</li> </ol>	6
7. A person you're acquainted with who seems very hard to get to know	7
8. The person you most dislike of the opposite sex	8
9. Another person you dislike of the opposite sex	9
10. The person you know whom you would least like to be like	10
11. The relative you like the most	11
12. The least successful person you know personally	12
<ol> <li>The person with whom you would most like to work on a project that is important to you</li> </ol>	13
14 The person you know who most depends on you	14
15. The person with whom you would least like to share your intimate thoughts and feelings	15
16. The person with whom you would least like to work on a project that is important to you	16
17. Yourself	17
18. The person you know whom you would most like to be like	18
<ol> <li>The person you've met recently whom you would most like to get to know</li> </ol>	19
20. Your closest friend (same sex)	20
21. Another close friend (same sex)	21
22. The most successful person you know personally	22
23. The person with whom you least like to party	23
24. Someone you know personally whom you admire	24
25. Another person you know personally whom you aduite	25
26. The person you most dislike of the same sex	26
27. Another person you dislike of the same sex	27
28. The person with whom you would most like to share your intimate thoughts and feelings	28



## DO 💼 💼 NOT WRITE IN THIS AREA

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1. considerate /.1./.2./.3./.4./.5./.6./.7./	inconsiderate 1	୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦୦	
2. unintelligent /.1./.2./.3./.4./.5./.6./.7./	intelligent 2	୦୦୦୦୦୦୦୦୦୦୦	
3. wise /.1./.2./.3./.4./.5./.6./.7./	foolish 3.	୭୦୦୦୦୦୦୦୦୦୦	
4. unperceptive /.1./.2./.3./.4./.5./.6./.7./	perceptive 4.	ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼	
5. openminded /.1./.2./.3./.4./.5./.6./.7./	closedminded 5.	୦୦୦୦୦୦୦୦୦୦	
6. uninteresting /.1./.2./.3./.4./.5./.6./.7./	interesting 6.	୭୦୦୭୭୭୭୭୭୭୭	
7. warm /.1./.2./.3./.4./.5./.6./.7./	cold 7.	୭୦୭୭୭୭୭୭୭୭୭	
8. confident /.1./.2./.3./.4./.5./.6./.7./	not confident 8.	୦୦୦୦୦୦୦୦୦୦୦	
9. not creative /.1./.2./.3./.4./.5./.6./.7./	creative 9.	୭୦୦୦୦୦୦୦୦୦୦	
10. skillful /.1./.2./.3./.4./.5./.6./.7./	not skillful 10.	©©©©©©©©©©©©	
11. lazy /.1./.2./.3./.4./.5./.6./.7./	hardworking 11.	00000000000	
12. irresponsible /.1./.2./.3./.4./.5./.6./.7./	responsible 12.	00000000000	
13. kind /.1./.2./.3./.4./.5./.6./.7./	unkind 13.	ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼	
14. unfriendly /.1./.2./.3./.4./.5./.6./.7./	friendly 14	ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼	
15. competent /.1./.2./.3./.4./.5./.6./.7./	incompetent 15.	ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼	
16. sociable /.1./.2./.3./.4./.5./.6./.7./	unsociable 16	ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼	
17. untrustworthy /.1./.2./.3./.4./.5./.6./.7./	trustworthy 17.	©0©30©©©©©	
18. independent /.1./.2./.3./.4./.5./.6./.7./	dependent 18	୦୦୦୦୦୦୦୦୦୦୦	
19. undependable /.1./.2./.3./.4./.5./.6./.7./	dependable 19	000000000000	
20. not clever /.1./.2./.3./.4./.5./.6./.7./	clever 20.	00034560089	
		ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼ଡ଼	
		00000000000	

· 1010

The person you've met recently whom you would least like to get to know

21. considerate /.1./.2./.3./.4./.5./.6./.7./ inconsiderate 21. 22.unintelligent /.1./.2./.3./.4./.5./.6./.7./ intelligent 22. wise /.1./.2./.3./.4./.5./.6./.7./ foolish 23. 23. 24. unperceptive /.1./.2./.3./.4./.5./.6./.7./ perceptive 24. 25. openminded /.1./.2./.3./.4./.5./.6./.7./ closedminded 25. 26.uninteresting /.1./.2./.3./.4./.5./.6./.7./ interesting 26. 27. warm /.1./.2./.3./.4./.5./.6./.7./ cold 27. 28. confident /.1./.2./.3./.4./.5./.6./.7./ not confident 28. 29. not creative /.1./.2./.3./.4./.5./.6./.7./ creative 29. 30 skillful /.1./.2./.3./.4./.5./.6./.7./ not skillful 30. 31. lazy /.1./.2./.3./.4./.5./.6./.7./ hardworking 31. 32.irresponsible /.1./.2./.3./.4./.5./.6./.7./ responsible 32. 33. kind /.1./.2./.3./.4./.5./.6./.7./ unkind 33. 34. unfriendly /.1./.2./.3./.4./.5./.6./.7./ friendly 34. 35. competent /.1./.2./.3./.4./.5./.6./.7./ incompetent 35. 36. sociable /.1./.2./.3./.4./.5./.6./.7./ unsociable 36. 37.untrustworthy /.1./.2./.3./.4./.5./.6./.7./ trustworthy 37. independent /.1./.2./.3./.4./.5./.6./.7./ dependent 38. 38. 39. undependable /.1./.2./.3./.4./.5./.6./.7./ dependable 39. 40. not clever /.1./.2./.3./.4./.5./.6./.7./ clever 40. 41. Mark a 0 for item 41. Mark a 3 for item 42.

-

•



ou would least like

7./ inconsiderate 21.

7./ intelligent 22.

7./ foolish 23.

./ perceptive 24.

./ closedminded 25.

./ interesting 26.

/ cold 27.

/ not confident 28.

/ creative 29.

/ not skillful 30.

/ hardworking 31.

/ responsible 32.

unkind 33.

friendly 34.

incompetent 35.

unsociable 36.

trustworthy 37.

dependent 38.

dependable 39.

clever 40.

an. A

APPENDIX B

Instructor Rating Form



## DO NOT WRITE IN THIS

(	D000000000		Dr	(your	general impression)
)	0034550089	1.	considerate	/.1./.2./.3./.4./.5./.6./.	7./ inconsiderate 1.
)	00000000000	2.	unintelligent	/.1./.2./.3./.4./.5./.6./.	7./ intelligent 2.
0	0000000000	3.	wise	/.1./.2./.3./.4./.5./.6./.	7./ foolish 3.
0	000000000000000000000000000000000000000	4.	unperceptive	/.1./.2./.3./.4./.5./.6./.	7./ perceptive 4.
0	0003456788	5.	openminded	/.1./.2./.3./.4./.5./.6./.	7./ closedminded 5.
0	000000000000	6.	uninteresting	/.1./.2./.3./.4./.5./.6./.	7./ interesting 6.
(	0003466789	7.	7. warm	/.1./.2./.3./.4./.5./.6./.	7./ cold 7.
0	<u>୭</u> ୦୦୦୦୦୦୦୦୦	8.	confident	/.1./.2./.3./.4./.5./.6./.	7./ not confident 8.
ŀ	000395608	9.	not creative	/.1./.2./.3./.4./.5./.6./.	7./ creative 9.
	000000000000	D 10.	skillful	/.1./.2./.3./.4./.5./.6./.	7./ not skillful 10.
	0000000000000	D 11.	lazy	/.1./.2./.3./.4./.5./.6./.	7./ hardworking 11.
	000000000000	D 12.	irresponsibl	.e/.1./.2./.3./.4./.5./.6./.	7./ responsible 12.
	00000000000	<sup>3</sup> 13.	kind	1/.1./.2./.3./.4./.5./.6./.	7./ unkind 13.
	00000000000	9 <sub>14</sub>	unfriendly	7 /.1./.2./.3./.4./.5./.6./.	7./ friendly 14.
	00000000000	9 <sub>15.</sub>	. competent	: /.1./.2./.3./.4./.5./.6./.	7./ incompetent 15.
	0003466008	16 O	. sociable	2 /.1./.2./.3./.4./.5./.6./.	7./ unsociable 16.
	00000000000	<sup>(1)</sup> 17	. untrustworth	x /.1./.2./.3./.4./.5./.6./.	7./ trustworthy 17.
	000345603	18 0	independen	F / 1 / 2 / 3 / 4 / 5 / 6 /	7 ( dependent 18
	0000000000	019	undependabl	• / 1 / 2 / 3 / 4 / 5 / 6 /	7 / dependent 10.
	0000000000	0000	pot clava	r / 1 / 2 / 3 / 4 / 5 / 6 /	7 / alover 20
	0000000000	0001	(Pour 225 onl		The crever 20.
	0000000000	0	• (13y 225 0hi)	y)	
	000305600	9			
	000346600	0.	on 21 de fem e		1-
	000300000		em 21 15 LOF M	the term Dr. Darciay's cla	ss oury.
	000305600	D @ 2e	merime during merally in agr	eement with him to stand in	front of the class
	0000000000	an DO <sup>to</sup>	c those who di remain seated	on t agree with him or didn	t support his ideas
	0000000000	DOPi	d you: 1. St	and (I agree.)	
	0000000000	30	2. R 3. I	emain seated (I disagree) wasn't in class	

Mark item 21.

AKEA

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P	93 ut your student number in space	es 1-6	1.	00000000000
			2.	00000000000000
7.	Which instructor ? (This soes	in space 7 ()	3.	0000000000000
	1. Psy 225 Dr. Barclay 4.	Psy 335 Dr. gard	4.	0000000000000
2. 1	ey 160 Dr. Fitzgerald 5. Psy	344 Dr. Truhon	5.	000000000000
3. 1	esy 160 Dr. Messe' 6. Psy	444b Dr. Truhon	6.	000000000000000000000000000000000000000
			7.	000000000000
	Dr's 1	ectures		0000000000000
9. clear	/.1./.2./.3./.4./.5./.6./.7./	unclear	9.	000000000000
10.uninteresting	/.1./.2./.3./.4./.5./.6./.7./	interesting	10.	000000000000
11.rational	/.1./.2./.3./.4./.5./.6./.7./	irrational	11.	000000000000
not understandable 13. easy	/.1./.2./.3./.4./.5./.6./.7./	understandable	12.	000000000000
to take notes	/.1./.2./.3./.4./.5./.6./.7./	to take notes	13.	00000000000
14.disorganized	/.1./.2./.3./.4./.5./.6./.7./	organized	14.	00000000000
				000000000000
	Dr's test	s/exams		000000000000
17. interesting	/.1./.2./.3./.4./.5./.6./.7./	untineresting	17.	000000000000
18. unfair	/.1./.2./.3./.4./.5./.6./.7./	fair	18.	000000000000
19. easy	/.1./.2./.3./.4./.5./.6./.7./	hard	19.	000000000000
not understandable	/.1./.2./.3./.4./.5./.6./.7./	understandable	20.	000000000000
21 relevant	/.1./.2./.3./.4./.5./.6./.7./	irrelevant	21.	000000000000
				0000000000000
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2				00000000000
				000000000000

11 1





As you have been told, this experiment is concerned with communication. You are going to play password, a game which involves communication between two people.

The experimenter will place a deck of cards face down in front of each of you. You will each receive 10 cards. Please do not look at these cards until you are told to do so.

The words which are on the cards are personality trait words. That is adjectives which might be applied to people - such as: humorous, wise, eager, trustworthy, polite, etc.

The object of the game is to try to communicate your word to your partner without using the word itself or any form of the word. You will alternate turns giving clues and making responses, starting with whoever has word number 1.

As clues you may use words which mean the same as (or have a close meaning to) your word. OR you might use a behavior which a person who possesses this trait might engage in, for example: if the word is HUMOROUS as a clue you might say FUNNY or you might say SOMEONE WHO TELLS A LOT OF JOKES IS

Please do not give more than one clue until your partner has made a response or until the experimenter tells you to give the next clue.

Similarly, only give one response per clue .. unless your partner fails to give another clue within 30 seconds and the experimenter indicates that 30 seconds have elapsed.

You will get a maximum of :

4 minutes per word 30 seconds to give each clue 30 seconds to give each response

7 clues and/or responses per word

ILLEGAL CLUES:

Rhymes with Sounds like

or for example if the word is LIKable "someone you can like" is not a good clue.

If you have any questions, please ask the experimenter.

There is no reason to feel bad if you miss a hot of words. You are among the first group of people we are running through this procedure and we don't have all of the bugs worked out. It is possible that the task is too hard and that no group will do well. Just do your best. Thank you for participating in this research.

Jack Condon







