1978

# Inferential Judgment And Implicit Theory Of Psychopathology

David Wai-ock Chan

## Recommended Citation

Chan, David Wai-ock, "Inferential Judgment And Implicit Theory Of Psychopathology" (1978). *Digitized Theses*. 1087.
https://ir.lib.uwo.ca/digitizedtheses/1087

# INFERENTIAL JUDGMENT AND
# IMPLICIT THEORY OF PSYCHOPATHOLOGY

by

David Wai-Ock Chan
Department of Psychology

Submitted in partial fufillment
of the requirements for the degree of
Doctor of Philosophy

Faculty of Graduate Studies
The University of Western Ontario
London, Ontario
May, 1978

# ABSTRACT

By examining the implicitness of the implicit personality theory, the viability of its structural representation, and its extension to domains other than normal personality, a broadened notion of the implicit personality theory was proposed. Within the framework of this broadened notion, the implicit theory per se was distinguished from the inferential judgments with respect to specific target persons based on the implicit theory. Such an explicit distinction suggested two distinct avenues for understanding individual differences in perception and in the judgment process.

The first study investigated the implicit theory of psychopathology. Multidimensional scaling analyses were applied to the judgments of dissimilarities of a set of psychopathological constructs from three samples of judges. Individual differences in the perception of psychopathology were explored by focusing on the differences between the experienced and the less experienced judges. A common perceptual space was postulated as a parsimonious and adequate representation of the general implicit theory for all judges. The correspondence between the perceptual spaces and the component structures derived from self-reported data from college students, alcoholic patients, prison inmates, and psychiatric patients to the same set of constructs suggested that people's perception of psychopathology was relatively "valid." A similar conclusion was reached by examining the perception of three clinical types in the joint spaces of traits and clinical types.

The second study investigated the process and accuracy of inferential judgments of judges with respect to three specific targets based on the implicit theory of psychopathology. Four models of decreasing complexity were fitted to the inferential judgment data of each judge with respect to each target using the common perceptual space and the individual perceptual space such that the judged targets could be located as points or vectors in the perceptual spaces. In this way, by defining complexity in the "subjective metric" of each judge, it was found that there were considerable individual differences in complex processing in addition to the differences in target complexity. Attempts to identify personality correlates of judges of different levels of complex processing were unsuccessful. Judges who used the general implicit theory of psychopathology effectively were found to make more "accurate" judgments of the psychopathology of the targets.

# ACKNOWLEDGMENTS

This thesis would not appear in its present form without the help and encouragement of many people. I am specially indebted to my Chief Advisor, Dr. Douglas N. Jackson, for his interest, supervision, support, and comments throughout this project. I wish to express my sincere thanks to members of my Advisory Committe, Dr. William R. Krane, Dr. Richard W. J. Neufeld, Dr. Robert C. Gardner, and Dr. E. Tory Higgins for their helpful suggestions and comments.

Throughout the completion of this project, I have been inspired by various mentors, colleagues, and friends to whom I express my appreciation. Many of their ideas and interests become mine. Dr. Harry Hunt, who made his influence long ago, has stimulated my interests in George A. Kelly's ideas and in implicit personality theory. Dr. Susan Pepper has taught me personality theories and got me interested in person perception; her valuable comments on a previous draft of the thesis are greatly appreciated. Dr. Douglas N. Jackson has instructed me in personality assessment and clinical judgment, and introduced me to multidimensional scaling. Dr. Ian Spence has since then greatly influenced me in my thinking regarding scaling procedures; his suggestions for the incomplete design for similarity judgments in the study presented in the thesis are gratefully acknowledged. My sincere thanks are also extended to Dr. James O. Ramsay for his encouragement, and for making available to me his multidimensional scaling programs. Dr. Richard A. Harshman has also made his influence

through his lectures and thought-provoking discussions on scaling every Friday afternoon for the past four months; his comments on the results of the studies are greatly appreciated. I also wish to thank Dr. Lubomir S. Prytulak with whom I am closely associated more as a friend and a colleague than a student during my years at Western; he has made valuable comments on a previous draft of the thesis.

Many of my colleagues and friends provided invaluable assistance and encouragement. Specially, I would like to thank Roland D. Chrisjohn, Edward Helmes, and Erich L. Strasburger, who provide many suggestions through many conversations, and all the graduate students who participated in the study. I also wish to thank Mrs. Sandy Lebodus for typing the long questionnaires prepared for the studies presented in the thesis.

Part of the success of this venture is attributable to each of the people mentioned above, and to many others who have not been mentioned. Finally, I want to thank my wife, Shirley, with deep affection and admiration. She has to put up with this thesis which has taken up so much of my time and energy. This project would definitely not be completed without her understanding and forbearance.

## TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

## LIST OF APPENDICES

# CHAPTER 1

# INTRODUCTION

Broadly speaking, judgment is a pervasive cognitive activity that everyone engages in each moment of his conscious life. The components in any act of judging consist of the judge, the information about the judged object, the judgmental setting, and the task requirements associated with the judgment.

In a simple judgmental task, one judges, for example, which of the two weights is heavier, or which of the two tones is louder. In such a psychophysical experiment, the alternatives of responses are both given and well-defined, and one assumes that the information given is the associated measurement of the judged object. It is evident that judgment is based on such information, though it is less obvious that the judge contributes something to the response, rather than being simply the means of transducing information.

Of particular interest is the case in which the judged object is a person in a social or clinical setting, as is the case when one judges the personality characteristics of a stranger, or when a clinician judges the psychopathology of a patient. The concern here is with precisely what items of information or cues are selected and how they are used in the judgment. The fact that judgment is typically a process going beyond the information given stimulates interest in research on impression formation. Typical research studies of impression formation involve an examination of how a person forms first impressions of another person, or how a judge infers characteristics of another person based on minimal information about him.

The basic paradigm for research on impression formation is due to the pioneering work of Asch (1946). It entails the presentation of a set of trait adjectives that are attributed to a hypothetical person with the requirement that the subject responds by indicating an impression of this target person. Subjects in one of Asch's experiments were asked to describe in their own words, and by choosing between paired adjectives, a person with the following characteristics: intelligent, skillful, industrious, determined, practical, cautious. In one experimental group, the characteristic "warm" was included, whereas in another condition, the characteristic "cold" was substituted for "warm." The associated traits that comprised the impressions were generally found to be much more favorable in the "warm" than in the "cold" condition. Asch concluded from these and similar data that impression formation follows a Gestalt principle whereby the target person's traits are integrated to form a unitary concept, and this coherent impression in turn facilitates further inferences about the target person.

Asch's work has posed at least three important and interrelated questions. The first question is concerned with people's perception of the relationships among traits and how such perceived relationships among traits can be specified. The second question is concerned with whether specification of such perceived relationships will allow one to predict accurately a judge's judgment of other pertinent characteristics of a specific target person from a given set of stimulus traits. The third question is concerned with how items of stimulus trait information are combined and processed in forming the final judgment. Research studies directed to these questions can be subsumed under the rubric of implicit personality theory and trait inference (see Rosenberg & Sedlak, 1972a, 1972b; Schneider, 1973). Extensive research directed to the third question has taken place in the area of impression formation and in the area of clinical judgment (see Slovic & Lichtenstein, 1971).

## Implicit Personality Theory

In the study of the way naive observers judged the personalities of others, Bruner and Tagiuri (1954) introduced the term "implicit personality theory" to describe that each individual has his own theory of what people are like. Specifically, each individual has his own relatively stable scheme of expectations and anticipations concerning relations among personality characteristics or traits of people, that is, which traits go together in others and which do not. Although the term was new, this notion was not novel. Similar ideas were proposed independently at about the same time by other writers (e.g., Cronbach, 1955; Kelly, 1955).

The notion of individual differences is emphasized in Kelly (1955) who suggested that each person views life through a system of personal constructs that are a unique part of his/her own life experience, and that are not directly translatable into the different personal construct systems of other persons. Accordingly, there are presumably as many implicit personality theories as there are individuals.

A person's implicit theory reveals itself in a number of different ways in everyday behavior. One is in the way the self, others, or people in general are described. Certain trait names tend to occur together regularly while others do not. A "rebellious" person, for example, is also likely to be described as "hostile," but probably not as "hypochondriacal." Another related way is in the trait inference that a person draws from a particular personality description. If a person is described as "rebellious," for example, this person might be thought of as "hostile" even though not described explicitly as such. Trait descriptions and trait inference not only point to the existence of individual implicit theories, but also to that of a common culturally shared general implicit theory of personality.

Early works directed at uncovering this general internal organization of trait relations generally involved summarizing and categorizing trait names and descriptions given by children and adults. Categorization in general was in terms of reference to appearance, emotional adjustment, interests, etc.

(e.g., Beach & Wertheimer, 1961; Dornbusch, Hastorf, Richardson, Muzzy, & Vreeland, 1965; Yarrow & Campbell, 1963). Other studies were confined to studying a small number of individual trait names and their combinations (e.g., Bruner, Shapiro, & Tagiuri, 1958; Hays, 1958).

As relatively more sophisticated analytical techniques come into use, structural representation of the general implicit theory of personality involving a representative set of trait names becomes possible. In general, a matrix of trait interrelatedness is first obtained from trait rating, trait sorting, or trait inference, or a variety of other methods ( see Schneider, 1973). Then a spatial or nonspatial model is applied as a vehicle for understanding and describing the structure of the perceived internal organization of traits. In a spatial or geometric representation obtained from factor analysis or multidimensional scaling, traits are represented as points or vectors in a space of reduced dimensionality such that significant features of the relationships among traits correspond to the geometric relationships among the points or vectors in the space. In a nonspatial model obtained from clustering, representation may take the form of an unrooted tree; a typological interpretation of the relationships among traits is substituted for a dimensional interpretation.

Over the years, an extensive body of data has accumulated, establishing that individuals share very similar implicit theories of personality (Lay & Jackson, 1969; Passini & Norman, 1966; Norman & Goldberg, 1966; Stricker, Jacobs, & Kogan, 1974). Such culturally shared perception of trait relationships is embedded in natural language (Schneider, 1973), and whether regarded as learned from experience (Lay & Jackson, 1969) or not, does not depend on any particular person as stimulus (D'Andrade, 1965; Mulaik, 1964; Schneider, 1973; Shweder, 1975). These and other studies on implicit personality theory have been reviewed by Jackson (1969), Rosenberg and Sedlak (1972a, 1972b), Schneider (1973), and J. Wiggins (1973), among others.

J. Wiggins (1973), after reviewing some of the studies and issues of implicit personality theory, commented that there is nothing "implicit" about implicit personality theory conceived as relationships among meanings of trait names, that this network of implicative and affective meaning of trait names by no means resembles a "theory," and the phenomenon is not peculiar to the domain of "personality."

J. Wiggins' conclusions, at least the first two counts, were based on the view that co-occurrence of trait names represents nothing more than the synonymity, semantic substitutability, or similarity in the meaning of these trait names. We do not share this view. However, we do share the view enumerated in the third count of J. Wiggins' comments that implicit theory is not confined to the domain of personality.

In the next three chapters, we shall address each of these counts in greater detail. Chapter 2 deals with why implicit personality theory is properly characterized as "implicit," and summarizes some of the issues arising from the implicitness of the implicit personality theory. Chapter 3 deals with the viability of representing implicit personality theory structurally. The multidimensional scaling approach will be examined. Our attempt here is merely in presenting the rationale underlying structural representation of implicit personality theory, rather than using multidimensional scaling in theory building as in the axiomatic treatment by Beals, Krantz, and Tversky (1968). Chapter 4 examines the implicit theory of psychopathology. An explicit distinction is suggested between implicit theory per se and inferential judgments made with respect to specific persons utilizing the implicit theory. Some models for the process of inferential judgments are proposed. In the two chapters following Chapter 4, two interrelated studies are reported. Chapter 5 deals with the investigation of the perception of psychopathology. Chapter 6 deals with the investigation of inferential judgments with respect to specific target persons based on the implicit theory. Chapter 7, the final chapter, states conclusion in the light of our data and argues for a broadened notion of implicit personality theory.

# CHAPTER 2

# THE IMPLICITNESS OF IMPLICIT PERSONALITY THEORY

There are at least three reasons why implicit personality theory is properly characterized as "implicit". First, an individual's implicit personality theory is his informal theory. Second, the trait relationships are implicit. Third, the rule of inference from one trait to another is implicit.

## Implicit Theory as An Informal Theory

It is unlikely that an individual can make explicit the structure of his perceived trait relationships. Frequently, he is unaware of this informal theory he employs in social interactions. His implicit personality theory can only be inferred from his descriptions, expectations, and anticipations about individuals and groups rather than being stated by him as a formal theory. The viability of making explicit the implicit theories of individuals will be examined in Chapter 3.

## Implicit Trait Relationships

The perceived relationships among traits are implicit in the sense that they are implied by the corresponding relationships among broad categories of behaviors representing those constructs.

This view, however, has not gone unchallenged.

Mulaik (1964) asked different groups of judges to rate real people or stereotyped roles using twenty trait names. The same trait names were also rated for meaning using the semantic differential technique. The factors derived from semantic ratings were found to correspond to the factors derived from judgments of people. D'Andrade (1965) also showed that ratings of similarity of trait names produced a factor structure resembling the one extracted from ratings of real people by Norman (1963). Passini and Norman (1966) found that ratings of strangers in a face-to-face situation yielded similar structures as ratings of acquaintances. Norman and Goldberg (1966) further showed that similar results were produced in the complete absence of target persons. These studies led to the opposing view that perceived trait relationships represent nothing more than the semantic meanings of trait names or particular beliefs of the judges, suggesting that such stereotypic perception of trait relationships only bias accurate judgment of target persons.

However, this semantic overlap hypothesis does not appear to be adequate in itself for accounting for the results of Lay and Jackson (1969). In addition to using trait names, these authors used personality scale items selected from the Personality Research Form (PRF) (Jackson, 1974) representing specific behavioral examplars of particular traits in their multidimensional scaling of judgments of probability of joint endorsement of pairs of these items. The resulting dimensions were compared to the factor structure derived from the self-reported data to the PRF from an independent sample of subjects. The high similarity between perceived dimensions and self-reported factors was interpreted as implying people's perception of the relationships among behaviors is to a large extent veridical.

Along the same lines, Stricker, Jacobs, and Kogan (1974) asked naive judges to classify the items from the Minnesota Multiphasic Personality Inventory (MMPI) Psychopathic Deviate Scale into clusters representing different traits. These clusters were found to correspond significantly with the factors obtained in a previous factor analysis of self-reported data to these items, and were consistently similar for individual judges.

In these studies, personality items referring to concrete behaviors were used. These items are different from trait names in that their "meaning" must be inferred. The implicit link between the behaviors represented by the items, and that between the item and the construct or trait embodied in the personality scale is not a simple lexical relationship.

As Reed and Jackson (1977) suggested, it is likely that the meaning of a trait name lies not only in the relation to that of a synonomous trait name, but also in the relations of the relevant behaviors linked probabilistically to the construct or trait. Other traits are linked to some of these same behaviors and to other behaviors with different probabilistic links. The underlying process in the judgment of similarity in meaning is thus indistinguishable from the judgment of trait relations, both involving at least to a large extent an appraisal of the degree to which behaviors implied by one trait is compatible with, is similar to, and is overlapping with behaviors relevant to a second trait.

Mirels (1976) however contended that the global correspondence between perceived behavior relationships embodied in items and self-reported relationships between constructs embodied in scales as in Lay and Jackson (1969) may mask subtle discrepancies between judged and self-reported relationships among specific behaviors. After analyzing Mirels' data as well as their own, Jackson, Chan, and Stricker (1978) concluded that there are significant relationships between judged and self-reported data on co-occurrence of specific behaviors as embodied in items, the same conclusion being reached earlier by Lay, Burron, and Jackson (1973).

In summary, perceived relationships among traits represent more than the explicit meanings of words. For example, in the study of Walters and Jackson (1966), danger was found to be related to talkativeness, the relationship clearly represents more than the explicit meaning of both trait names in dictionary or thesaurus. Kelly (1955) also insisted that a construct is made up of a "trait" and its submerged opposite which may not be the grammatical or semantic opposite and has to be uncovered by the investigator.

Implicit Rule of Inference

This aspect of implicitness is based on a broadened notion of implicit personality theory which includes as part of implicit personality theory the study of the implicit rule of inference process. Specifically, the process whereby unobserved characteristics of a person are inferred from observed or known characteristics, and items of information are combined and integrated to arrive at a judgment is implicit.

In general, two major approaches can be delineated in attempting to uncover the underlying implicit rule of inference. One is represented by various probability models, especially the Bayesian model, and the other is represented by various models of cognitive algebra.

Probability models. In the basic research paradigm in the studies of trait inference and trait attribution, a target person is described as possessing trait A or displaying behavior A, and the subject is asked to indicate how likely it is that he has trait B or will display behavior B. Underlying this judgment task is the assumption that the implicit inference process is probabilistically based. In their attempts to formalize and make explicit the inference process, investigators of this approach have proposed various models derived from probability theory to deal explicitly with the relations among subjective probabilities.

Wyer and his associates (e.g., Wyer, 1970a, 1970b; Wyer & Goldberg, 1970), for example, have attempted to test the general hypothesis that relations among subjective probabilities obey objective probability laws of conjunction and disjunction. Warr and Smith (1970) compared the predictive power of six different probability models dealing with trait inference. These models were designed to predict the conditional probability that a person has trait A, given that he has trait B and trait C. Although these models involved somewhat different assumptions, they were all found to predict inferences with some accuracy.

Applications of Bayesian inference have also gained some popularity. Strictly speaking, Bayes' theorem is neither a model nor a theorem. It is a mathematical consequence of how conditional probability is defined. In the area of belief formation and change, the Bayesian model has been employed as the optimal way an ideal observer revises his belief in the light of new information. The model has been applied to the study of people's perception of the likelihood of several interpersonal relationships in hypothetical two- and three-person groups (McNeel & Messick, 1970), to the study of the way in which beliefs of a hypothetical person's age are revised as further information is presented sequentially (Lovie & Davies, 1970), to the studies of subjects' revisions of beliefs on the basis of consistent or inconsistent information (DeSwart, 1971), and on the basis of different problems of different degrees of perceived importance (pokerchips, atomic explosion, birth defects) and different degrees of perceived complexity (two and three hypotheses) (Alker & Herman, 1971).

The application of the Bayesian model also serves to identify a set of quantitative variables by which the observer's perception of an actor in a situation can be analyzed. Attribution theory which deals with the process whereby, on the basis of information, one infers traits, dispositions, or attitudes as causal explanation of observed behavior has been reinterpreted in the formulation of Bayes' rule (Ajzen, 1971; Ajzen & Fishbein, 1975). Trope (1974), and Trope and Burnstein (1975) have also applied the Bayesian model to test a specific asymmetric certainty paradigm for trait inference originally suggested by Messick (1971) for situations of forced compliance.

Most studies involving the Bayesian model reported reasonable success in predicting judges' performance except that human judges are consistently suboptimal compared with the ideal judge prescribed by Bayes' rule. Various explanations have been offered, and can be grouped as either the "misperception" hypothesis, the "misaggregation" hypothesis, or the "response bias/artifact" hypothesis (DuCharme, 1970; Edwards, 1968; Slovic & Lichtenstein, 1971). It has been suggested that the Bayesian model is only a "normative" model which specifies how an ideal Bayesian observer would optimally combine sequential information and at best provides a baseline for actual performance, clarifying the nature of the underlying process when the data do not fit the model. Attempts however have also been made to introduce a fitted parameter in Bayes' rule to approximate it to a descriptive model of judgment (e.g., Philips & Edwards, 1966).

In summary, the Bayesian model, mathematically derived, focuses on the probabilistic nature of information and the probabilistic processing of information. It approximates the representation of the uncertainty and subjectivity of human judgment if not the underlying process of judgment and its implicit rule of inference.

Models of cognitive algebra. This alternative approach focuses on how diverse items of information are integrated with one another as well as with the prior beliefs, attitudes, and impressions of the judge in arriving at a final judgment. Simply stated, the rules for integrating information are hypothesized as following simple rules of ordinary algebra.

One representative theory is the information integration theory proposed by Anderson (1968, 1971, 1974a, 1974b). In comparison with the Bayesian model, which is concerned with the subjective impact of each individual datum as measured by its subjective likelihood ratio, information integration theory makes a conceptual distinction between two kinds of impact, weight, and value. Each piece of information is represented by two parameters: a weight and a scale value. The value is the location of the informational stimulus along the dimension of judgment. The weight represents the psychological importance of the information. Both parameters will depend on the dimension of judgment as well as the individual making the judgment. The same piece of information may have quite different value and importance on different dimensions, for different individuals on the same dimension.

The two basic operations in integration theory are valuation and integration. Any judgment task requires a preliminary evaluation of the meaning and relevance of the stimuli. The role of the valuation operation is to process the given information and extract the needed parameters. Once evaluated, the information is ready to be combined in an overall judgment.

Among the algebraic rules, Anderson (1974a, 1974b) has demonstrated that the averaging rule for combining items of information has extensive applications whereas the multiplicative rule and the subtractive rule have only limited applications. Specifically, Anderson and his associates have reported successful applications of the averaging rule to areas of social attribution (e.g., Anderson, 1974a), attitude or opinion change (e.g., Anderson, 1971; Himmelfarb & Anderson, 1975), and impression formation (e.g., Himmelfarb, 1972).

The claim of the averaging model of information integration theory as a general descriptive-explanatory model of judgment and inference has not gone unchallenged. Hodges (1973), for example, has proposed a weighted adding model which is not dependent either on Anderson's assumption of averaging or an initial belief or impression, and yet passes all the tests (e.g., parallelism, directional, set-size effect etc.) discussed by Anderson. Schönemann, Cafferty, and Rotten (1973) also pointed out that the constraints Anderson places on the weight parameters to sum to unity is completely arbitrary, and there is an infinite number of weight parameters which can replace the original ones suggested by Anderson, and a new set of scale values may be computed such that the original judgmental response is reproduced perfectly. Wyer (1969), in his analysis of different models of impression formation, suggested reasons why this averaging model gives a better fit than other models. Specifically, he pointed out that when the averaging model is used to predict the evaluation of an object described by trait A and trait B in combination on the basis of separate A and B descriptions, the model can be reduced to a prediction of collective evaluation as a linear function of component evaluations requiring curve fitting estimates of the slope and intercept parameters. It is thus not surprising that the model gives a better fit than other models that require fewer parameters to be estimated.

In summary, the averaging rule suggests that the rule of inference is not different from the rules of algebra. However, the averaging rule is not mathematically distinguishable from a weighted additive model. Similarly, an additive model is also not distinguishable from a multiplicative model with logarithmic transformation of the measurement scales. The ultimate test seems to rest on assessing the models with respect to the "subjective metric" of the judge making the judgment. This same issue also recurs in multiple cue utilization experiments in the area generally known as clinical judgment.

## Clinical Judgment

In the area of clinical judgment, research efforts have been directed at either the investigation of the accuracy of judgment or that of the process of judgment (Goldberg, 1968). Historically, the focus on accuracy precedes the focus on process. Studies on the judgmental accuracy of clinical psychologists revealed that the amount of professional training, the experience of the judge, and the amount of information available to the judge do not relate to his judgmental accuracy. Various reasons were suggested for this lack of relationship (see Goldberg, 1968; Wiggins, 1973). One important reason suggested by Reed and Jackson (1977) is that these studies have failed to present the judges with a "psychologically meaningful" task. They defined a judgment task as meaningful if a judge is asked to make predictions based on cues where the data on which the cues are based have some predictive validity. Thus, it is no surprise, they argued, that valid judgment is not possible given that the judgment tasks are concerned with nonexistent, extremely weak, or highly contrived empirical relationships as was the case with the tasks reported by Chapman and Chapman (1971). Comprehensive reviews of studies on judgmental accuracy can be found in Goldberg (1968), and J. Wiggins (1973), among others.

As a consequence of the discouraging results, investigators have turned from validity or accuracy studies to studies of the process of clinical inference. The aim of these process studies is to represent, simulate, or model the implicit cognitive processes of the clinician as he makes his judgmental decisions (Hoffman, 1960).

In all process studies, it is generally acknowledged that judgments obtained on the basis of a group average may distort the judgment strategies of many individual judges. In fact, there may not exist any real judges to whom a group average result applies. In a typical experimental paradigm, the judge is required to make quantitative judgments of attributes of specific persons on the basis of a number of stimuli, cues, symptoms, or personality traits or characteristics. The objective is to investigate how a judge integrates in some optimal manner the available information, which is usually diverse in content, into a unitary judgmental response regardless of the actual validity of those judgments themselves. A great deal of research, however, has been directed at demonstrating the superiority of one or another integration rule for representing, capturing, or characterizing each judge's idiosyncratic method of combining and weighting information (Dawes & Corrigan, 1974; Goldberg, 1968; Hoffman, 1960; Hoffman, Slovic, & Rorer, 1968).

Among a wide variety of mathematical models developed to capture judgmental policies, the most prominent one is the linear model. This model suggests a simple process whereby cues are assigned differential weights and combined in an additive fashion. Much research on cue utilization has attempted to test the validity of this weighted linear model. Multiple regression analysis has served as the primary tool for this test since it provides estimates of cue weights as well as an index of the predictive accuracy of the model. More specifically, the obtained multiple correlation coefficient expresses the degree to which simultaneous consideration of the cues permits prediction of the inference. In addition, each cue is given a weight which represents its contribution to the prediction of the inference. Slovic and Lichtenstein (1971) have reviewed a large number of studies in which subjects were asked to use cues to make judgments about such things as personality characteristics, performance in college and on the job, physical and mental pathology, and legal matters. These studies demonstrated that judgments are predicted with considerable accuracy on the basis of a weighted linear combination of cues.

Despite the predictive success of the linear model, one cannot necessarily conclude that judges combine cues in a linear fashion when making a judgment or forming an inference. In fact, judges' verbal introspections indicated that they believed they used cues in nonlinear or configural ways. Attempts to capture nonlinear and configural processing have resulted in more complex equations by including exponential (curvilinear) terms and/or cross-product (configural) terms in the judges' policy equations in the linear regression model (e.g., Wiggins & Hoffman, 1968).

Of particular interest is configural processing in which judges' weighting of a cue or an item of information varies according to the nature of other available information or cues. Asch (1946) has argued similarly for the configural view in personality impression formation. It has been assumed (e.g., Meehl, 1954; Wiggins & Hoffman, 1968) that significant regression weights for the cross-product terms would imply configurality in the judgmental process.

An alternative formulation of the general linear model in the investigation of linear and configural processing relies on the analysis-of-variance (ANOVA) approach (e.g., Hoffman, 1968; Hoffman, Slovic, & Rorer, 1968). Basically, an ANOVA partitions the total variance in the dependent variable (the judgment) and provides estimates of the amount of variance due to each of the stimulus dimensions or factors (main effect) and their interactions. If a simple additive or linear combination of cue values determine judgments, only the main effects should be significant. Findings of significant interactions are assumed to constitute evidence for configurality in judgments.

In the multiple regression approach, investigators have typically selected cue profiles that are descriptive of real persons or objects. In contrast, when the ANOVA paradigm is used, investigators normally construct all possible combinations of cues. The use of such an orthogonal factorial design ensures that the cue dimensions are unrelated since every cue is paired with every other cue. This restriction is a disadvantage of the ANOVA paradigm since the inclusion of unrealistic profiles may be disruptive of the very process under study.

Anderson (1972), in the context of his theory of information integration, suggested that the successful application of the averaging process in clinical judgment indicates configurality in clinical judgment since the relative weight of each cue depends on what other cues it is combined with. In particular, he also pointed out that configural and nonlinear processing is not meaningful unless it is assessed with respect to the "subjective metric" of the judge. The question is to what extent people utilize complex strategies of differential weighting of particular stimulus combinations determined subjectively by the judges. In this sense, the estimation of scale values and weights using the information integration approach does not presume the "parameters" of cues, though the cue dimensions for judges are still provided by the experimenter.

If configural processing refers to judging a stimulus with reference to other stimuli in the array, there seems to be ample evidence at the individual judge level for differences in the degree of configural processing (Einhorn, 1970; Wiggins & Hoffman, 1968). Although a linear model will fit almost any judge reasonably well due to its power and generality (Dawes & Corrigan, 1975; Wainer, 1976), some judges may be more characteristically configural than others.

Thus, the linear model should not be looked upon as truly reflecting the underlying process of clinical judgment. Indeed, algebraically different models may be equally predictive, given fallible data, and algebraically equivalent models do not necessarily suggest a similar underlying process of judgment. This is the paramorphic representation issue addressed by Hoffman (1960, 1968). Green (1968) also noted that the process by which clinical judgment takes place is not necessarily identical to the mathematical representation. Thus, mathematical models may only indicate an approximation to the true state of affairs.

# CHAPTER 3

## STRUCTURAL REPRESENTATION OF IMPLICIT PERSONALITY THEORY

J. Wiggins' comment that implicit personality theory does not resemble a theory is at variance with our view. Implicit personality theory does resemble a theory. Of course, the first step is to define what we mean by a theory.

For our purposes, a theory is a way of structuring observations of reality, of placing them in a rational system that specifies their interrelations. More specifically, a theory consists of a set of constructs, and a set of relationships that link the constructs together. In the case of implicit personality theory, the set of constructs is the set of representative traits, and the set of relationships among constructs is the set of rules of inference among traits.

Thus human beings, acting as naive psychologists, construct theories about social reality. These theories can be regarded as having all the features of the formal theories constructed by the scientists. These theories employ traits as constructs and rules of inference as relationships among traits derived from observation of behaviors; they provide a perceived structure of trait relationships through which social reality is observed; they enable the individuals to make predictions about unobserved behaviors or traits given the observation of certain behaviors or the description of certain traits. The only difference is: people are frequently unaware of the theories they employ, hence the name implicit personality theories.

One of the most difficult problems in formalizing an individual's implicit theory involves making explicit or discovering the rules which govern the relations among the constructs or traits. This task is simplified if we can hypothesize that the structural theory we are concerned with is isomorphic, paramorphic, or corresponds by analogy to a known mathematical structure. Then we can use the many known theorems of the mathematical structure to make predictions about the properties of the implicit theory, precision which we gain beyond theories existing only at the verbal level (see Simon & Newell, 1956). In this regard, Miller (1964) suggested that psychologists have used the structure of Euclidean space more than any other mathematical structure to represent structural relationships of psychological processes. For example, Schlosberg (1954) has represented perceived emotional similarities among facial expressions by the two dimensions of pleasantness vs. unpleasantness and rejection vs. attention. Osgood (1962) has analyzed the components of meaning of words into evaluation, potency, and activity. Realizing the great power of spatial representations to suggest the existence of important psychological mechanisms, psychologists have developed techniques, such as factor analysis and multidimensional scaling, to construct systematically spatial representations from empirical measurements, representing objects of interest as points in a multidimensional space.

The Multidimensional Scaling Approach

As indicated in Chapter 1, the lack of appropriate techniques has been a major impediment in formalizing an individual's implicit personality theory which, in the form of observed relations among trait names, is not always susceptible to immediate understanding at an intuitive level.

Studies in implicit personality theory might well have remained at the stage of summarizing and categorizing the co-occurrence of trait names was it not for the breakthrough in the application of the multidimensional scaling. The appealing feature of this technique is that the investigator does not have to specify the measurement scales for obtaining trait inference or trait sorting data, and thus makes no assumption about the nature of the trait dimensions. It is typically assumed that with a set of traits reasonably representative of the personality domain of interest, psychologically meaningful dimensions can be "discovered" rather than being "imposed" by applying multidimensional scaling (Kruskal & Wish, 1978).

To apply multidimensional scaling, specified dissimilarity observations between pairs of traits such as those obtained from trait inference or trait sorting are to be interpreted as measures of distances between pairs of points. The most common choice of distance is the Euclidean distance. For the traits to be properly represented by points in this metric space, the usual metric distance axioms must be satisfied such that the distances between pairs of points approximate the dissimilarity measures between pairs of traits. Traits which occur together more frequently are represented by points close together in the configuration, and traits which occur together less frequently or not at all are represented by points distant from each other. Thus the main objective of multidimensional scaling is to construct a configuration of traits by estimating the locations of these points, one for each trait, so that the interpoint distances approximate as closely as possible the corresponding dissimilarity observations.

Another fundamental issue in multidimensional scaling is whether exactly the same distance for a specified pairs of traits is to be used in approximating each subject's dissimilarity judgments, or whether some provisions are to be made for variations in judgments from one subject to another. The latter provisions give rise to individual differences models of multidimensional scaling. A general description of the varieties of multidimensional scaling procedures can be found in Green and Carmone (1970), Green and Rao (1972a), Kruskal and Wish (1978), and Spence (1977). A brief description of some of the major varieties however is in order since they are relevant to our empirical investigations in Chapter 5 and Chapter 6.

## Metric Scaling

In metric scaling models, there is a spatial component relating the interpoint distances to the coordinates of the stimuli in the constructed configuration, and a distance component relating the dissimilarities to these distances (Torgerson, 1958).

In the spatial component of the model, the problem is the determination of the coordinates of the $n$ points, that is $X$, given the matrix of distances $D$ is known. The Euclidean distance $d_{ij}$ between stimuli $i$ and $j$ in an m-space is defined as

$$d_{ij} = \left[\sum_{a=1}^{m} (x_{ia} - x_{ja})^2\right]^{\frac{1}{2}} \quad .$$

Further, we assume that the m-dimensional configuration $X$ has its origin at the centroid of the points, that is,

$$X'\underline{1} = \underline{0} \quad ,$$

where $\underline{1}$ is the unit vector and $\underline{0}$ is the null vector. The scalar product matrix referred to this origin is

$$B = XX' \quad .$$

Thus the configuration $X$ can be found by decomposition. Usually, $D$ is not known exactly and $B$ has to be constructed using our knowledge of a matrix of distance estimates $D^*$, assuming an error term in $d^*_{ij} = d_{ij} + e_{ij}$ . The matrix of estimated scalar products is

$$B^* = -\tfrac{1}{2} M(D^* * D^*)M \quad ,$$

where $(D^* * D^*)$ is the Hadamard (elementwise) product matrix of squared distance estimates, and $M$ is the mean centering matrix defined as

$$M = \left[I - (\underline{1}\underline{1}') / n\right] ,$$

I is the identity matrix.

Using the residual matrix,

$$E = B^* - XX' ,$$

we can define the least squares loss function in terms of the scalar products (not distances) as

$$L = tr(E'E) = tr\left[(B^* - XX')' (B^* - XX')\right] .$$

By matrix differentiation, $L$ can be found to have a minimum with $X$, the set of $m$ eigenvectors of $B^*$, scaled in the way such that

$$X'X = V ,$$

where $V$ is the diagonal matrix of nonzero eigenvalues of $B^*$. $X$ is thus unique up to distance preserving transformations such as translation of origin and any rigid rotation.

The distance component of the model specifies that the distance estimates $D^*$ are some linear transformation of the "true" distances $D$. The matrix $D^*$ is assumed to be determined on an interval scale. Thus some preprocessing of the dissimilarities by some unidimensional scaling procedures such as successive interval scaling (Diederich, Messick, & Tucker, 1957) may be deemed necessary. In general,

$$d^*_{ij} = a + bd_{ij} + e_{ij} \quad (b > 0, a \neq 0) .$$

The error $e_{ij}$ causes no real problem since a least squares fit to the estimated scalar products may be obtained. The constant $b$ represents only a change of scale. The constant $a$ however may cause the estimated scalar product matrix B* to be indefinite, thus making it impossible for a Euclidean representation (see Young & Householder, 1938; Torgerson, 1958). To ensure that B* is positive semi-definite, a large enough arbitrary constant is added to the $d^*_{ij}$ . This is the "additive constant" problem in metric scaling (Cooper, 1972; Messick & Abelson, 1956; Torgerson, 1958).

Individual Differences Metric Scaling

When dissimilarities are obtained from N different subjects each yielding a separate $D^*_k$ matrix (k = 1, 2, ..., N), it may seem unreasonable to assume that the same distances can be used to approximate each subject's dissimilarity judgments if the mean dissimilarities are not representative of each member of the group. One possibility is to estimate N scalar product matrices $B^*_k$ , each of which can then be decomposed individually, that is

$$B^*_k = X_k X'_k \quad .$$

In the context of implicit theory, when it is not reasonable to assume that a common perceptual space is representative of the individuals' perceptual spaces, individual spaces may accordingly be obtained. In fact, this is the rationale of the Tucker-Messick points-of-view analysis (Cliff, 1968; Tucker & Messick, 1963). In this approach, instead of dealing directly with each individual, individuals are partitioned into homogeneous subgroups with respect to their dissimilarity measures by factor analytic procedures such that individuals within subgroups can be represented by idealized individuals, one for each subgroup, sharing similar linear functions relating dissimilarities to distances. However, as there is no specification of how the individual spaces are related to each other in separate individual scalings, there is no specification of how the idealized individual spaces are related to each other.

Paradoxically, in the context of implicit theory, it again seems unreasonable to postulate that individuals sharing the same culture have radically different implicit theories. One formulation which takes into account individual differences yet provides a common perceptual space for all subjects is the weighted Euclidean model. A well-known example is the individual differences model of Carroll and Chang (1970). In this model, a common perceptual space for all subjects is postulated. This common space is then expanded and contracted along particular axes to produce individual spaces. Individual differences among subjects can be accounted for by defining a set of idiosyncratic weights for each individual which reflects the importance or salience attached to the dimensions of the common space by that individual.

Thus this model is a generalization of the Euclidean model. The interpoint distance, often referred to as elliptical distance, between stimuli $i$ and $j$ for individual $k$ is

$$d_{ijk} = \left[ \sum_{a=1}^{m} w_{ka}(x_{ia} - x_{ja})^2 \right]^{\frac{1}{2}} .$$

The common configuration $X$ can be scaled differentially by the diagonal weight matrix $W_k^{\frac{1}{2}}$ to produce the individual space $X_k$ ,

$$X_k = XW_k^{\frac{1}{2}} \quad .$$

In terms of estimated scalar products,

$$B_k^* = X_kX_k' = XW_kX' \quad .$$

Similarly, we can define the least squares loss function as

$$L = \sum_{k=1}^{N} \operatorname{tr}\left[(B_k^* - XW_kX')'\,(B_k^* - XW_kX')\right] \quad .$$

There is usually only one set of $W_k$ and one $X$ which will minimize $L$ when a sufficient number of arbitrary constraints (e.g., translational and individual weights constraints) are imposed. That is, $X$ is not rotationally indeterminate provided that the data also fulfill certain minimal conditions of variations across individuals (see Harshman, 1970, 1972). Any rotation of $X$ will result in a poorer fit.

To decompose $B_k^*$ , Carroll and Chang (1970) have treated it as essentially a regression problem, using a procedure known as alternating least squares (Wold, 1966). Alternative procedures have also been devised using other numerical optimization procedures to optimize specified loss functions bypassing the intermediate scalar products (e.g., Krane, 1976; Ramsay, 1977).

In summary, the metric individual differences scaling models involve the same two components. In the distance component, dissimilarities are assumed to relate to distances linearly, and an additive constant is estimated for each individual. In the spatial component, the distance estimates are first transformed to scalar products, and the weighted model is fitted to the estimated scalar products for all individuals to yield the common configuration and individual weights.

The difficulties with this two-stage estimation procedure have been pointed out by Krane (1976) and Ramsay (1977). First, the errors associated with the distance component of the model are reflected in the estimates of the scalar products using the squared distance estimates. Second, since the spatial component of the model is fitted to the estimated scalar products, the parameters specified in the Euclidean model, weighted or unweighted, are affected by these errors.

## Nonmetric Scaling

Some of the difficulties encountered in the models in previous sections are overcome in the nonmetric varieties of multidimensional scaling.

In general, in the distance component of the model, an ordinal rather than a linear relation between the dissimilarities and the distances is assumed. Thus, preprocessing of dissimilarities is generally not necessary. However, a close coupling between distances and dissimilarities is demanded such that when the configuration is constructed, an order isomorphy requirement has to be satisfied as well as possible,

$$d_{ij} \leq d_{kl} \quad \text{iff} \quad d^*_{ij} \leq d^*_{kl} \ ,$$

where $D$ contains the distances of the configuration and $D^*$ the dissimilarities.

This means that a configuration has to be found such that

$$d_{ij} \approx f(d^*_{ij}) \ ,$$

where $f$ is a nondecreasing function.

In the spatial component of the model, the distances are fit directly to the dissimilarities. A configuration is sought such that the following loss function or its equivalent will be minimized.

$$S = \sum_{i,j}^{n} \left[ d_{ij} - f(d^*_{ij}) \right]^2 .$$

The problem is computationally more involved since in addition to finding an approximate X, the monotonic transformation which relates the dissimilarities and the distances has to be found. A variety of algorithms has been devised ( see Spence, 1977), each containing some kind of iterative procedures.

In general, a configuration X in m-space is first chosen, and D is computed. Then a set of $D^t$ which is some transformation of D and is order isomorphic to D* is chosen. By some numerical methods such as a gradient method, X is altered such that the specified loss function is improved, and a new D is computed, the new D being a "good" approximation to $D^t$ with the distance requirement satisfied. In short, by this iterative procedure, the points of the initial configuration are moved by small adjustments to arrive at a solution optimally satisfying the order isomorphy requirement, the distance requirement, and at the same time minimizing the specified loss function.

An advantage of this procedure not shared by the metric scaling procedures in previous sections is: the optimization procedure does not require all (i, j) pairs of dissimilarities since the summation may be performed over whichever pairs are present. Consequently, missing data can be easily handled. However, in this type of procedure, the iterations may not converge to the best possible solution. Further, if a matrix with many missing elements or a small matrix is scaled, the nonmetric procedures become quite unstable. This is due to the insufficient number of degrees of freedom available to allow the estimation of the coordinates and the irregular monotone transformation. The computation of these discontinuous steplike functions has been known to require a large number of degrees of freedom.

## Maximum Likelihood Estimation in Multidimensional Scaling

As mentioned in previous sections, Ramsay (1977) pointed out that previous metric procedures are statistically inefficient. Because they operate on a scalar product matrix based on squared dissimilarities, they contain more error. In addition, he pointed out that the use of a least squares criterion based on scalar products implicitly assuming that the scalar products are independently and normally distributed about the population values may be unrealistic. Consequently, like the nonmetric procedures, Ramsay's maximum likelihood procedure deals directly with the distances. However, unlike the nonmetric procedures, to avoid using a large number of degrees of freedom in estimating the irregular monotone transformation, only a smooth transformation from a power family is used and one degree of freedom is lost in estimating the exponent.

Specifically, two of the models considered by Ramsay (1977) are the weighted and unweighted Euclidean model. The unweighted model has no provision for variations in D across subjects, the $D_k$ being all approximated by the same value.

$$d^*_{ijk} \approx d_{ijk} = \left[ \sum_{a=1}^{m} (x_{ia} - x_{ja})^2 \right]^{\frac{1}{2}} .$$

The weighted model provides for individual variations in the distances and individual variations in the relations between dissimilarities and a common set of distances.

$$d^*_{ijk} \approx d_{ijk} = \left\{ \left[ \sum_{a=1}^{m} w_{ka}(x_{ia} - x_{ja})^2 \right]^{\frac{1}{2}} \right\}^{p_k} .$$

Here each dimension for subject k is multiplied by a coefficient $w_{ka}$ which defines the importance of dimension a in contributing to the distances which approximate subject k 's dissimilarities. The exponents $p_k$ allow for the possibility that each subject's dissimilarities have a power law relationship to the basic common distances. This power law relationship is assumed to vary from subject to subject, and hence each subject has his own exponent $p_k$, which is equivalent to analyzing each subject's $d^{*\,(1/p_k)}_{ijk}$ rather than $d^*_{ijk}$ directly.

After specifying the models by which the data are to be approximated, the criterion with respect to which the fit is to be optimized remains to be specified. In maximum likelihood estimation, this reduces to specifying how each $d^*_{ijk}$ distributes itself about its population value.

Specifically, each observed dissimilarity, $d^*_{ijk}$ , is assumed to be a sample from a probability distribution with expectation $d_{ij}$ and constant error variance $s^2$ . That is,

$$d^*_{ijk} \sim f(d^*_{ijk} \mid d_{ij} , s^2) \ .$$

Ramsay (1977) chose the lognormal distribution to be the probability density function $f$ on the grounds that the error distribution has the properties of (a) restricting the range of the $d^*_{ijk}$ to the non-negative reals, and (2) having a standard deviation which is proportional to $d_{ij}$ . This choice is supported in applications in judgment task in which subjects when faced with two identical stimuli are more certain of their ratings of dissimilarity than they are when faced with two very dissimilar ones. Hence,

$$f(d^*_{ijk} \mid d_{ij}, s^2) = (2\pi)^{-\frac{1}{2}}(sd^*_{ijk})^{-1}\exp\left[-\log^2(d^*_{ijk}/d_{ij})/(2s^2)\right] .$$

Under the independence assumption, the likelihood function is defined as

$$L = \prod_{i,j,k} f(d^*_{ijk} \mid d_{ij} , s^2) \ .$$

Since the product is taken over available (i, j, k) triples, missing data can be handled. As usual, it is more convenient to maximize the logarithm of $L$ ,

$$\log L = \sum_i \sum_j \sum_k \log f(d^*_{ijk} \mid d_{ij} , s^2) \ .$$

The estimation of the configuration, weights, and the exponents of the power transformation is computationally involved and requires numerical optimization procedures. Ramsay (1977) has implemented the unweighted and weighted models in his programs MLMDS1 and MLMDS3, respectively, using his "implicit equation approach" algorithm (Ramsay, 1975, 1977) which is a gradient-like procedure. Our empirical investigations described in Chapters 5 and 6 used both of these programs.

Maximum likelihood procedures also allow hypothesis testing if the number of subjects involved is reasonably large. In multidimensional scaling, testing dimensionality and testing one model against another are of interest. For example, in testing dimensionality, the quantity

$$X^2 = -2 (\log L_{m-1} - \log L_m) ,$$

has an asymptotic $\chi^2$ distribution, thus allowing for statistical evaluation of the improvement in fit from $(m - 1)$ to $m$ dimensions.

In summary, Ramsay (1977) has shown that if the error distribution of the distances is assumed to be lognormal, the well known maximum likelihood estimation procedure can be employed in constructing multidimensional configuration. As a result, the data are used more efficiently in estimating the parameters. This is especially important in the single subject problem where a dissimilarity matrix of sizeable amount of error is involved. More efficient estimates means that smaller number of stimuli may be used, fewer subjects may be used, and the resulting estimates contain less estimation errors.

# CHAPTER 4

# IMPLICIT THEORY OF PSYCHOPATHOLOGY

We share the view of J. Wiggins that implicit theory should not be confined to the domain of personality. However, J. Wiggins arrived at his conclusion by arguing that since implicit personality theory is based on the meaning relationships among a set of words, similar linguistic considerations could lead to the postulation of "a theory of physical objects" or "a theory of vegetables." We, in contrast, arrive at our conclusion by subscribing to the view that in order to minimize uncertainty in a probabilistic world, people have implicit notions about attributes of entities and entities themselves. In short, people seek to construct their realities about many aspects of the world, including (but not limited to) personality.

Thus each person has his own implicit theories of personality (e.g., Rosenberg, Nelson, & Vivekanathan, 1968), of causation (e.g., Jones & Davis, 1965; Kelley, 1967, 1973), of psychopathology (e.g., Chan & Jackson, 1976), of interpersonal relations (e.g., Wish, Deutsch, & Kaplan, 1976), of relations among nations (e.g., Wish, Deutsch, & Biener, 1972), of similarity of political candidates (e.g., Shikiar, Wiggins, & Fishbein, 1976), etc. Indeed, Wegner and Vallacher (1977) have included implicit motivation theory, implicit personality theory, implicit abnormal psychology, implicit social relations theory, and implicit self-theory as components of their "implicit psychology."

These implicit theories however are by no means static, rigid, or inflexible. Kelly (1955), for example, suggested that each man can be regarded as a scientist having hypotheses with respect to the events in life and he goes about testing these hypotheses. This does not imply that we follow rules prescribed by mathematical statistics. We may simply be intuitive statisticians who make suboptimal decisions as compared to mathematical rules or make judgments using certain heuristics (e.g., Kahneman & Tversky, 1973).

## The General Implicit Theory of Psychopathology

Chan and Jackson (1976) and Rosenberg and Cohen (1977) are two recent studies which serve to broaden the notion of implicit theory of personality extending it to the domain of psychopathology.

Rosenberg and Cohen (1977) realized that the lay conception of psychopathology of a particular individual or group may not correspond, either in form or in content, to an official taxonomy (e.g.,the diagnostic system of the American Psychiatric Association) or to any formal theory of psychopathology. Following Kadushin (1969), they believed that the perceived problems of psycniatric patients rather than their diagnoses should be used in understanding some of the reasons that prompt individuals to seek psychotherapy.

With this view, they asked college students to give reasons why people might seek psychotherapy using a free-response approach.

The resulting problem statements were then used in a sorting task in which a separate group of college students were asked to judge the similarity of the problems. Subsequent analyses by multidimensional scaling and cluster analysis revealed that the two distinct but correlated dimensions were abnormality and referral source.

This study however is confined to the lay conception of problems given by college students. As Rosenberg and Cohen (1977) noted, there are problems which are prominent in the lay literature and entertainment media but have not been spontaneously mentioned by students. Some of these problems are physical symptoms with psychological significance, obsessive-compulsive symptoms, manic behaviors and paranoid behaviors. These problems would be recognized by the students as psychopathological if specific examples are given to them.

In contrast to the Rosenberg and Cohen (1977) study, Chan and Jackson (1976) started with a set of behavioral referents representing 27 psychopathological constructs from the Differential Personality Inventory (DPI) (Jackson & Messick, 1971). With a slightly different aim, they attempted to represent structurally the general implicit theory of psychopathology of a sample of college students by applying multidimensional scaling to their similarity judgments of pairs of these behavioral referents. They found three dimensions and interpreted them as impulse expression vs. inhibition and withdrawal, cognitive dysfunctioning vs. overcontrol and denial, and resignation vs. interpersonal conflict. Subsequently, as in Lay and Jackson (1969), they also assessed the correspondence between these inferential dimensions and the factors obtained from self-reported data to the same set of constructs from an independent sample of college students. The correspondence was found to be significant and moderately high, but clearly lower than that obtained by Lay and Jackson (1969) for normal personality characteristics. They suggested that since people's accurate perception of trait relationships may depend on having had previous experience observing the probabilistic co-occurrence of behaviors in others, the relatively attenuated correspondence may be due to the rarity of pathological behaviors as compared with normal behaviors.

This interpretation suggests that there may exist distinct points of view regarding the perception of psychopathology. Specifically, the implicit theory shared by judges with more experience with the co-occurrence of pathological behaviors in others should more closely parallel the self-reported data to the same set of pathological constructs. Thus, even though judges in the aggregate show relatively high agreement on the average (e.g., Reed & Jackson, 1975), it is still likely that individual judges within a group may vary reliably in their perception of trait relations from the consensus. To the extent that individuals are more likely to have idiosyncratic experience with pathological behaviors, individual implicit theories are more likely to exist, and individual differences should not be masked indiscriminatively in a group approach.

## Implicit Theory and Inferential Judgment

Although the area of implicit personality theory and the area of clinical judgment have been systematically explored, relatively little attention has been devoted to the implications of implicit theory for clinical judgment. The conceptual link was however early recognized by Cronbach (1955). Hays (1958), in addition, noted that in person perception the judge always deals with limited and incomplete information about the person being judged, so that the judge is obliged, deliberately or unknowingly, to add information about unobserved characteristics by some inferential processes about the associations of traits in the same individual. Thus, implicit theory serves to mediate known but limited information about a person and unobserved and inferred characteristics about him such that the judge's inferential judgments are based not only on the observed information but also on additional inferred information.

Inferential judgment, as used here, is part of the implicit theory yet can be distinguished from what is generally considered as implicit theory per se in at least two aspects. First, implicit theory represents the relatively static aspect of trait inference, referring to the internal organization of trait relationships as perceived by the judge in a generalized other. This implicit theory may be acquired as a result of learning and experience of the probability of co-occurrence of certain behaviors in people in general. In contrast, inferential judgment is the relatively dynamic aspect, referring to the active process of judging the trait relationships in a specific person. This depends on how the judge integrates incoming information to arrive at a judgment. Second, implicit theory and inferential judgment occur at two different levels of generality. Inferential judgments are always made with respect to a particular specific person, whereas implicit theory exists in the absence of any specific persons. Increasing specificity of a target person, in this case, can be conceptualized as a corresponding increase in specific information about him. Similarly, increasing generality of a target person can be conceptualized as a corresponding lack of specific information. The limiting case of this lack of specific information about a target person is the situation in which a judge has to operate in the absence of any relevant information, or the information is so general that it applies to any person. Then the target person is no more specific than a generalized person.

Some evidence supporting the utility and plausibility of this distinction between implicit theory per se and inferential judgment can be gleaned from the findings of a number of studies.

In a direct person perception study, Norman and Goldberg (1966) compared the peer ratings from groups varying in the length of acquaintance of the group members. Increased degrees of acquaintance about the ratees resulted in higher rater agreement. A similar conclusion was reached by Kusyszyn (1968), who also found that the correlations between peer ratings and relevant PRF scale scores were higher for groups living together than for those living apart. Along the same lines, Jackson, Neill, and Bevan (1973) computed convergent validity measures for . PRF scales separately for peer ratings for judges for whom the degree of acquaintance was rated high, and for judges for whom the degree of acquaintance was rated low. In two separate samples in which personality was assessed by two response formats, there was a significant association between the degree of acquaintance and the level of validity.

Thus, it seems likely that the implicit theory of a judge with respect to a particular person may change with increasing acquaintance with this target person. These changes, however, may be easily reconceptualized as the end results of inferential judgments with respect to a target person on the basis of increasing amounts of specific information about him.

Another source of evidence supporting the distinction between implicit theory and inferential judgment can be found in the indirect person perception experiment by Hanno and Jones (1973). Specifically, they asked subjects to judge the trait relationships in different reference persons rather than a generalized person. They found that the trait adjective configuration was altered by a change of the identity of the reference person from a family doctor to a nationally known politician, although the same basic trait adjective structure appeared to exist for both reference persons. They concluded that individuals probably do not have unitary, universally applicable implicit personality theories.

It follows from this study that individuals may have one implicit theory for a family doctor, another one for a politician, still another one for a police officer, another one for a firefighter, ... We may continue to add to this an endless list of implicit theories for different classes of people. Alternatively, the distinction between implicit theory and inferential judgment allows us to reconceptualize the host of implicit theories of a judge as the end results of his inferential judgments with respect to different specific target persons based on his general implicit theory of trait relationships as perceived in a generalized person.

In short, the distinction between implicit theory and inferential judgment is useful in that it allows for an economical and parsimonious way of conceptualizing the infinitude of implicit theories of each judge. Such reconceptualization also highlights the necessity of separately examining a judge's perceived trait relationships in a generalized person, and the underlying process whereby he utilizes this general implicit theory in making inferences about the characteristics of different specific target persons. Further, this explicit distinction makes it possible to conceptualize two distinct potential avenues through which individual differences may be expressed.

## The Individual Differences Approach

Implicit theory. The emphasis on individual implicit theories implies a recognition of the importance that individuals may differ significantly in the perception of trait relationships. N. Wiggins (1973), and Wiggins and Blackburn (1976) have argued that the ways in which individuals organize traits constitute in part individuals' personalities, and if the shared general implicit theory is insensitive to individual differences, then implicit theories cannot be an important feature of personality. This similar notion has actually formed the basis of Kelly's (1955) theory of personality that each person has a "system of personal constructs" through which he interprets his interactions with others.

In his review of the evidence dealing with implicit personality theory, Schneider (1973) identified two approaches to studying individual differences. In the first approach, groups of judges are divided on the basis of external criteria, and differences in implicit theories are sought in terms of differences in dimensions or configurations. In multidimensional scaling, this corresponds to constructing a separate perceptual space for each a priori group. In studies of this sort, there is only weak evidence for group differences.

The second approach is to identify individual differences in the judges' dissimilarity judgments, and then look for personality variables which discriminate between persons having different implicit theories. In terms of multidimensional scaling, individual differences in perceived trait relationships are assumed to arise from one or more of the following ways. Individuals may differ in the functions which relate their judgments of dissimilarities to the distances between points in the geometric representation. Each individual may have his own perceptual space. A variation of this formulation assumes subgroups of individuals are homogeneous with respect to their dissimilarity judgments and can be represented by idealized individuals. Each idealized individual then has a different perceptual space. This corresponds to the Tucker-Messick points-of-view model (Tucker & Messick, 1963). Alternatively, individuals are assumed to share a common perceptual space. Either the same linear monotone function is assumed to relate dissimilarities to distances for all individuals or different functions are assumed for different individuals. Further, individuals differ in the importance attached to the dimensions of the common perceptual space. Examples of this formulation are the Carroll-Chang individual differences model (Carroll & Chang, 1970) and Ramsay's weighted model (Ramsay, 1977).

In this second approach, a number of investigators have been able to identify clusters of judges with differentiating points of view (Sherman, 1972; Walters & Jackson, 1966; Wiggins & Blackburn, 1976), providing evidence that judges may differ in the perception of trait relationships in generalized others. However, Schneider (1973) has cautioned that these individual differences are typically quite small, and are not systematically related to classic personality variables.

Inferential judgment. Even if individuals or groups of individuals can be assumed or are found to share relatively similar perceptions of trait relationships, they may still differ as to their processes of inferential judgments with respect to specific target persons. This potential source of individual differences has long received recognition in the studies of clinical judgment. For example, Hoffman (1960) compared two judges in the prediction of the intelligence of persons described by a series of nine-cue profiles. A linear equation for each judge was derived by obtaining the cue weights from the multiple regression of the nine input cues on the judge's predictions. The resulting regression weights indicated the relative emphasis each judge placed on the various cues. One problem of this approach is that this may result in as many equations representing judgments as the number of judges. A more parsimonious way is to partition judges into groups characterized, for example, by levels of complexity in their judgment processes. However, as Anderson (1972) has argued, nonlinearity and configurality are not meaningful unless cue dimensions are subjectively assessed.

Generally, in studies of cue utilization, each of the judgment responses is obtained on an a priori determined unidimensional response scale, assuming that the experimenter and the subject know and agree upon the relevant stimulus dimensions without assessing the subject's perceived stimulus dimensionality. Although this assumption may hold for physical stimuli, for social and clinical stimuli in the areas of person perception and clinical judgment, the underlying perceived dimensions are generally unknown. Multidimensional scaling models, which employ judgments of dissimilarities of stimuli, allow the perceived relevant stimulus dimensions to emerge, constrained only by the set of stimuli sampled. Thus, we gain more insight into an individual's process of making judgment by relating clinical judgment to implicit theory using the cue dimensions determined by multidimensional scaling. An approach to the study of individual differences in the process of inferential judgment will be elaborated in the following sections.

## Two Models of the Item Responding Process

As explicated in previous sections, the study of inferential judgments with respect to specific target persons can be appropriately considered as part of the study of implicit theory. Of particular relevance to the understanding of individual differences in the process of inferential judgments are two models developed to describe the process underlying the subject's response to test items. One model is Jackson's threshold model of the item responding process (Jackson, 1968), which has subsequently been generalized to a model for "inferential accuracy" (Jackson, 1972). The other model is Cliff's cognitive model for inventory response (Cliff, 1968; Cliff, Bradley,

& Girard, 1973), which has also been applied to relating unidimensional judgments to multidimensional scaling (Cliff, 1969; Cliff & Young, 1968).

Jackson's threshold model. Recognizing that an individual's probability of a positive response varies as a function of item desirability, Jackson (1968) first proposed the threshold model to describe stylistic responding. Specifically, the threshold model posits that each individual possesses a unique curve relating judged item desirability and his endorsements of the items. This subject operating characteristic curve is specified by two parameters. The threshold refers to a critical level of desirability that marks the transition form a false to a true response tendency, and the sensitivity refers to an estimate of the salience the subject attaches to the desirability dimension.

Support for the threshold model as a valid model of the item responding process has been provided by Rogers (1971). Voyce and Jackson (1977) extended it to judged item frequency and demonstrated that by employing a simple linear model of responding process, the two parameters, threshold and sensitivity, can be estimated by least squares procedures. The slope is interpreted as the subject's sensitivity, while the point on the desirability or frequency continuum where the subject surpasses the 50 per cent level of true responding is termed the intercept and constitutes an estimate of his threshold.

Subsequently, the model has been recognized to have relevance not only to item responding, but to clinical judgment as well. The relative commonality and validity of the shared implicit theory of personality and the concern with individual differences in clinical judgment have led Jackson (1972) to generalize the threshold model to a model for "inferential accuracy."

In this version of the model, "inferential accuracy" is defined in terms of a judge's ability, given limited information about a target person, to judge correctly other pertinent characteristics about that person. In making judgments about the personalities of other people, "inferential accuracy" depends to a large extent on the judge's use of the shared implicit theory of personality in making inference. Thus, individuals may vary in terms of their awareness or sensitivity to the shared implicit theory and in terms of their readiness or threshold to attribute traits or behaviors to others based on the implicit theory of perceived relations among traits or behaviors. In this version, sensitivity is estimated by the correlation between the individual judgment and the group consensus judgment usually with respect to a specific target person, and threshold is estimated by the mean judgment ratings of the individual judging that specific target person.

Burron and Jackson (1974), employing this model to evaluate individual differences in making trait inference in person perception, found supporting evidence for the independence of the two parameters, and their generalizability across target persons and response statements. High sensitivity judges were more accurate at making specific trait inferences and were far more confident about them than were low sensitivity subjects. Low threshold judges were more inferentially accurate when characteristics were positively related, but were less inferentially accurate when they were negatively related than were high threshold judges.

More recently, Reed and Jackson (1975) applied the model to the area of clinical judgment of psychopathology. They found that judges in the aggregate demonstrate high consensus in inferring the probability of a true response to a pathological personality statement when given a summary of the characteristics of a patient. Sensitivity and threshold were found to be independent, and generalizable across patient types. Supporting evidence was found for the accuracy of the consensus judgment.

Cliff's cognitive model of inventory response. Cliff (1968) proposed a cognitive model in which responses of an individual to test or inventory items can be conceptualized in the framework of an internal organization of items occupying particular positions in a multidimensional space; the probability of item endorsement by the individual is a function of the items' locations in the space. He found supporting evidence that subjects' endorsement of adjectives under both "self-description" and "fake good" instructions are mediated by the multidimensional space generated from similarity judgments between pairs of adjectives.

A more generalized formulation was provided by Cliff and Young (1968) who related various decisions or judgments of individuals concerning the members of a collection of stimuli to the internal organization or underlying structure for the collection of stimuli as perceived by the individuals. This notion was substantiated in the studies of judgment of intensity of emotion expression, favorableness judgments of adjectives, judgments of possible action and threat in simulated air raids (Cliff & Young, 1968). In this general formulation, however, the function relating unidimensional judgments to the multidimensional representation of stimuli revealed by multidimensional scaling is unspecified, implying that different judgmental responses may be related to the same representation by different functions. Thus, it is assumed that the individual has a psychological map of the stimuli, and he uses it in various ways depending on the type of judgment. Two functions, the vector model and the unfolding or ideal point model, which have been found useful in the studies of liking judgments and preferences for stimuli (Cliff, 1969; Green & Carmone, 1970), were systematically examined in relating inventory response to multidimensional scaling structure by Cliff, Bradley, and Girard (1973).

The unfolding model assumes that when the individual responds to an inventory, there is a particular location (ideal point) in the multidimensional space defined by the items that corresponds to his self. He endorses items to the degree that they are close to that location, and rejects them as they are increasingly distant from that location in any direction. The vector model assumes that in the space of the items, there is for each individual a direction of increasing endorsement, and that the further out the items lie in that direction, the greater is the degree of endorsement by that person. Endorsement is an increasing function of items' projections on a vector in the multidimensional space. Cliff (1969) has found support for both models in his studies. He suggested that the unfolding model may represent the true state of affairs, but the vector model provides a good approximation.

## Some Models for the Process of Inferential Judgment

We suggest here that the process of inferential judgments attributing traits or behaviors to a target person can be conceptualized in terms of a geometric representation in a manner similar to the item responding process. Specifically, we suggest that each act of inferential judgment with respect to a specific target person represents for the judge an attempt to locate that specific target person in this same judge's implicit theory or perceptual space of trait or behavior relationships.

In terms of the vector model first introduced by Tucker (1960), a vector direction is sought in the perceptual space to represent the judged target. The projections of the traits or behaviors on the vector direction represent the relative ordering of traits or behaviors as judged in or to be displayed by the target, the direction of the vector being the direction of increasing likelihood that these traits or behaviors will be attributed to the target.

To illustrate, two judged target persons are shown in Figure 1 which contains a two dimensional perceptual space of a hypothetical individual. Target X is judged by the individual as mostly likely to engage in specific behavior A, less so for B, E, C, and D in order of decreasing likelihood, or as possessing traits A, B, E, C, and D in order of decreasing likelihood. Similarly, behaviors or traits E, D, A, C, and B are attributed to target Y in order of decreasing likelihood. The cosines of the angles the target vectors form with the coordinate axes give the relative importance of the dimensions of the perceptual space in contributing to the inferential judgments with respect to the targets. In our hypothetical example, Dimension 1 is relatively more important than Dimension 2 in judging target X, but they are equally important in judging target Y.

The simple unfolding model was first introduced by Coombs (1950) for the unidimensional case and was generalized to the multidimensional case by Bennet and Hays (1962). It assumes that the judged target occupies a particular location or ideal point in the judge's perceptual space. The farther away a trait or behavior is from this location, the less likely that this trait or behavior will be attributed to this target person. This notion of relative distance

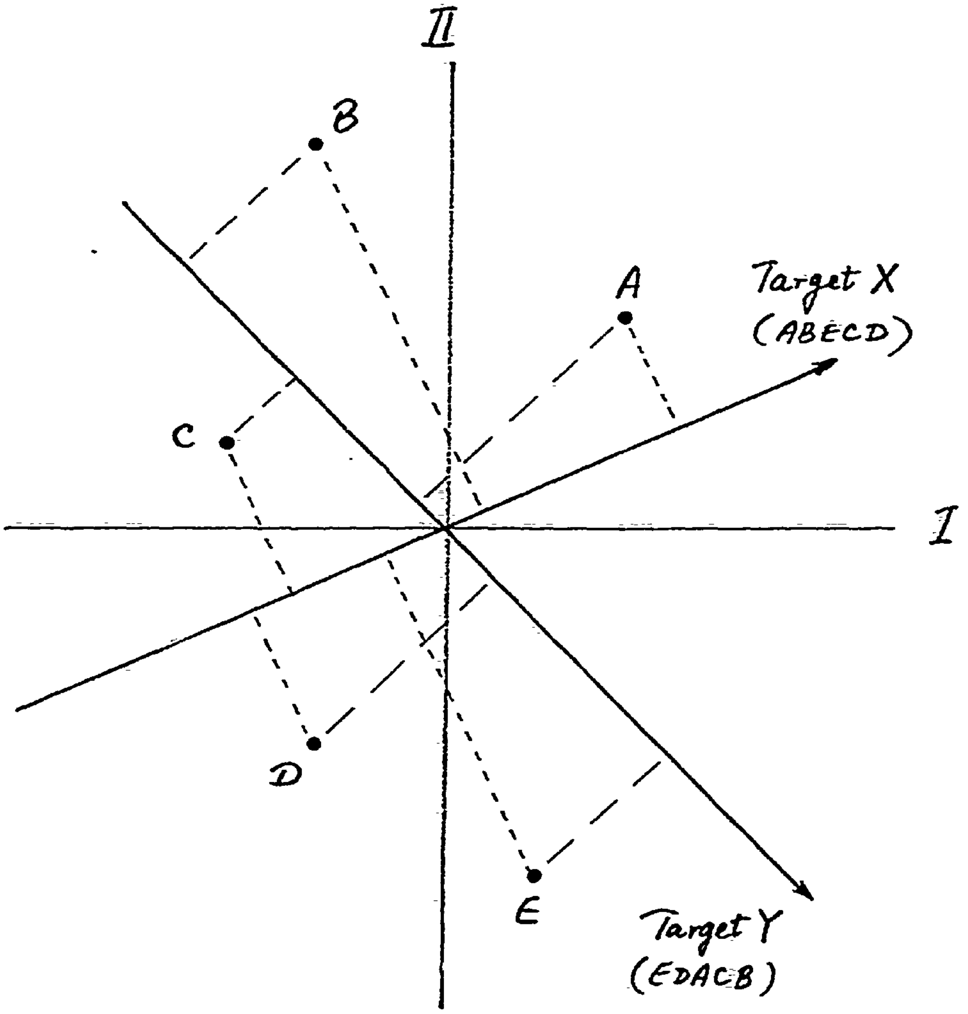

Figure 1. Vector model for inferential judgment in a two dimensional space illustrated. (A, B, C, D, and E are traits or behaviors; X and Y are judged target persons)

implies a metric on the space which for our purpose is assumed to be Euclidean.

As Carroll (1972) and Coombs (1975) have indicated, the vector model can be regarded as a special case of the simple unfolding model. By moving the ideal point farther and farther out along a fixed line from the origin, the relative ordering of distances from the ideal point to the stimulus points will approach and will asymptotically be identical to that of the projections of the stimuli onto a vector whose direction is the same as that of the line along which the ideal point is moved.

To continue with our hypothetical example for illustration, the same two targets X and Y are represented as points in the two dimensional perceptual space in Figure 2. The distance between a stimulus point representing a trait or behavior and the ideal point representing the location of the judged target gives the likelihood that the trait or behavior will be attributed to the target. To target X is attributed, in decreasing likelihood, traits or behaviors A, C, B, E, and D, and to target Y, E, D, A, C, and B.

Since all directions are relevant in the unfolding model, in a two dimensional space, we can imagine concentric circles centered at the target location indicating points of equal likelihood that certain traits or behaviors will be attributed to the target. In the case of three or more dimensions, spheres and spheroids or hyperspheroids replace circles. As in the vector model, we can also conceptualize

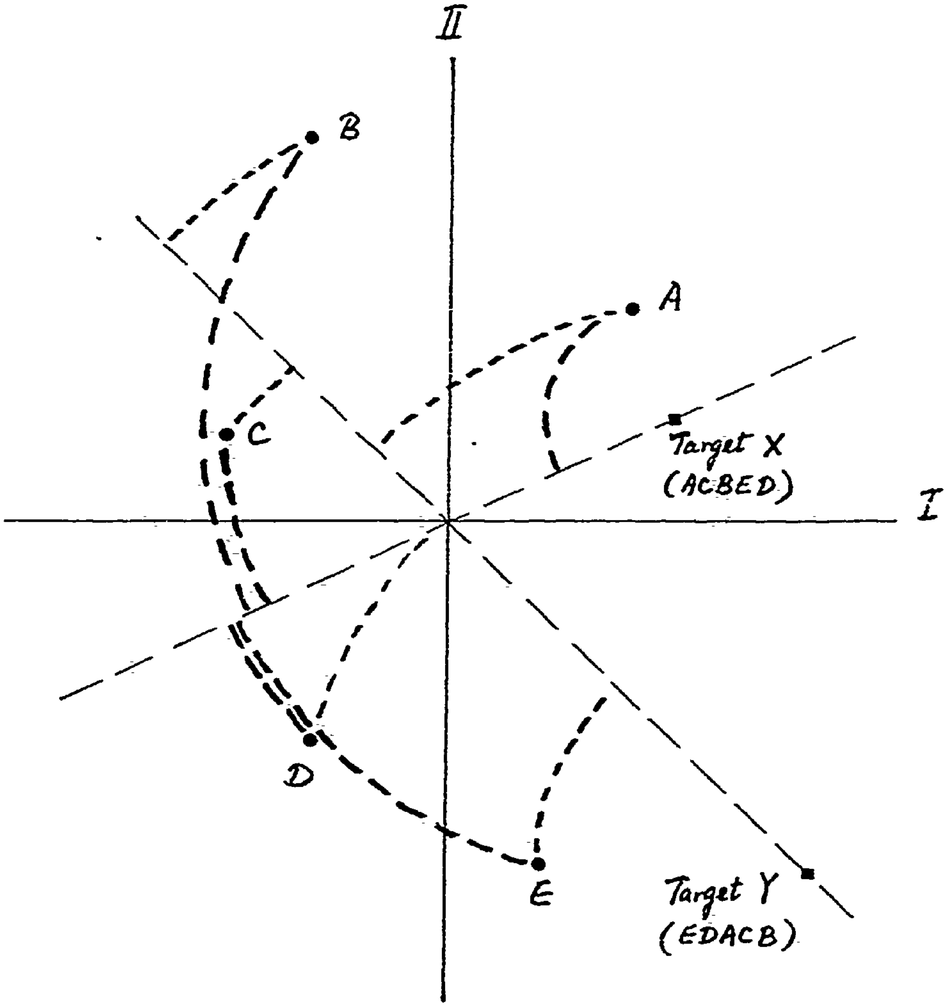

Figure 2. Simple unfolding model for inferential judgment in a two dimensionsal space illustrated. (A, B, C, D, and E are traits or behaviors; X and Y are judged target persons)

projecting the stimulus points onto an arbitrary line through the target location. We choose a line similar to the vector direction in Figure 1 for both targets so that comparison can be made with the vector model representation. Figure 2 shows that the stimulus points are projected in a different manner from the projection schema for the vector model. The projections are formed by folding the distances between the stimulus points and the ideal point back upon this line, indicating the model is nonlinear. Incidently, Figure 2 also illustrates that target Y represented as a point far out along the line through the origin is attributed traits or behaviors in the same relative ordering of likelihood as the same target represented as a vector direction in Figure 1.

By defining distance between a stimulus point (trait or behavior) and the ideal point (judged target person) as distance other than the usual Euclidean distance, Carroll and Chang (Carroll, 1972) have introduced some variants of the unfolding model. Specifically, the usual distance becomes elliptical distance in the model in which the judges are allowed to attach different saliences to different dimensions of the perceptual space. The variants of the unfolding model, together with the vector model, form a linear-quadratic hierarchy of models.

## The Linear-Quadratic Hierarchy of Models

Carroll and Chang (Carroll, 1972) described a linear-quadratic hierarchy of models, which in order of descreasing complexity are the general unfolding model, the weighted unfolding model, the simple unfolding model, and the vector model. Although this hierarchy is formulated to relate preference data to a given multidimensional configuration, we reformulate it here to relate an individual's inferential judgments with respect to specific target persons to his perceptual space. Our formulation is similar to that of Cliff's model of inventory response, and incorporates some of the ideas of the individual differences approach in the model for "inferential accuracy." In addition, by fitting the hierarchy of models to the inferential judgments of an individual with respect to specific target persons in his perceptual space, linear, nonlinear and configural processes of inferential judgments can be structurally represented and assessed.

These four models are implemented in the four phases of the program PREFMAP (Carroll, 1972). Model fitting starts with the most complex model in phase 1 to the least complex model in phase 4. A brief treatment of the models in the context of inferential judgment follows.

Model 1 : General unfolding model. In general, for all models in our treatment, the perceptual space or implicit theory of the judge is assumed to be known in the form of a matrix of coordinates X of order n by m , n being the number of stimuli, and m being the number of dimensions. The row vector $\underline{x}_j$ represents the stimulus point j . The individual's inferential judgment $s_{ij}$ gives how likely a trait or behavior j will be attributed to a target i . In all variants of the unfolding model, it is assumed that $s_{ij}$ is linearly related to the squared distance $d^2_{ij}$ between stimulus point $\underline{x}_j$ representing a trait or behavior and the ideal point $\underline{y}_i$ representing the location of the judged target. That is,

$$s_{ij} = a_i d^2_{ij} + b_i + e_{ij} \quad (a_i \geq 0) \quad ,$$

where $a_i$ and $b_i$ are arbitrary constants, and $e_{ij}$ is an error term. The way $d^2_{ij}$ is defined gives rise to the variants of the unfolding model.

In the general unfolding model, it is assumed that in making inferential judgments to locate a target person in his perceptual space, an individual may choose a set of "reference axes" within the space. In the rotated reference frame, he may also attach differential weights to the rotated axes in making his inferential judgments with respect to specific target persons.

Mathematically, it is assumed that both $\underline{x}_j$ and $\underline{y}_i$ are operated on by an orthogonal transformation matrix $T_i$ ,

$$\underline{x}^*_j = \underline{x}_j T_i \quad ,$$

$$\underline{y}^*_i = \underline{y}_i T_i \quad .$$

The squared elliptical distance is then defined as

$$d^2_{ij} = \sum_{a=1}^{m} w_{ia}(x^*_{ja} - y^*_{ia})^2 \quad ,$$

where $w_{ia}$ is the weight attached to dimension a in judging target i.

In matrix form,

$$d_{ij}^2 = (\underline{x}_j^* - \underline{y}_i^*)\, W_i\, (\underline{x}_j^* - \underline{y}_i^*)' \quad ,$$

where $W_i$ is a diagonal matrix containing the weights $w_{ia}$ .

By expansion, we can show that

$$d_{ij}^2 = \underline{x}_j(T_iW_iT_i')\underline{x}_j' - 2\underline{y}_i(T_iW_iT_i')\underline{x}_j' + \underline{y}_i(T_iW_iT_i')\underline{y}_i' \quad .$$

By substitution,

$$s_{ij} \approx a_i\left[\underline{x}_j(T_iW_iT_i')\underline{x}_j' - 2\underline{y}_i(T_iW_iT_i')\underline{x}_j' + \underline{y}_i(T_iW_iT_i')\underline{y}_i'\right] + b_i \quad .$$

Letting

$$R_i = a_i(T_iW_iT_i') \quad ,$$

$$b_i^* = -2a_i\underline{y}_i(T_iW_iT_i') \quad , \text{ and}$$

$$c_i = a_i\left[\underline{y}_i(T_iW_iT_i')\underline{y}_i'\right] + b_i \quad ,$$

$$s_{ij} \approx \underline{x}_jR_i\underline{x}_j' + b_i^*\underline{x}_j' + c_i \quad .$$

This formulation makes explicit the nature of the quadratic equation involving cross-product terms, square terms, and linear terms. Thus complex processing with configurality and nonlinearity in inferential judgments with respect to a particular target can be assessed using this model.

Model 2 : Weighted unfolding model. In this more restricted unfolding model, it is assumed that in making inferential judgments to locate a target person in his perceptual space, an individual may attach differential weights to the dimensions of his perceptual space. Thus model 2 can be considered as a special case of model 1 in that

$$T_i = I \quad ,$$

where I is an identity matrix.

Then, letting

$$W_i^* = a_i W_i \quad ,$$

$$s_{ij} \approx \underline{x}_j W_i^* \underline{x}_j' + b_i^* \underline{x}_j' + c_i \quad .$$

Since $W_i^*$ is a diagonal matrix, the quadratic equation has only square terms and linear terms. Thus, complex nonlinear processing in inferential judgments with respect to a particular target can be assessed using model 2.

Model 3 : Simple unfolding model. In this restricted model, it is assumed that in making inferential judgments to locate a target person in his perceptual space, an individual attaches equal weights to all the dimensions of his perceptual space. Thus model 3 can be regarded as a special case of model 2 in that

$$W_i = I \quad .$$

Then, letting

$$U_i = a_i W_i \quad ,$$

$$s_{ij} \approx \underline{x}_j U_i \underline{x}_j' + b_i^* \underline{x}_j' + c_i \quad .$$

Since $U_i$ is a scalar matrix, the equation involves only square terms and linear terms. Thus model 3 again allows the assessment of nonlinearity in the process of inferential judgments.

Model 4 : Vector model. In this model, it is assumed that in the individual's perceptual space, the judged target $i$ can be represented by a vector direction $\underline{y}_i$ in the space such that

$$s_{ij} \approx a_i \underline{y}_i \underline{x}_j' + c_i \quad .$$

This formulation makes explicit that the equation contains only linear terms. Thus linear processing or approximation by linear processing in inferential judgments can be assessed using this model.

Geometrically, the representation of the judged target in model 4 has been described previously, and the representations in models 1, 2, and 3 are similar to the representation described previously for the unfolding model except for some modifications. To simplify, we again consider the two dimensional case. In judging a specific target, uniform dilation or contraction of both dimensions is allowed in model 3. Therefore, concentric circles centered at the judged target location indicating equal likelihood of trait or behavior attribution can be described. When differential weights are allowed to apply to the dimensions as in model 2, these circles become ellipses, the axes of which are parallel to the dimensions. The length of the axes are related inversely to the weights. That is, the larger the weight, the smaller the corresponding axes of the ellipses, reflecting the fact that it takes a smaller change to make the same amount of difference along that corresponding dimension. In model 1, rotation of axes preceding differential weighting of rotated axes is allowed. Therefore, stretching or contracting may take place along axes other than the original dimensions of the perceptual space. Then the axes of the ellipses need not be parallel to the dimensions of the perceptual space. In higher dimensions, circles and ellipses become spheres or hyperspheres, ellipsoids or hyperellipsoids.

In the unfolding model representation of inferential judgment, the weights attached to particular dimensions (or rotated dimensions in model 1) by the judge can be interpreted as the contribution of the dimensions in the judgment of the target. However, the weights are not constrained to be nonnegative. One interpretation, with negative weights attached to a dimension is: traits or behaviors distant from the ideal point or judged target location along that axis are more likely to be attributed to the target. If all dimensions have negative weights, the ideal point is transformed into an anti-ideal point. The anti-ideal point can also be interpreted as the judged target location, but instead of traits or behaviors, the opposite traits or the omissions of behaviors are attributed to this target. If however some dimensions have positive and other negative weights, the interpretation becomes more complicated. Instead of either an ideal point or an anti-ideal point, we have a saddle point, that is, along positively weighted dimensions, traits or behaviors are attributed to the target, and along negatively weighted dimensions, the opposite traits or omissions of behaviors are attributed to the target.

Our formulation of the four models for inferential judgment has focused on a particular judge's inferential judgments with respect to different specific target persons employing his individual implicit theory. However, if it is reasonable to assume a common implicit theory is shared by judges, individual differences in inferential judgments with respect to a particular target person can also be assessed using these models.

In summary, the fitting of these models, under the linear assumptions, is equivalent to solving linear and quadratic equations. Carroll (1972) suggested that the multiple correlation R can be used to assess the fit of each model to the inferential judgment data by the conventional F statistics. Given the hierarchical embeddedness of the models, he also suggested using the F statistics to compare pairs of these multiple Rs to determine whether the R corresponding to the more general model accounts for significantly more variance than a less general model. Since this is equivalent to testing whether the addition of new independent variables in a stepwise regression procedure accounts for a significant extra amount of variance, in the context of inferential judgment, this allows an assessment of the extent of nonlinear and configural processing and the linear approximation to nonlinear and configural processing in a way different from the traditional experimental paradigm in clinical judgment studies.

## An Overview of Two Studies

We have in this and previous chapters reviewed some of the studies and issues in the areas of implicit personality theory and clinical judgment. We have also attempted to make an explicit distinction between implicit theory and inferential judgment. This distinction has led us to design the following two distinct yet interrelated studies. Study 1 deals with the perception of psychopathology, that is, the implicit theory of psychopathology; Study 2 deals with inferential judgments, examining "process" as well as "accuracy."

Study 1. As we have indicated, the existence of implicit personality theory is rarely an issue. What is at issue is whether this shared implicit personality theory represents relatively "accurate" perception of the co-occurrence of behaviors or traits in people. The evidence to date seems to suggest that instead of biasing the accurate judgment of people, this shared implicit theory of personality forms a valid foundation for assessing inferential judgments (Jackson, Chan, & Stricker, 1978; Lay, Burron, & Jackson, 1973; Lay & Jackson, 1969; Stricker, Jacobs, & Kogan, 1974).

The evidence regarding the relative "validity" of the implicit theory in the domain of psychopathology however is less compelling (Chan & Jackson, 1976). Chan and Jackson (1976) suggested that as a person's accurate perception of psychopathological trait or behavior co-occurrence depends on his experience with the co-occurrence of psychopathological behaviors, there may exist distinct points of view for experienced and inexperienced judges.

Thus one primary aim of this study was to examine possible individual differences in the perception of psychopathology, focusing on the differences between experienced and inexperienced groups of judges. Without assuming that the a priori groups of experienced and inexperienced judges share a common implicit theory, we sought to construct a separate perceptual space for each group.

Then we assessed the similarity of the spaces and investigated possible individual differences within each group.

Another aim of the study was to assess the relative "validity" of the implicit theory or theories against self-reported data from normal as well as abnormal groups. A related concern was the perception of certain clinical types in relation to the perception of the representative set of psychopathological constructs in the joint space. The importance of the perception of individuals in relation to attitude statements (e.g., Boyd & Jackson, 1967) and the perception of political candidates in relation to political issues (e.g., Shikiar, 1973) have received recognition. Therefore, an examination of the perception of clinical types by experienced and inexperienced judges is not only of interest in itself, but will also provide evidence about whether such perceptions represent nothing more than invalid stereotypes.

To summarize, Study 1 was concerned with the following specific aims:

1. To discover, separately for experienced and inexperienced judges, using the same selected sample of behavioral referents, those psychopathological behaviors or traits that are perceived as in the same individual and those that are not, and to represent structurally the implicit theories or theory of psychopathology.
2. To compare the similarity of the implicit theories of different groups.

3. To examine the ways in which certain clinical types are perceived in the context of these implicit theories.

4. To assess the relative "validity" of the implicit theories with respect to self-reported data from normal as well as abnormal groups.

Study 2. The typical studies in clinical judgment usually emphasize the capturing of judges' strategies characterized by different composition rules. As we have indicated, configurality and nonlinearity in the process of judgment cannot be meaningfully interpreted if cue "parameters" or cue dimensions or both are not determined subjectively by the judge. This problem is overcome in this study by investigating the process of inferential judgments of three specific target persons using the implicit theories of the judges as determined by multidimensional scaling.

Thus Study 2 wasbased on the premise that an individual's inferential judgments with respect to a target person using a collection of traits or behaviors are mediated by the perceptual space of the same collection of traits or behaviors, and that he may use the perceptual space in different ways depending on the specific target. By partitioning judges according to the level of complexity in the process of judgment, we explored whether the resulting types of judges were related to certain personality correlates. In addition, by assuming that judges shareda common perceptual space, we also examined individual differences in the process of inferential judgments with respect to a particular target.

Following Goldberg (1968), although our study could properly be classified as a "process" study, it also bore on the issue of the "accuracy" of judgment. If it could be established in Study 1 that the implicit theory or theories of psychopathology were relatively "valid," implying that our inferential judgment task was meaningful (Reed & Jackson, 1977), then it would be appropriate to investigate whether judges who used the common perceptual space effectively did make more "accurate" judgments.

To summarize, Study 2 was concerned with the following specific aims:

1. To represent individual inferential judgments of specific targets as vector directions or ideal points in the perceptual spaces of the judges.
2. To assess the extent of individual nonlinear and configural processing in inferential judgments with respect to different targets.
3. To partition judges according to their levels of complex processing into types, and to seek personality correlates of these resulting types.
4. To investigate the relative"accuracy" of inferential judgments of judges.

# CHAPTER 5

## STUDY 1:

## PERCEPTION OF PSYCHOPATHOLOGY

### Method

### Stimulus Materials

Similarity judgments. The 30 stimuli in this study consisted of items representing the 27 psychopathological constructs of the Differential Personality Inventory (DPI) (Jackson & Messick, 1971), and the trait descriptions of three clinical types. The DPI was constructed using the methods similar to those employed in the construction of the PRF (Jackson, 1974). Jackson and Carlson (1973) presented supporting evidence of the convergent and discriminant validity of the DPI. Hoffmann, Jackson, and Skinner (1975) found that the DPI and the MMPI assess similar dimensions of psychopathology. Thus, the choice of the use of these behavioral referents should more readily allow interpretation of the obtained inferential configurations in terms of the constructs represented by these behavioral referents, rather than solely in terms of semantic meanings of words.

To represent each of the 27 constructs of the DPI, two statements were drawn from each scale of the inventory. The pairs of statements representing each scale were randomly assigned to two different sets, designated A and B. All selected statements were true-keyed, indicating the positive pole of each of the constructs, and not extreme in their endorsement frequencies. The scale names and their abbreviations are shown in Table 1. The selected items for set A and set B together with their endorsement frequencies are shown in Tables 2 and 3.

In addition to the two sets of 27 items selected for similarity judgments, general trait descriptions were included in both set A and set B to represent three commonly encountered types of psychopathology or clinical types as in Reed and Jackson (1975). "A depressed person" represented clinical depression, "a person with a persecution complex" represented preparanoid, and "an assaultive person (one prone to violence on the slightest provocation)" represented psychopathy.

Design for similarity judgments. With a large stimulus set ($n = 30$), a design which requires each judge to make all possible distinct pairs of comparison, i.e., 435 judgments, becomes a prohibitive task. Alternative designs (see Rosenberg & Sedlak, 1972b) which require each judge to judge a subset of the total set of stimuli and by aggregating the judgments yield only a group space for all the judges. The present study requires a design which does not obliterate individual differences yet reduces the size of each judge's task.

It is well known that in a complete design with $n(n - 1)/2$ comparisons, $nm$ parameters are estimated from the $n$ stimuli if there are $m$ dimensions. Since $m$ is usually very small relative to $n$, there are many more comparisons than parameters to be estimated. Therefore, each judge makes many redundant comparisons.

For metric multidimensional scaling, Young and Cliff (1972),

## Table 1

## Scale Names and Abbreviations of the Differential Personality Inventory

| | Scale Name | Abbreviation |
|---|---|---|
| 1 | Insomnia | Ins |
| 2 | Headache Proneness | HPr |
| 3 | Broodiness | Brd |
| 4 | Cynicism | Cyn |
| 5 | Depression | Dep |
| 6 | Desocialization | DSc |
| 7 | Disorganization of Thinking | DTh |
| 8 | Familial Discord | FmD |
| 9 | Feelings of Unreality | FUn |
| 10 | Health Concern | HCn |
| 11 | Hostility | Hos |
| 12 | Hypochondriasis | Hyp |
| 13 | Ideas of Persecution | IPs |
| 14 | Impulsivity | Imp |
| 15 | Irritability | Iry |
| 16 | Mood Fluctuation | MdF |
| 17 | Neurotic Disorganization | NDs |
| 18 | Panic Reaction | PnR |
| 19 | Perceptual Distortion | PcD |
| 20 | Rebelliousness | Reb |
| 21 | Repression | Rep |
| 22 | Sadism | Sdm |
| 23 | Self-Depreciation | SDp |
| 24 | Shallow Affect | SAf |
| 25 | Socially Deviant Attitudes | SDA |
| 26 | Somatic Complaints | SmC |
| 27 | Defensiveness | Def |

## Table 2

## Item Set A with

## Corresponding Endorsement Frequencies

1. I often wake up during the night. (.36)
2. I often have headaches upon completing a day's work. (.17)
3. I spend hours thinking out just exactly what I will say in certain conversations. (.24)
4. Politics are and always will be rotten. (.41)
5. I often think that I have very little to look forward to. (.24)
6. I choose to be alone as much as possible. (.32)
7. When several things are happening at once, I cannot keep them separated in my mind. (.24)
8. Other members of my family often find fault with what I do. (.50)
9. My daydreams are sometimes so real to me that I can't stop them even when I try. (.17)
10. I am always on the lookout for symptoms which may indicate a serious illness. (.28)
11. I let people know when I'm angry. (.50)
12. When I get pains, I can't tell other people what they are like. (.31)
13. I often feel that someone is trying to make my life difficult and unpleasant. (.22)
14. I'm willing to do almost anything on the spur of the moment. (.38)
15. I find that the actions of people often annoy me. (.49)
16. The way I feel depends upon a great deal on how the people around me feel. (.52)
17. I often lose things such as pencils and keys. (.26)
18. Little things scare me more than they do most people. (.19)
19. Sometimes my brain is full of colored lights. (.12)
20. I don't like or believe in having too many laws. (.47)
21. At night, I rarely think over what has happened to me during the day. (.38)
22. I believe that "Each man hurts the one he loves," sometimes on purpose. (.62)
23. My whole life has been a big mistake. (.22)
24. When I am playing a game, I don't care if I win or lose. (.45)
25. I think it would be great fun to cheat certain people. (.25)
26. Sometimes my legs feel so weak that I can't walk. (.15)
27. I always live up to my responsibilities. (.48)

Note. Endorsement frequencies are based on college, prison, and psychiatric samples (N = 1105).

### Table 3

### Item Set B with

### Corresponding Endorsement Frequencies

1. I often have trouble sleeping because there is something on my mind. (.48)
2. Whenever I am worried about something, I get a headache. (.22)
3. I do not tell others how I feel about certain things. (.67)
4. There is good reason to believe that "there's a sucker born every minute." (.52)
5. My days seem gloomy and dull. (.25)
6. I try to stay away from groups of people because they make me feel uncomfortable. (.29)
7. My mind sometimes goes blank. (.26)
8. The members of my family believe I am stubborn. (.59)
9. Sometimes my surroundings appear to change so that I am in a strange place. (.25)
10. I watch to see that my body is always working properly. (.50)
11. If I were angry enough, I might even strike a friend. (.53)
12. When I have an illness, it's never in one place. (.24)
13. I would be much more successful if certain people were not against me. (.21)
14. Many times I do things without thinking. (.49)
15. Little things often bother me. (.41)
16. My surroundings can easily make me happy or sad. (.71)
17. Many times I have forgotten what I was going to say. (.49)
18. Even when I know something cannot hurt me, I sometimes feel afraid. (.41)
19. I am sometimes able to hear voices that seem to come from the sky. (.05)
20. I do not like having to follow a routine. (.46)
21. I think it is childish to "let yourself go". (.34)
22. I sometimes enjoy teasing animals. (.22)
23. I feel that I should apologize for most of the things I have done. (.33)
24. I don't either like or dislike people. (.43)
25. I think I could plan a perfect crime. (.30)
26. I sometimes have pains in my chest. (.41)
27. I cannot think of any way in which I have failed a friend. (.38)

Note. Endorsement frequencies are based on college, prison, and psychiatric samples (N = 1105).

drawing on the results of the study of Ross and Cliff (1964), concluded that if $n$ stimuli lie in an $m$-dimensional Euclidean space, it is sufficient to know the distances of each point from a subset of $m + 1$ points, provided that the latter cannot be embedded in a space of smaller dimensionality. Thus only $n(m + 1) - (m + 1)(m + 2)/2$ distances are necessary. In the case of $n = 30$, the number of necessary judgments for one- to eight- dimensional space is shown in Table 4.

Spence and Domoney (1974), using Monte Carlo procedures to investigate the properties of a nonmetric multidimensional scaling algorithm to scale an incomplete matrix of dissimilarities, have found that cyclic designs with about half deletion yield reasonably good and stable recovery. Cyclic designs, in graph theoretic terms, have the desirable properties of balance and connectedness since their graphs are regular, that is, every stimulus appears equally often and the set is not divisible into two or more subsets in the sense that no comparisons are made between the subsets (David, 1963). With the same set of stimuli numbered from 0 to $n - 1$, many cyclic designs with planned missing cells can be constructed by combining different cyclic sets, each cyclic set being defined as

$$\{s\} \; : \; (0,\ s),\ (1,\ s+1),\ \ldots,\ (t,\ s+t),\ \ldots,\ (n-1,\ s+n-1) \quad ,$$

where $s = 1, 2, \ldots, n-1$ .

Each of the cyclic sets satisfies the requirement that every stimulus appears equally often, but may or may not satisfy the

## Table 4

### The Number of Necessary Dissimilarity Judgment for Metric Multidimensional Scaling (30 Stimuli)

| Dimension | Necessary Judgment | Required Fraction of Judgment Data |
|---|---|---|
| 1 | 57 | .131 |
| 2 | 84 | .193 |
| 3 | 110 | .253 |
| 4 | 135 | .310 |
| 5 | 159 | .366 |
| 6 | 182 | .418 |
| 7 | 204 | .469 |
| 8 | 225 | .517 |

requirement of connectedness. If s and n have greatest common divisor d , then $\{s\}$ contains d connected but disjoint subsets. If the cyclic sets $\{s_1\}$ , $\{s_2\}$ , ... are combined to form a cyclic design, and n, $s_1$, $s_2$, ... have greatest common divisor equal to unity, then the design is connected. Table 5 lists the possible cyclic sets for a fixed labelling of the points, and the corresponding values of d (the number of connected subsets) for the case of $n = 30$.

Spence and Domoney (1974) also made a distinction between local and global connectedness, and suggested that designs which are more strongly connected in a global sense would do better. This notion is derived from the observation that, in graph theoretic terms, when the number of triangles, for a fixed number of edges, is taken as a rough index of local connectedness, the fewer the number of triangles, the better the recovery. It turns out that it is always possible to construct a zero triangle cyclic design collecting half of all the pairwise comparisons. For $n = 30$, for example, this can be accomplished by combining the following cyclic sets:

$\{1, 3, \ldots, 15\}$ or a chosen subset of these cyclic sets. Accordingly, for about half deletion, we used a design by combining 9 cyclic sets of the total 15 sets. For completeness, another design using a combination of the complement sets of the first design plus 3 other cyclic sets was also employed. Specifically, Design 1 has observed cells in cyclic sets 1, 3, 5, 7, 9, 11, 13, 14, 15, and Design 2 has observed cells in cyclic sets 2, 4, 6, 8, 10, 12, 13, 14, 15, cyclic sets 13, 14, and 15 being common to both designs. (See Table 6)

Table 5

The Possible Cyclic Sets for n = 30

| Set<br>$\{s\}$ | Number of Connected but Disjoint Subsets<br>d |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 2 |
| 5 | 5 |
| 6 | 6 |
| 7 | 1 |
| 8 | 2 |
| 9 | 3 |
| 10 | 10 |
| 11 | 1 |
| 12 | 6 |
| 13 | 1 |
| 14 | 2 |
| 15 | 15 |

Note. Set $\{15\}$ is the half set and is totally unconnected.

## Table 6

## Two Cyclic Designs

Stimulus

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | |
| 1 | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | ○ | | ○ | | ○ | | ○ |
| 2 | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | ○ | | ○ | | ○ | |
| 3 | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | ○ | | ○ | | ○ |
| 4 | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | ○ | | ○ | |
| 5 | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | ○ | | ○ |
| 6 | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | ○ | |
| 7 | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | ○ |
| 8 | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | |
| 9 | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ |
| 10 | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | |
| 11 | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| 12 | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ |
| 13 | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ |
| 14 | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ | ○ |
| 15 | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ | ○ |
| 16 | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | ○ |
| 17 | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ |
| 18 | | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ | |
| 19 | ● | | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | | ○ |
| 20 | | ● | | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ | |
| 21 | ● | | ● | | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | | ○ |
| 22 | | ● | | ● | | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ | |
| 23 | ● | | ● | | ● | | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | | ○ |
| 24 | | ● | | ● | | ● | | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ | |
| 25 | ● | | ● | | ● | | ● | | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | | ○ |
| 26 | | ● | | ● | | ● | | ● | | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ | |
| 27 | ● | | ● | | ● | | ● | | ● | | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | | ○ |
| 28 | | ● | | ● | | ● | | ● | | ● | | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | | |
| 29 | ● | | ● | | ● | | ● | | ● | | ● | | ● | ● | ● | ● | ● | | ● | | ● | | ● | | ● | | ● | | ● | |

● Observed cells in Design 1 (Lower triangle)

○ Observed cells in Design 2 (Upper triangle)

Using Designs 1 and 2, Questionnaires A and B were made up from Item Sets A and B, pairing statements within each set. Thus, Questionnaire A, based on Design 1, was comprised of two parts: 255 paired comparison judgments from Item Set A and the same number of judgments from Item Set B. Questionnaire B, based on Design 2, was also comprised of two parts: 255 judgments from Item Set A and the same number of judgments from Item Set B. For both Questionnaires A and B, 20 judgments, 10 randomly selected from Item Set A and 10 randomly selected from Item Set B, were repeated in the questionnaires as a reliability check for each judge.

In each part of the questionnaire booklet, 4 items in self-reported format were included to check judges' experience with the perception of psychopathology. The 4 items are reproduced in Appendix 1.

Bipolar rating. The same set of stimuli, the 54 statements and the 3 clinical types were also used in ratings with respect to 4 bipolar scales. The 4 scales were: desirable-undesirable, optimistic-pessimistic, impulsive-controlled, and confused-perceptive. The desirable-undesirable scale was chosen to appraise the role of desirability in the obtained inferential configurations. The other 3 scales were chosen to correspond to the broad diagnostic categories of affective disorders, personality disorders, and psychotic disorders.

Subjects

Three samples of subjects provided the similarity judgment data. Sample A was comprised of 18 graduate students of clinical and personality psychology at the University of Western Ontario. They participated as volunteers. By random assignment, 9 judges completed Questionnaire A, and 9 judges completed Questionnaire B. This sample was chosen to represent a group a judges who had relatively more experience in interacting with psychopathological groups.

Sample B was comprised of 20 introductory psychology students enrolled in summer at the University of Western Ontario. By random assignment, 10 judges completed Questionnaire A, and 10 judges completed Questionnaire B. Sample C was comprised of another group of 30 introductory psychology students of the University of Western Ontario. By random assignment, 15 judges completed Questionnaire A, and 15 judges completed Questionnaire B. Subjects of Samples B and C participated in the study for partial fulfilment of a course requirement. They represented two groups of judges who were less experienced in psychopathology. Since Sample B judges appeared to have greater variations in age, working experience, and educational background than Sample C judges, the two samples were kept separate.

An index of intra-subject reliability was obtained for each judge by computing the Pearson product-moment correlation between the two sets of judgments made by each judge in response to the 20 repeated pairs of statements. Three judges, 2 from Sample C and 1 from Sample B, whose reliability indices were below .30 ($p > .10$, one-tailed) were excluded from subsequent analyses for reason of suspected random responding. One judge from Sample C did not complete the whole questionnaire and was also excluded. Appendix 2 shows the intra-subject reliability indices for the final 64 judges. Thus, the final three samples were made up of the following judges completing Questionnaires A and B, respectively: Sample A - 9 judges (7 males and 2 females); 9 judges (7 males and 2 females). Sample B - 10 judges (5 males and 5 females); 9 judges (7 males and 2 females). Sample C - 12 judges (4 males and 8 females); 15 judges (7 males and 8 females).

Another group of 34 subjects (9 males and 25 females) provided bipolar ratings of the same set of stimuli, two sets of statements and three clinical types, using four bipolar scales. They were introductory psychology students enrolled in intersession at the University of Western Ontario. They took part in the study to receive credits toward fulfilment of a course requirement.

The self-reported data to the DPI were from the following three abnormal samples and one college sample (N = 1597). The Alcoholic Sample was comprised of 282 male and 122 female psychiatric patients consecutively admitted to the Minnesota State Hospital, Willmar, for treatment of alcoholism. The Prison Sample was comprised of 720 males at Kingston. The Psychiatric Sample was comprised of 181 psychiatric patients from psychiatric hospitals in Southwestern Ontario. The College Sample comprised of 113 male undergraduates at the University of Western Ontario, and 84 males and 95 females at the University of California at Los Angeles.

## Procedure

Similarity judgment task. Subjects completing either Questionnaires A or B were instructed to make similarity judgments for both Item Set A and Set B. Part A, for Item Set A, was completed in one session, and Part B, for Item Set B, was completed in another session. Each session lasted for about 45 minutes. This replication approach using the same judges but a different set of items was based on the notion that a single item representing a construct might be less reliable.

In making similarity judgments, judges were first asked to consider a person who has answered "true" to statement A, and consider another person who has answered "true" to statement B, then they were asked to judge the similarity between the two persons on a nine point scale, that is, "1" indicates the two persons were "extremely similar," and "9" indicates the two persons were "not at all similar." In the case of the comparison between a statement and a clinical type, or between two clinical types, "a person described by the trait adjectives" was substituted for "a person who has answered 'true' to the statement" in the instructions.

At the end of each session, as a check on whether Sample A indeed was a more experienced group of judges, judges of all three samples were asked to rate their extent of experience with psychopathology. Specifically, four statements in self-reported format were employed. For example, one of the statements is: "I have observed at close hand neurotic behavior in people I know." Each judge was instructed to indicate on a nine point scale whether each statement was characteristic of him: "1" indicated least characteristic, and "9" most characteristic.

Bipolar rating task. The 34 judges were instructed to make bipolar ratings of each of the 54 statements in Item Set A and Item Set B and the three clinical types using the four bipolar scales. Specifically, in judging statements using the desirable-undesirable scale, subjects were asked to indicate on a nine point scale from "1" (extremely desirable) to "9" (extremely undesirable) the desirability of that characteristic as reflected in a person who has answered "true" to the statement. In judging a clinical type, subjects were asked to make judgments of the desirability of the clinical type. In a similar manner, subjects were asked to make judgments using the optimistic-pessimistic scale, then using the impulsive-controlled scale, and finally using the confused-perceptive scale.

## Results

### Judges' Self-Reported Experience with Psychopathology

Judges' ratings on the four self-reported items regarding their experience with psychopathology were aggregated across the two replications to yield four scores for each judge.

To check whether Sample A indeed represented the more experienced group of judges as compared to Sample B and Sample C, a one-way multivariate analysis of variance (MANOVA) was performed using the four scores as a vector of dependent variables and the three samples as the single factor. Table 7 shows that the means for Sample A were reported to be higher than those of Samples B and C. The resulting statistics were: Wilk's Lambda $W = .263$ and the associated Rao's $F(8, 116) = 2.06$ ; Lawley-Hotelling Trace $T = .296$ , Roy's Largest Root $R = .208$ ($s = 2$, $m = \frac{1}{2}$, $n = 28$). All the criteria indicated significant differences among the three samples ($p < .05$). For exploratory purposes, the univariate F ratios for items 1 to 4 were also computed, they were, in order: $F(2,61) = .65$ ; $F(2, 61) = 4.96$ ; $F(2, 61) = 7.76$ ; $F(2, 61) = 4.24$ . Significant differences appeared to be contributed by the last three items ($p < .05$). This was verified by examining the standardized discriminant function coefficients (-.07, -.15, -.79, -.12) and the correlations between the four items and the discriminant scores or canonical variates (-.27, -.77, -.98, -.70). For multiple comparisons, the 95% Roy-Bose simultaneous confidence intervals were constructed for all paired comparisons. Only the contrast between Samples A and C for item 3 was significant (See Table 7).

# Table 7

## Judges' Self-Reported Experience with Psychopathology

| | | Item 1 | Item 2 | Item 3 | Item 4 |
|---|---|---|---|---|---|
| Sample | | | | | |
| A | mean | 7.19 | 6.97 | 7.44 | 7.00 |
| | s.d. | 1.37 | 2.37 | 2.00 | 2.80 |
| B | mean | 7.03 | 5.82 | 5.58 | 4.76 |
| | s.d. | 1.34 | 2.62 | 2.82 | 3.28 |
| C | mean | 6.69 | 4.70 | 4.65 | 4.56 |
| | s.d. | 1.75 | 2.21 | 2.17 | 2.73 |
| Contrast | | Roy-Bose 95% Confidence Intervals | | | |
| A-B | | .17 | 1.16 | 1.87 | 2.24 |
| | | ±1.91 | ±2.96 | ±2.91 | ±3.64 |
| A-C | | .51 | 2.27 | 2.80 | 2.44 |
| | | ±1.77 | ±2.74 | ±2.69 | ±3.36 |
| B-C | | .34 | 1.11 | .93 | .21 |
| | | ±1.74 | ±2.70 | ±2.65 | ±3.31 |

Note. Sample A : N = 18; sample B : N = 19; sample C : N = 27

## Multidimensional Scaling

Analyses were undertaken separately for the three samples of judges. Within each sample, the dissimilarity judgments for each individual from Item Sets A and B were aggregated and averaged cell by cell.

By assuming that individuals within a sample were reasonably homogeneous such that they shared a common perceptual space, and an individual's space was related to this common space by weighting of dimensions, the dissimilarity judgments of individuals of each sample were inputed to MIMDS3, a three-way multidimensional scaling program using Ramsay's weighted Euclidean model with maximum likelihood estimation and a lognormal model for error (Ramsay, 1977). The implicit equation algorithm (Ramsay, 1977) was used with a convergence criterion defined by requiring that the maximum relative change in any coordinate from one iteration to the next not exceed .001. Solutions were obtained from one through six dimensions separately for A, B, and C. The number of dimensions sufficient to approximate the observed dissimilarities to within the standard error to give an adequate representation were assessed by computing the asymptotic chi-square criterion. The results for A, B, and C are shown in Table 8.

By assuming that the asymptotic criterion applied, the results showed that possibly many more dimensions might still provide significant fit to the data. However, as Ramsay (1977) noted,

### Table 8

### Multidimensional Scaling Analysis

### (Weighted Model)

| | | Iterations to Convergence | Unbiased Standard Error | Number of Parameters | Error df | Log Likelihood Function | Asymptotic $\chi^2$ |
|---|---|---|---|---|---|---|---|
| Dimension | | | | | | | (df = 46) |
| | 1 | 500[a] | .423 | 64 | 4526 | 1690.359 | |
| | 2 | 287 | .292 | 110 | 4480 | 3409.170 | 3437.622 |
| | 3 | 310 | .261 | 156 | 4434 | 3955.209 | 1092.078 |
| A | 4 | 306 | .251 | 202 | 4388 | 4149.087 | 387.756 |
| | 5 | 402 | .245 | 248 | 4342 | 4287.343 | 276.512 |
| | 6 | 299 | .238 | 294 | 4296 | 4448.812 | 322.938 |
| | | | | | | | (df = 47) |
| | 1 | 500[b] | .459 | 66 | 4779 | 1384.146 | |
| | 2 | 494 | .342 | 113 | 4732 | 2834.182 | 2900.072 |
| | 3 | 271 | .330 | 160 | 4685 | 3029.664 | 390.964 |
| B | 4 | 492 | .319 | 207 | 4638 | 3218.193 | 377.058 |
| | 5 | 261 | .313 | 254 | 4591 | 3328.423 | 220.460 |
| | 6 | 379 | .309 | 301 | 4544 | 3426.713 | 196.580 |
| | | | | | | | (df = 55) |
| | 1 | 500[c] | .444 | 82 | 6803 | 2186.331 | |
| | 2 | 427 | .341 | 137 | 6748 | 4039.706 | 3706.750 |
| | 3 | 367 | .329 | 192 | 6693 | 4316.233 | 553.054 |
| C | 4 | 334 | .322 | 247 | 6638 | 4488.864 | 345.262 |
| | 5 | 331 | .315 | 302 | 6583 | 4672.880 | 368.032 |
| | 6 | 500[d] | .309 | 357 | 6528 | 4821.351 | 296.942 |

[a] The largest relative change at the end of 500 iterations in coordinate of matrix X was .00704, matrix W was .00014.

[b] As (a), matrix X was .01066, matrix W was .00020.

[c] As (a), matrix X was .00266, matrix W was .00014.

[d] As (a), matrix X was .00182, matrix W was .00063.

the applicability of this criterion depends on a reasonably large number of replications, or more precisely, the degrees of freedom for error obtained from the total number of observations less than the number of parameters to be estimated. He further suggested a conservative rule for the applicability of this criterion by requiring that the number of degrees of freedom for error be 30 times the number of parameters to be estimated. For each sample in this study, with planned missing observations, the number of degrees of freedom for error beyond fitting the third dimension was much less than 30 times the number of parameters to be estimated. Thus the samples might not be regarded as of asymptotic proportion and the criterion should be used with caution.

To further aid in the determination of the appropriate number of dimensions, additional criteria were computed. One criterion is a SSTRESS-like badness-of-fit index using the average residual sum of squares akin to the SSTRESS proposed by Takane, Young, and DeLeeuw (1977) for ALSCAL :

$$(1/N) \sum_{k=1}^{N} \left[ \sum_{i=2}^{n} \sum_{j=1}^{i-1} (d^{*}_{ijk} - d_{ijk})^{2} / \sum_{i=2}^{n} \sum_{j=1}^{i-1} d^{*2}_{ijk} \right] ,$$

where $d^{*}_{ijk}$ is the observed dissimilarity between stimuli $i$ and $j$ in stimulus set of $n$ for an individual $k$ out of $N$ , and $d_{ijk}$ is the corresponding distance estimated by the model.

The results from one to six dimensions were: .118, .062, .050, .050, .048, and .051 for A; .139, .084, .077, .073, .071, and .071 for B; .129, .079, .073, .070, .068, and .071 for C.

Another criterion we computed was a goodness-of-fit index employing the average of the correlation coefficients between the observed dissimilarities and the estimated distances (Kruskal, 1968). This index is akin to Young's index of metric recovery (Young, 1970). It is computed by:

$$(1/N) \sum_{k=1}^{N} \left[ (\underline{d}_k - \underline{\bar{d}}_k)'(\underline{d}_k^* - \underline{\bar{d}}_k^*) \; / \; ( \| \underline{d}_k - \underline{\bar{d}}_k \| \cdot \| \underline{d}_k^* - \underline{\bar{d}}_k^* \| ) \right] \quad .$$

The average was obtained via r-to-Z transformation.
The results from one to six dimensions were: .156, .604, .694, .712, .729, and .748 for A; .308, .610, .646, .668, .686, and .698 for B; .246, .572, .608, .627, .650, and .660 for C. The log likelihood functions, the SSTRESS-like indices, and the goodness-of-fit indices are plotted against the number of dimensions in Figures 3, 4, and 5.

In all the plots, there are discernible elbows for A, lending support to a three-space representation. For B and C, the less drastic drop in the SSTRESS-like indices, and the less drastic rise in the goodness-of-fit indices and the log likelihood functions indicated a two- or possibly a three-space representation for B and C. To strike a balance between the overall fit indices and parsimony and interpretability of the dimensions, we chose a three-space representation across the three samples. Since, in addition, it is known that underestimation of dimensionality results in a sharp deterioriation in metric recovery (Spence & Graef, 1974), our three-space representation appeared to be adequate.

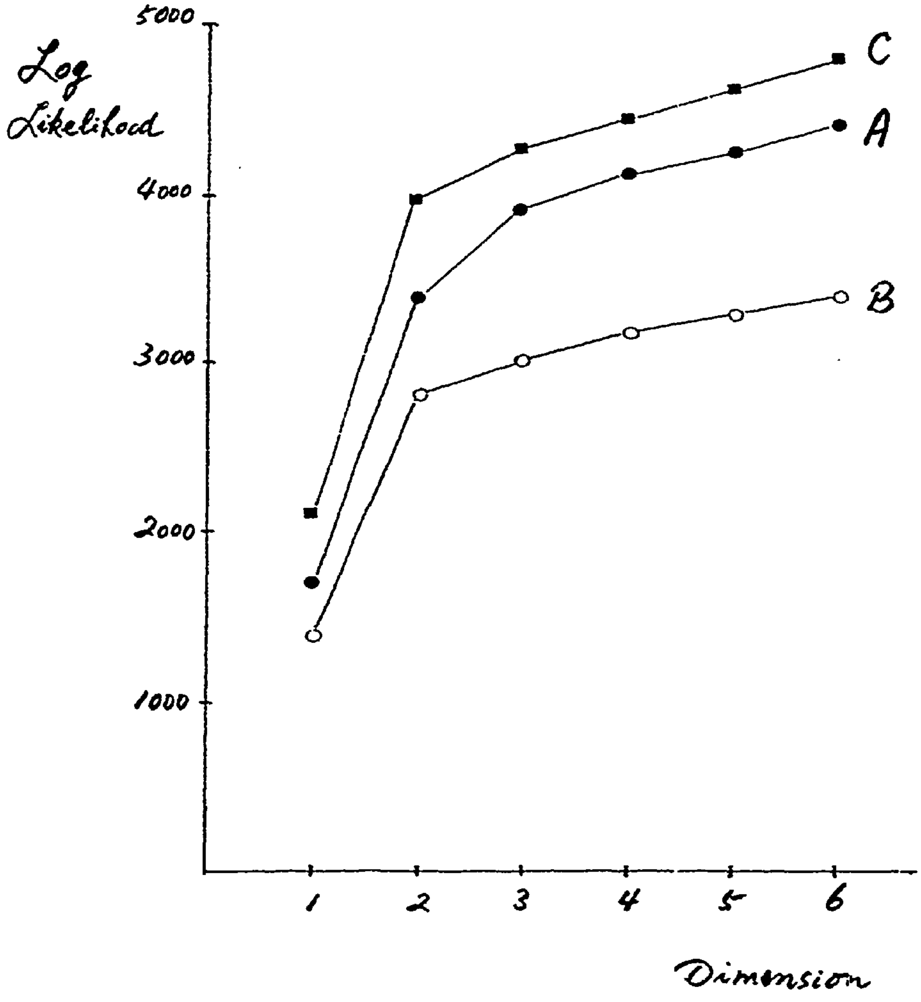

Figure 3. Log likelihood vs. dimensionality

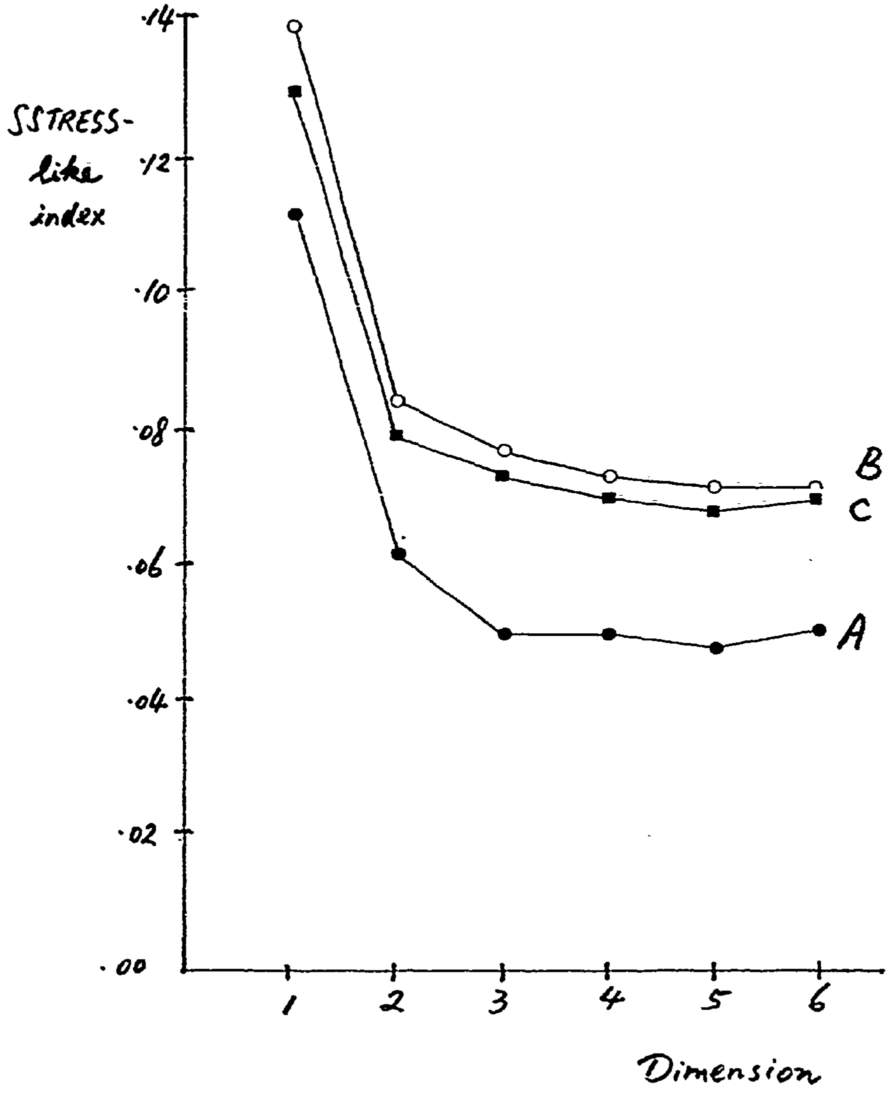

Figure 4. Badness-of-fit vs. dimensionality

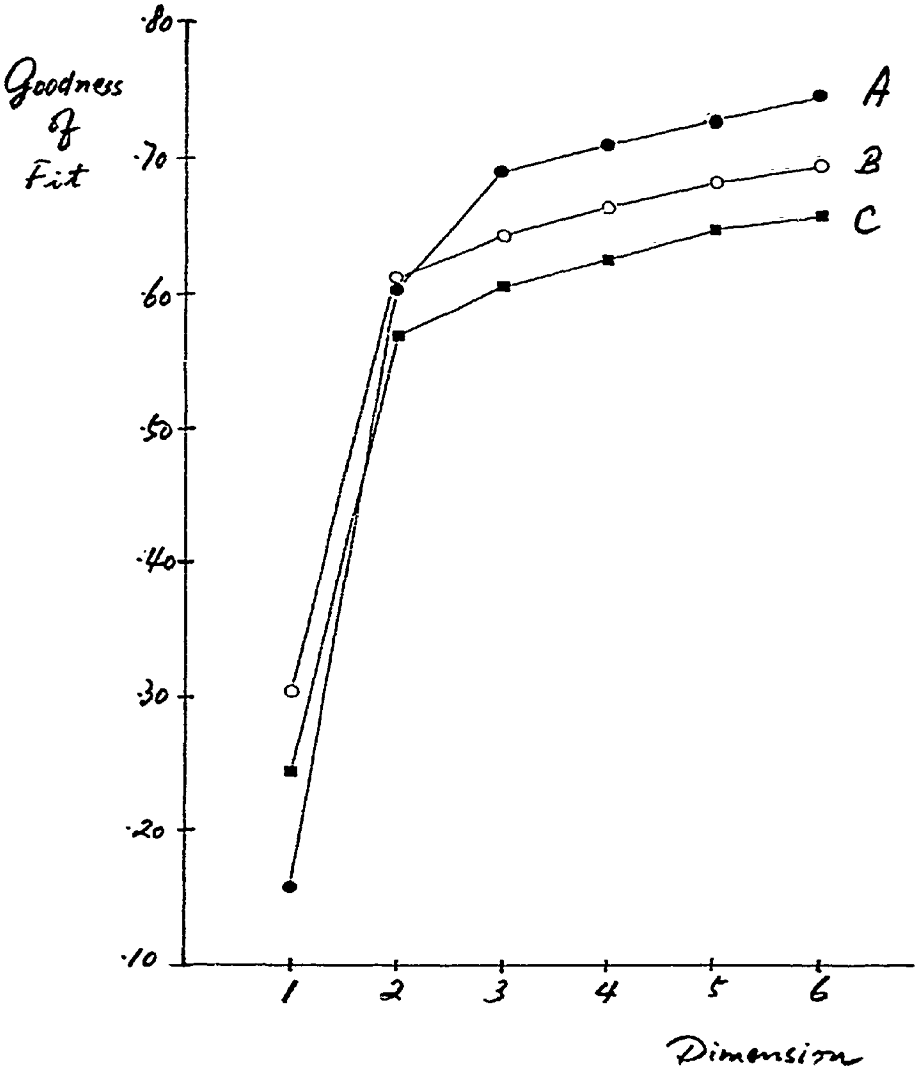

Figure 5. Goodness-of-fit vs. dimensionality

The three-dimensional configurations of Samples A, B, and C, designated A, B, and C, respectively are shown in Tables 9, 10, and 11. The corresponding weight matrices are shown in Table 12. To check whether judges assigned to Design 1 differed in the weighting of dimensions from judges assigned to Design 2, a Hotelling's $T^2$ was performed using the vector of weights of each judge as the dependent variables. The analysis was done separately for each sample testing each as a replication. The results showed that no significant differences were found between judges of the two designs in the weighting of dimensions of their common space. For A, the associated Rao's F(3, 14) = .87; for B, the associated Rao's F(3,15) = 1.24; for C, the associated Rao's F(3, 23) = 2.25. Figures 6 to 14 are plots of the weight matrices for A, B, and C. Design 1 judges are: subjects 1 to 9 in A, subjects 1 to 10 in B, and subjects 1 to 12 in C. Design 2 judges are: subjects 10 to 18 in A, subjects 11 to 19 in B, and subjects 13 to 27 in C. The plots show that there is no obvious clustering or separation of judges of the two designs.

Table 13 shows the within-subject unbiased standard errors for judges. For A, they ranged from .188 to .382; for B, from .263 to .423; for C, from .213 to .432. Thus judges within each sample could be regarded as relatively homogeneous. For most of the judges, squared dissimilarities were analyzed, the range of the exponents for the dissimilarities of judges ranged from 1.2 to 2.5 (See Appendix 3).

Table 9

Configuration A

| Stimulus | | Dimension I | II | III |
|---|---|---|---|---|
| 1 | Insomnia | -3.04 | -4.70 | -5.58 |
| 2 | Headache Proneness | -5.53 | -6.18 | -1.82 |
| 3 | Broodiness | -9.82 | -2.90 | 5.04 |
| 4 | Cynicism | 8.45 | .39 | 9.91 |
| 5 | Depression | -9.67 | -.76 | -4.80 |
| 6 | Desocialization | -3.66 | 1.05 | .44 |
| 7 | Disorganization of Thinking | 3.77 | 3.90 | -9.70 |
| 8 | Familial Discord | -1.29 | -2.96 | 8.73 |
| 9 | Feelings of Unreality | 4.58 | -.68 | -10.15 |
| 10 | Health Concern | -5.67 | -11.53 | -.16 |
| 11 | Hostility | 14.08 | 5.12 | 2.41 |
| 12 | Hypochondriasis | .15 | -15.57 | -2.82 |
| 13 | Ideas of Persecution | 2.34 | -2.19 | 3.71 |
| 14 | Impulsivity | 11.74 | 11.42 | 1.06 |
| 15 | Irritability | 2.59 | -1.18 | -.57 |
| 16 | Mood Fluctuation | 10.53 | -10.00 | -4.78 |
| 17 | Neurotic Disorganization | .92 | 8.41 | -10.41 |
| 18 | Panic Reaction | 1.09 | -9.20 | -6.46 |
| 19 | Perceptual Distortion | 4.28 | -2.46 | -13.42 |
| 20 | Rebelliousness | 8.14 | 11.62 | 5.53 |
| 21 | Repression | -11.88 | 14.99 | 8.36 |
| 22 | Sadism | 6.31 | 3.56 | 13.32 |
| 23 | Self-Depreciation | -8.42 | -1.15 | -8.67 |
| 24 | Shallow Affect | -8.17 | 15.46 | -4.91 |
| 25 | Socially Deviant Attitudes | 9.39 | 8.16 | 13.16 |
| 26 | Somatic Complaints | -5.53 | -9.65 | -6.13 |
| 27 | Defensiveness | -18.04 | -4.34 | 14.10 |
| 28 | Type A | -8.02 | -1.21 | -5.63 |
| 29 | Type B | .80 | -2.68 | 4.32 |
| 30 | Type C | 9.60 | 5.27 | 5.93 |

Table 10

Configuration B

| Stimulus | Dimension I | II | III |
|---|---|---|---|
| 1 Insomnia | -.03 | 3.34 | -3.67 |
| 2 Headache proneness | -4.55 | 2.15 | -6.03 |
| 3 Broodiness | -10.84 | 5.89 | -7.16 |
| 4 Cynicism | 1.68 | 2.13 | 9.82 |
| 5 Depression | -1.52 | 7.82 | 2.10 |
| 6 Desocialization | -6.12 | 5.61 | -3.36 |
| 7 Disorganization of Thinking | -.18 | -3.11 | -12.02 |
| 8 Familial Discord | -7.82 | .10 | 5.37 |
| 9 Feelings of Unreality | -.02 | -5.56 | -6.50 |
| 10 Health Concern | -9.07 | 11.89 | 3.45 |
| 11 Hostility | -2.11 | -11.09 | 7.24 |
| 12 Hypochondriasis | -2.19 | 10.65 | -11.49 |
| 13 Ideas of Persecution | -2.67 | 1.31 | 1.27 |
| 14 Impulsivity | 4.27 | -17.09 | 6.02 |
| 15 Irritability | -5.02 | -.45 | -1.79 |
| 16 Mood Fluctuation | -9.02 | -6.50 | -4.81 |
| 17 Neurotic Disorganization | 1.55 | -8.80 | -11.88 |
| 18 Panic Reaction | -2.49 | 7.31 | -7.30 |
| 19 Perceptual Distortion | 3.50 | -1.68 | -9.12 |
| 20 Rebellicusness | 5.67 | -12.61 | 6.62 |
| 21 Repression | 19.14 | -1.18 | 5.46 |
| 22 Sadism | -3.62 | -1.70 | 15.29 |
| 23 Self-Depreciation | -1.27 | 9.54 | -1.32 |
| 24 Shallow Affect | 16.67 | -10.16 | -5.73 |
| 25 Socially Deviant Attitudes | -1.04 | -7.49 | 20.93 |
| 26 Somatic Complaints | 4.07 | 6.69 | -4.38 |
| 27 Defensiveness | 20.08 | 11.54 | 2.02 |
| 28 Type A | -2.43 | 6.18 | -1.22 |
| 29 Type B | -2.55 | 3.26 | 3.03 |
| 30 Type C | -2.08 | -7.96 | 9.14 |

## Table 11

### Configuration C

| Stimulus | Dimension<br>I | <br>II | <br>III |
|---|---|---|---|
| 1 Insomnia | -5.66 | -2.97 | -7.29 |
| 2 Headache Proneness | -1.42 | -7.68 | -10.91 |
| 3 Broodiness | 9.66 | -7.66 | -11.21 |
| 4 Cynicism | 4.52 | -9.69 | 23.23 |
| 5 Depression | -8.04 | -12.09 | 2.58 |
| 6 Desocialization | .83 | -11.74 | -1.43 |
| 7 Disorganization of Thinking | -8.77 | 11.31 | -8.70 |
| 8 Familial Discord | -13.41 | -.70 | 7.63 |
| 9 Feelings of Unreality | -7.14 | 8.70 | -15.80 |
| 10 Health Concern | -2.06 | -7.77 | -25.06 |
| 11 Hostility | -2.99 | 8.62 | 16.71 |
| 12 Hypochondriasis | -20.40 | -6.55 | -13.86 |
| 13 Ideas of Persecution | -3.92 | -2.44 | .84 |
| 14 Impulsivity | -2.50 | 20.33 | 13.56 |
| 15 Irritability | 3.11 | -4.46 | .16 |
| 16 Mood Fluctuation | 10.37 | 7.88 | -2.95 |
| 17 Neurotic Disorganization | -10.54 | 17.77 | -6.14 |
| 18 Panic Reaction | -12.64 | -1.70 | -8.71 |
| 19 Perceptual Distortion | -2.69 | 14.00 | -15.72 |
| 20 Rebelliousness | 9.75 | 14.53 | 17.01 |
| 21 Repression | 30.85 | -5.45 | 7.63 |
| 22 Sadism | -4.45 | -2.05 | 27.22 |
| 23 Self-Depreciation | -9.31 | -14.79 | -3.72 |
| 24 Shallow Affect | 22.13 | 21.96 | 1.77 |
| 25 Socially Deviant Attitudes | 12.08 | -.44 | 25.66 |
| 26 Somatic Complaints | -8.79 | -13.10 | -16.02 |
| 27 Defensiveness | 30.47 | -4.29 | -16.67 |
| 28 Type A | -5.52 | -9.58 | -1.91 |
| 29 Type B | -3.20 | -4.50 | 4.97 |
| 30 Type C | -.31 | 4.55 | 17.10 |

Table 12

Weight Matrices of A, B, and C

| Dimension | A | | | B | | | C | | |
|---|---|---|---|---|---|---|---|---|---|
| Subject | I | II | III | I | II | III | I | II | III |
| 1 | .88 | .95 | 1.43 | 1.39 | .75 | 1.22 | .49 | .35 | .22 |
| 2 | 1.68 | .91 | 1.21 | .30 | .17 | .24 | .16 | .30 | .19 |
| 3 | .58 | .65 | .69 | 1.37 | 1.28 | 1.08 | .11 | .10 | .05 |
| 4 | .65 | 1.10 | .59 | .98 | 1.77 | .84 | 1.50 | 2.51 | 1.36 |
| 5 | 1.16 | 1.09 | 1.01 | 1.61 | 1.88 | 2.05 | 2.44 | 1.10 | 1.53 |
| 6 | .12 | .07 | .11 | .49 | .34 | .24 | .08 | .07 | .12 |
| 7 | .51 | .39 | .29 | .91 | .22 | .23 | .40 | .28 | .29 |
| 8 | .48 | .55 | .51 | .23 | .13 | .15 | 1.28 | .84 | .68 |
| 9 | .20 | .21 | .24 | .89 | .67 | .54 | .43 | .59 | .63 |
| 10 | 1.19 | 1.33 | 1.06 | 1.36 | .31 | .45 | .06 | .12 | .10 |
| 11 | .62 | .59 | .50 | .44 | .71 | .54 | .11 | .09 | .10 |
| 12 | .45 | .40 | .32 | .42 | .57 | .33 | .19 | .26 | .28 |
| 13 | 1.61 | 1.96 | 1.80 | 1.07 | 1.90 | 1.58 | .10 | .55 | .98 |
| 14 | 1.31 | .96 | 1.49 | 1.51 | .99 | .79 | .52 | .24 | .36 |
| 15 | 1.42 | 2.14 | 1.56 | .19 | .28 | .25 | .95 | .50 | 1.41 |
| 16 | .64 | .68 | .50 | 1.05 | .87 | 1.62 | 1.51 | 1.44 | 1.54 |
| 17 | .63 | .45 | 1.10 | .94 | 1.48 | 1.43 | .13 | .12 | .31 |
| 18 | 1.62 | .82 | 1.18 | .76 | .65 | .57 | .95 | 1.13 | 1.63 |
| 19 | | | | 1.20 | .70 | 1.45 | 2.23 | 1.34 | 1.27 |
| 20 | | | | | | | .43 | .16 | .93 |
| 21 | | | | | | | 1.32 | .81 | 1.69 |
| 22 | | | | | | | .60 | .35 | .63 |
| 23 | | | | | | | .43 | 1.98 | .20 |
| 24 | | | | | | | 1.59 | 1.30 | .53 |
| 25 | | | | | | | 1.39 | 2.35 | 2.05 |
| 26 | | | | | | | .41 | .56 | 1.78 |
| 27 | | | | | | | .12 | .05 | .12 |

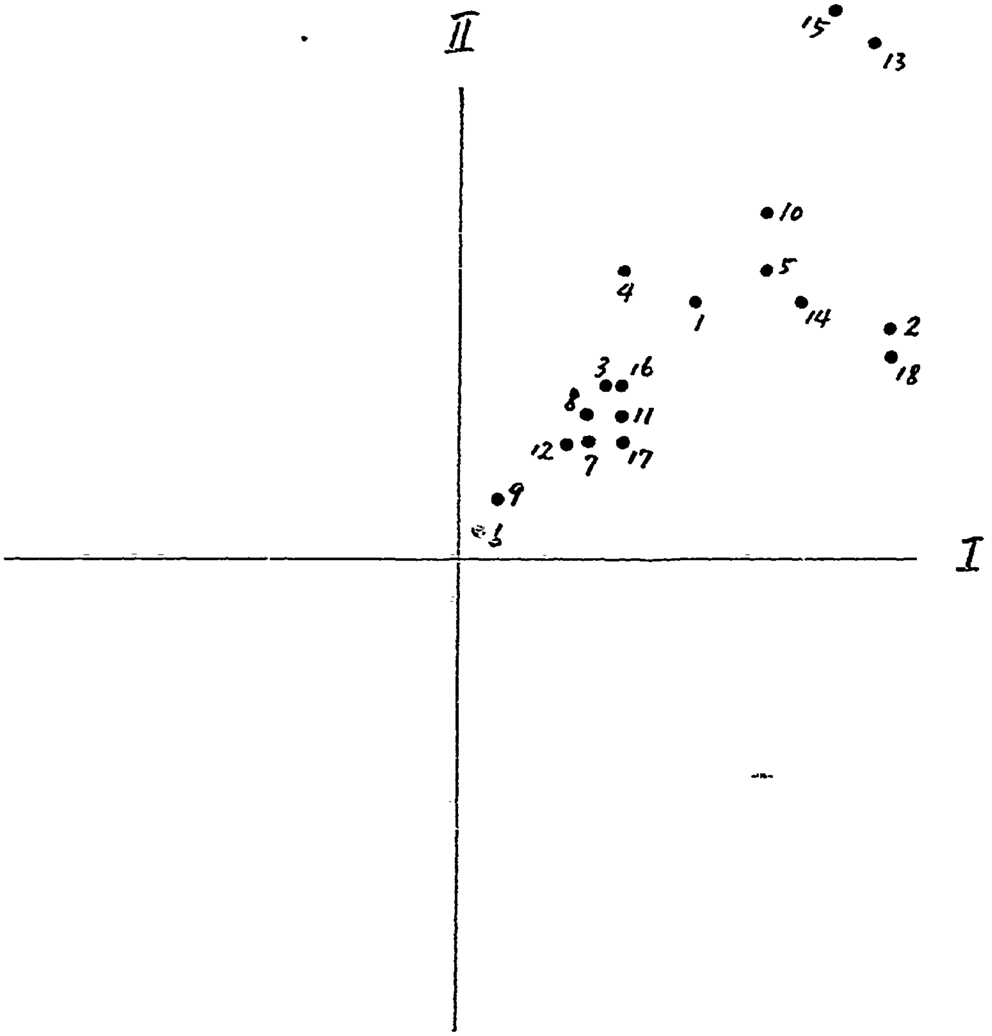

Figure 6. Plot of dimension 1 vs. dimension 2 of the weight matrix of configuration A.

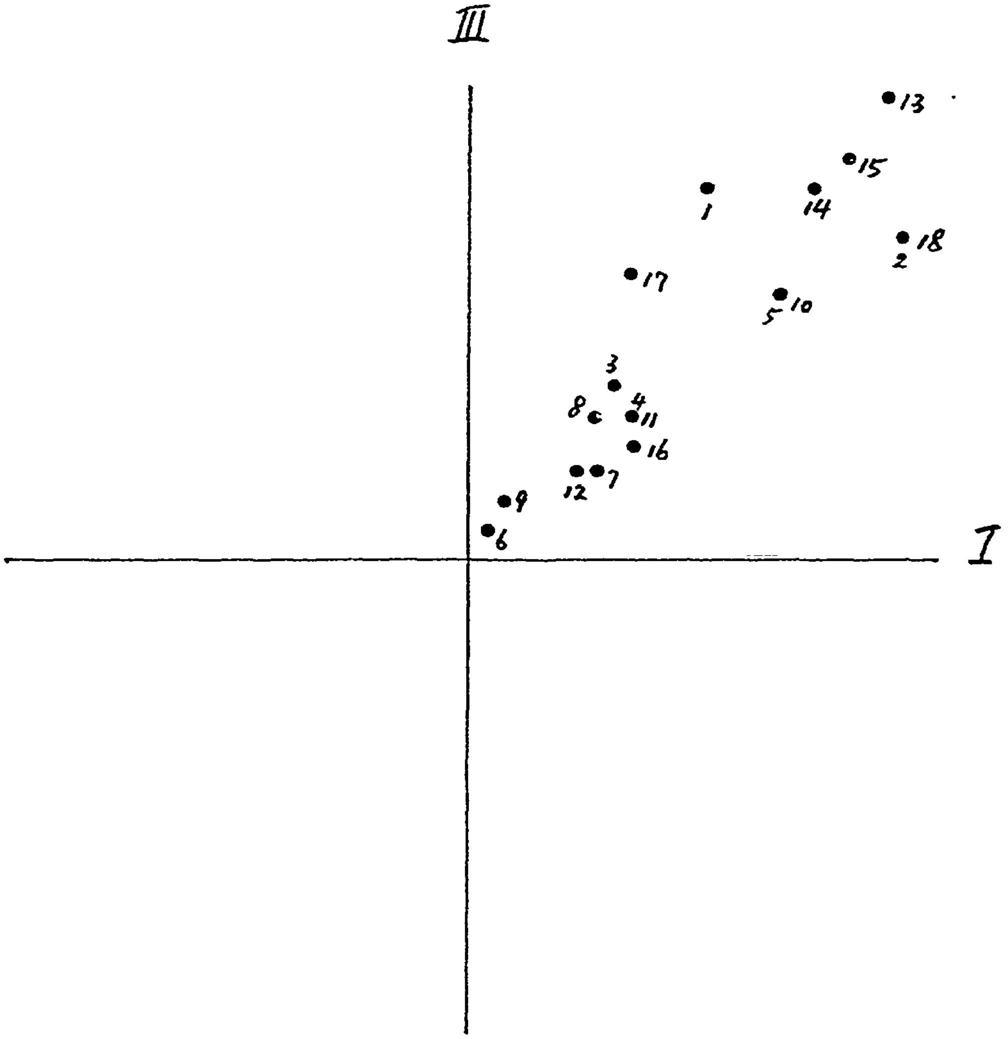

Figure 7. Plot of dimension 1 vs. dimension 3 of the weight matrix of configuration A.

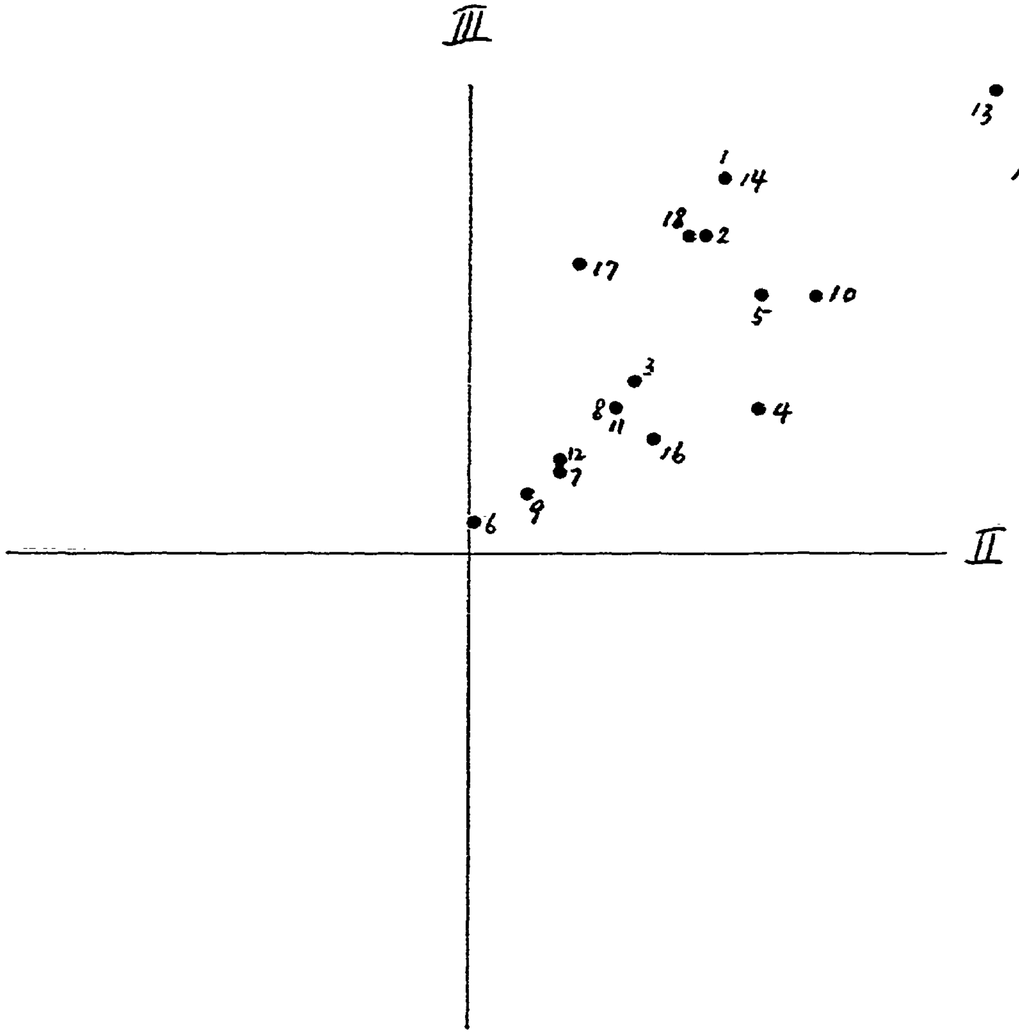

Figure 8. Plot of dimension 2 vs. dimension 3 of the weight matrix of configuration A.

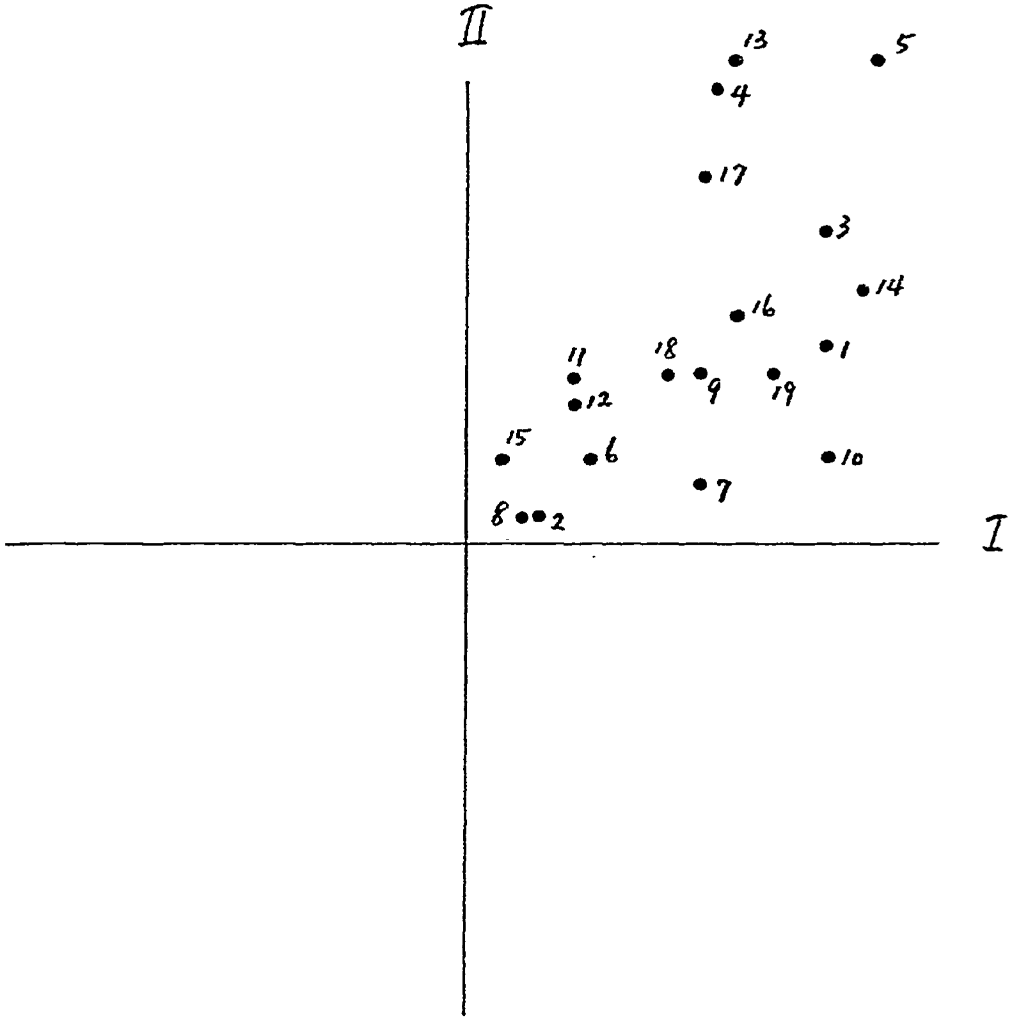

Figure 9. Plot of dimension 1 vs. dimension 2 of the weight matrix of configuration B.

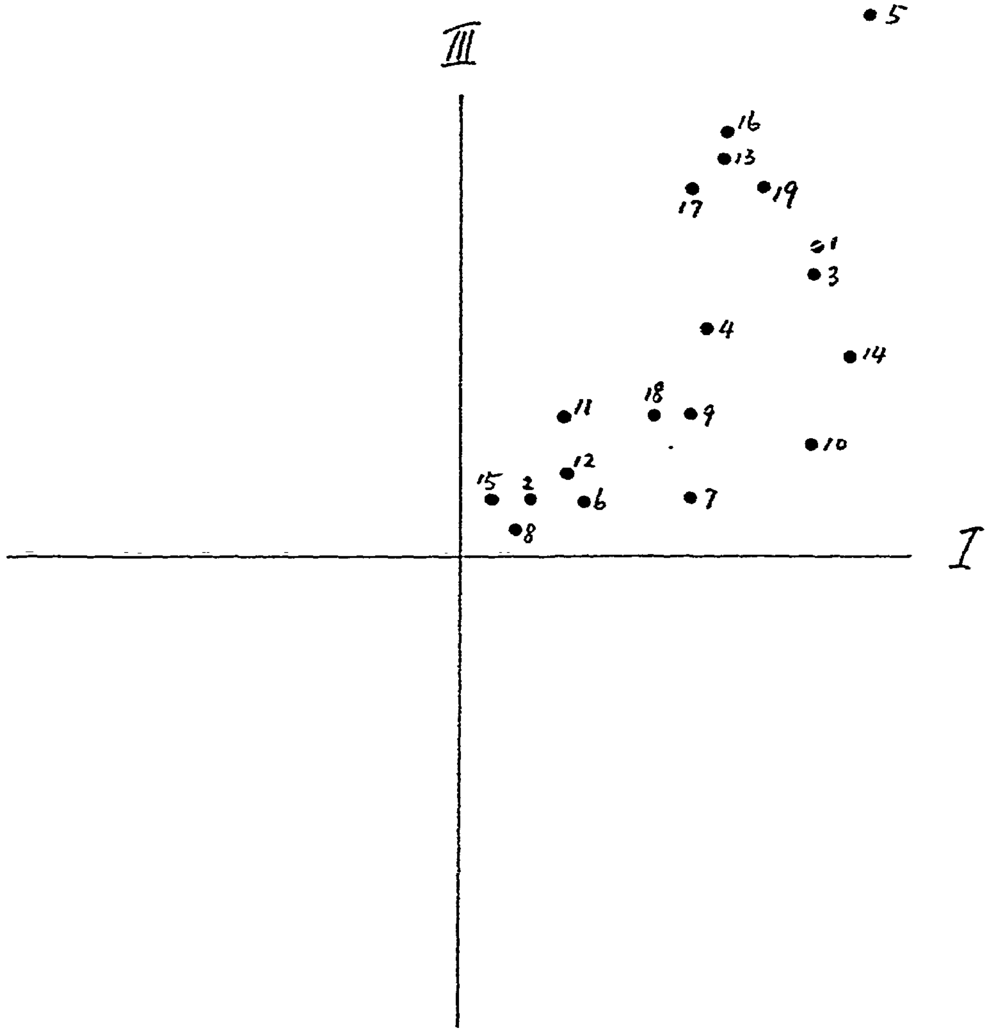

Figure 10. Plot of dimension 1 vs. dimension 3 of the weight matrix of configuration B.

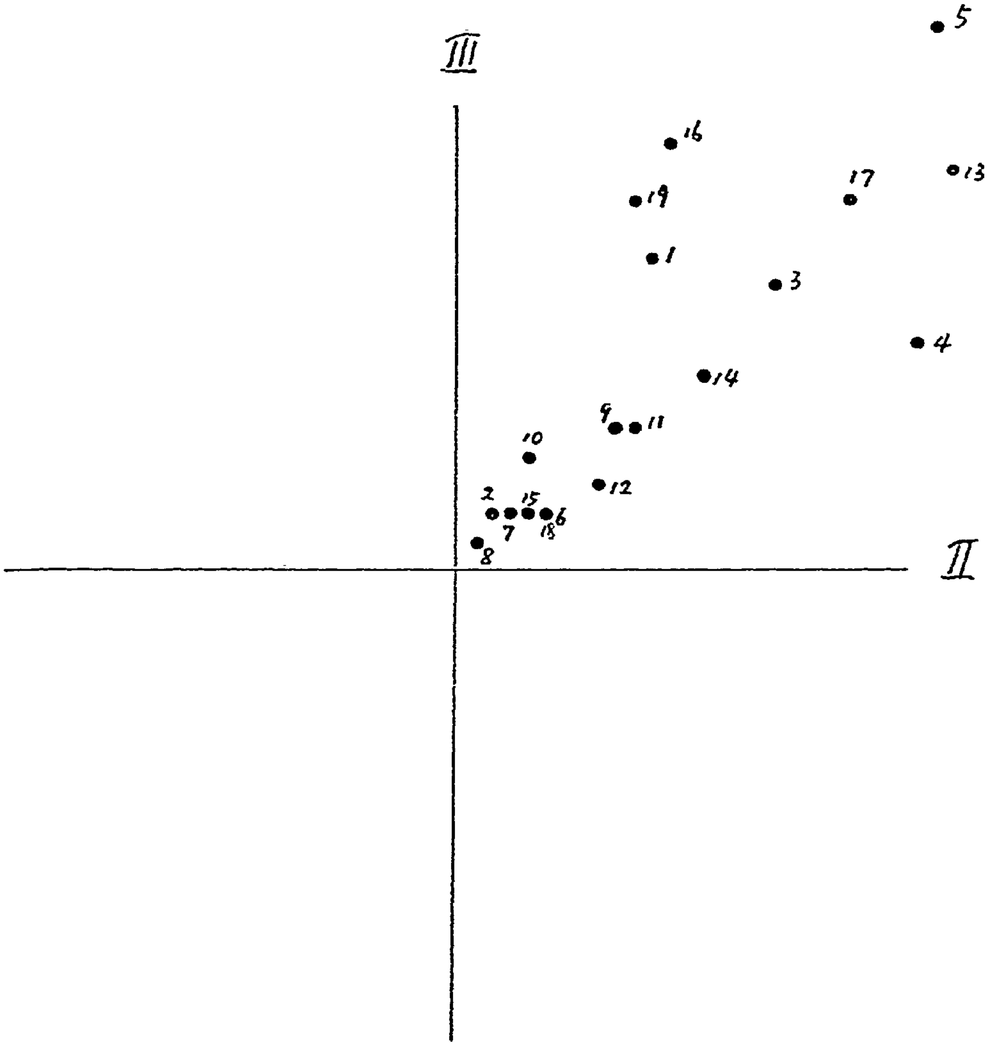

Figure 11. Plot of dimension 2 vs. dimension 3 of the weight matrix of configuration B.

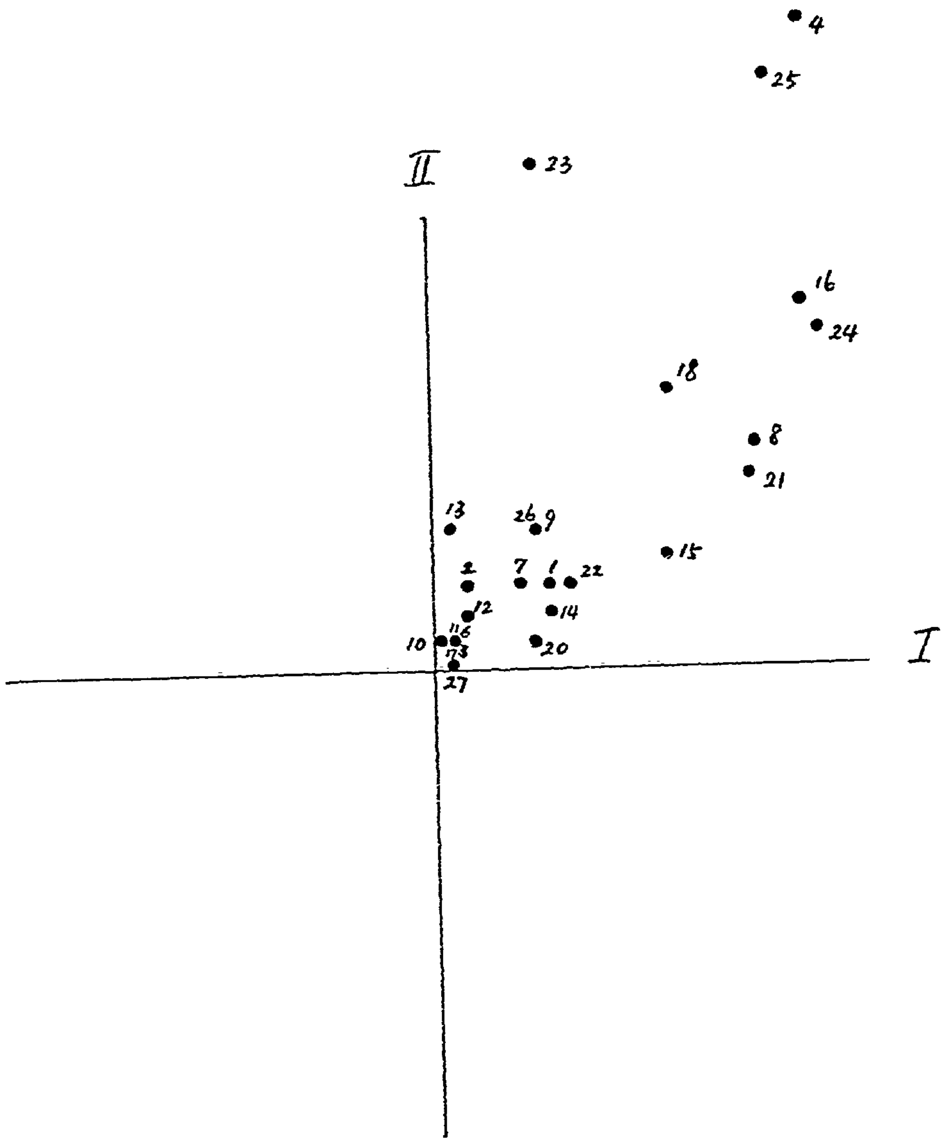

Figure 12. Plot of dimension 1 vs. dimension 2 of the weight matrix of configuration C.

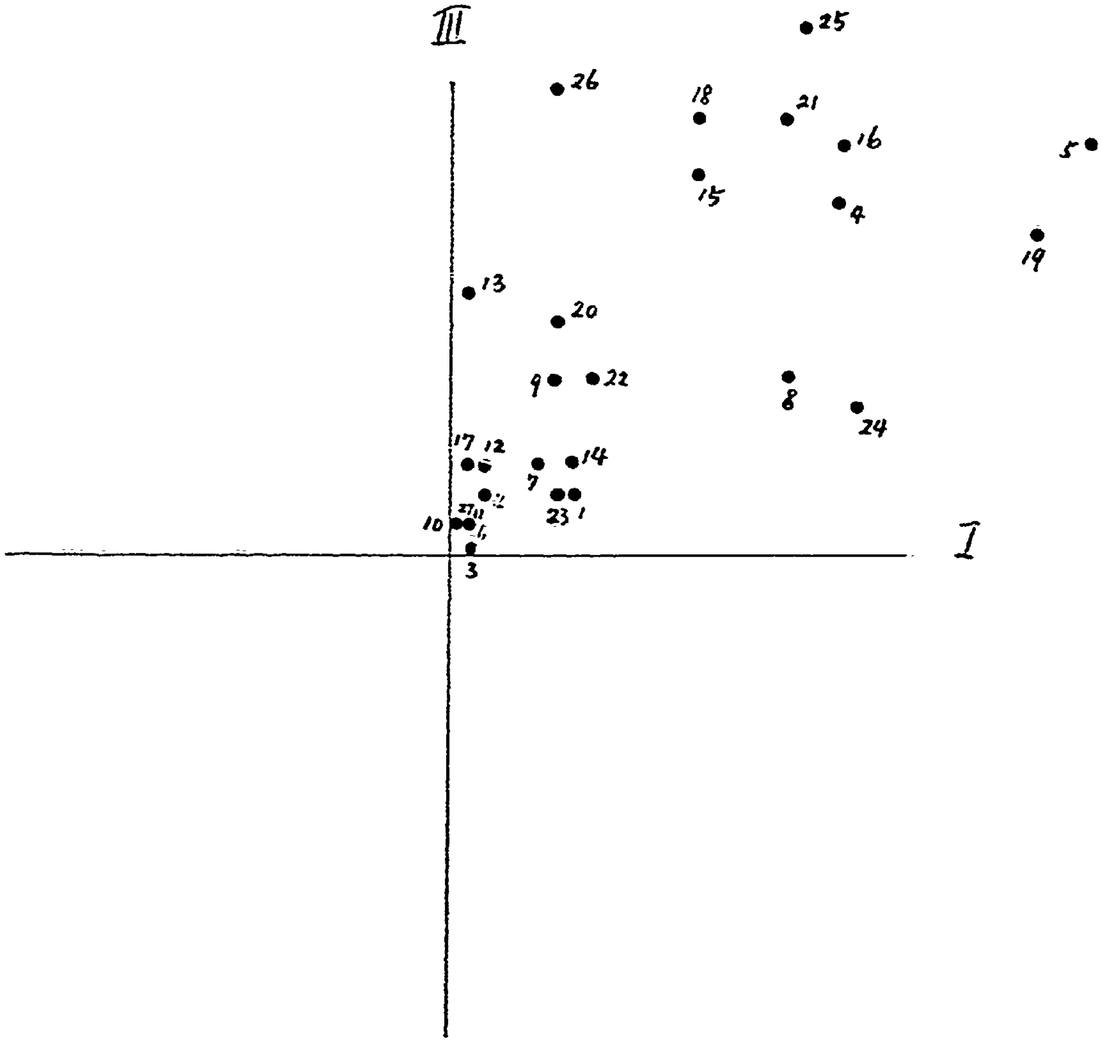

Figure 13. Plot of dimension 1 vs. dimension 3 of the weight matrix of configuration C.

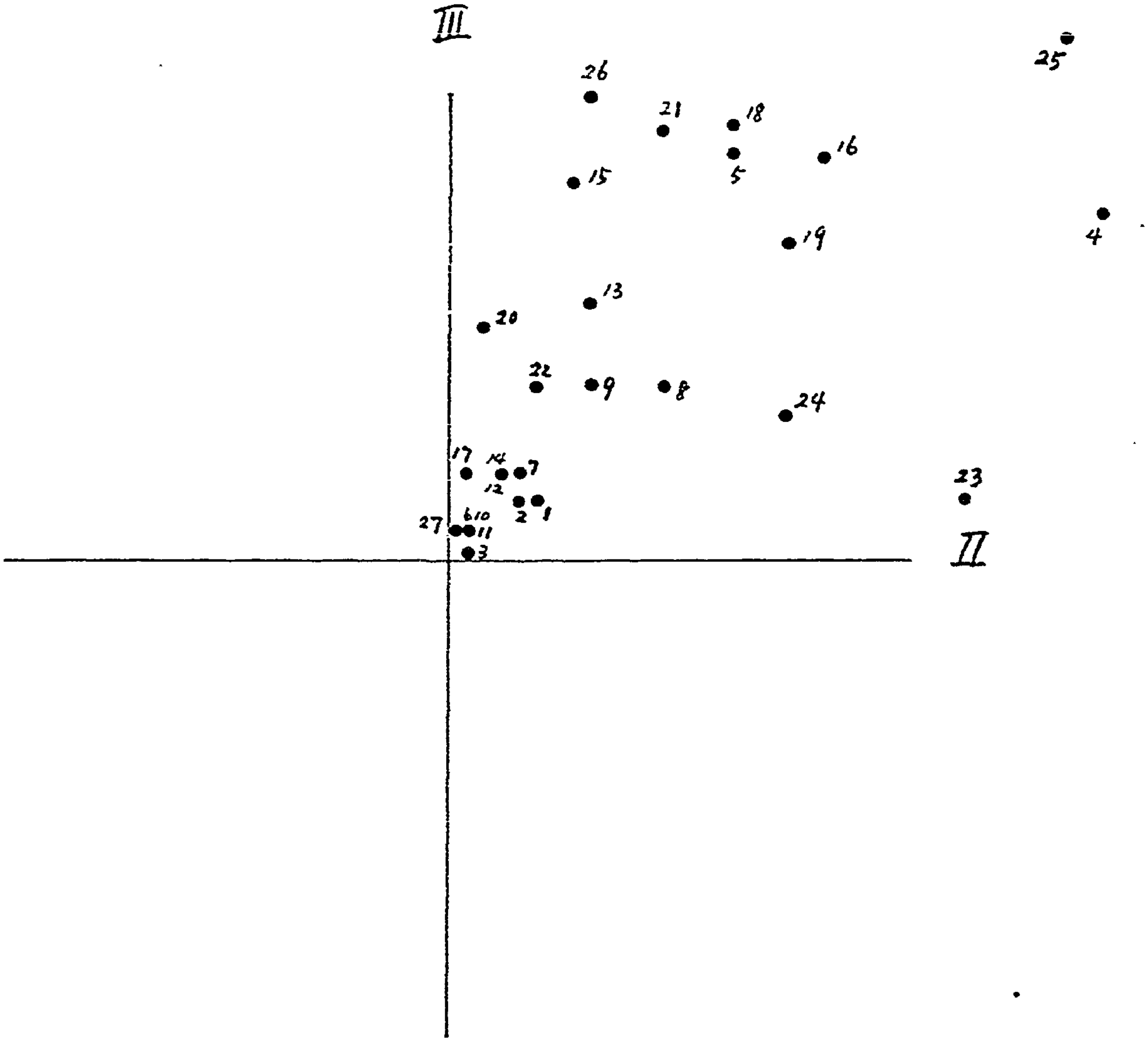

Figure 14. Plot of dimension 2 vs. dimension 3 of the weight matrix of configuration C.

### Table 13

### Within-Subject Unbiased Standard Error

| Subject | A | B | C |
|---|---|---|---|
| 1 | .205 | .289 | .345 |
| 2 | .211 | .423 | .353 |
| 3 | .238 | .269 | .271 |
| 4 | .217 | .315 | .231 |
| 5 | .221 | .373 | .356 |
| 6 | .382 | .339 | .339 |
| 7 | .267 | .318 | .291 |
| 8 | .280 | .301 | .251 |
| 9 | .351 | .284 | .299 |
| 10 | .223 | .297 | .363 |
| 11 | .297 | .354 | .362 |
| 12 | .277 | .292 | .370 |
| 13 | .188 | .263 | .385 |
| 14 | .195 | .291 | .344 |
| 15 | .188 | .408 | .309 |
| 16 | .337 | .272 | .245 |
| 17 | .246 | .392 | .318 |
| 18 | .262 | .322 | .297 |
| 19 | | .399 | .213 |
| 20 | | | .346 |
| 21 | | | .272 |
| 22 | | | .301 |
| 23 | | | .352 |
| 24 | | | .432 |
| 25 | | | .277 |
| 26 | | | .415 |
| 27 | | | .409 |

To investigate further the extent of inter-subject variations in the three-dimensional solutions, two other analyses were undertaken. First, the original dissimilarities of individuals were used as input to MLMDS1, a two-way multidimensional scaling program using the unweighted model by maximum likelihood estimation with a lognormal model for error. Group solutions of three dimensions were obtained separately for each sample using the same convergence criterion of .001 .

To assess whether the weighted group solution of each sample represented an important contribution to the quality of the solution over the ordinary unweighted group solution, an asymptotic $\chi^2$ was computed. For A, $\chi^2(54) = 1892.71$ ; for B, $\chi^2(57) = 1355.06$ ; for C, $\chi^2(81) = 2759.50$ . They all indicated significance ($p < .001$). Moreover, the unbiased standard error estimate dropped from .318 to .261 in A, from .377 to .310 in B, and from .398 to .329 in C using the weighted group solutions instead of the unweighted group solutions. Thus individual weighting of the dimensions was an important contribution to the quality of the solutions in all three samples.

Second, the observed dissimilarities of each individual of the three samples were separately scaled using MLMDS1 resulting in 64 individual configurations. The mean unbiased standard errors were .229, .272, and .257, and the total log likelihoods were 5439.75, 4902.60, and 7356.48 , for A, B, and C, respectively.

To compare the separate scaling solutions with the weighted group solutions separately for each sample, asymptotic $\chi^2$ criteria were computed. For A, $\chi^2(1374) = 2969.09$ ; for B, $\chi^2(1455) = 3745.87$ ; for C, $\chi^2(2103) = 6080.49$ . In each case, a highly significant improvement was indicated ($p < .001$). It appeared that the nature of individual differences was much more complex than the simple variations in the weighting of the dimensions of the group space. The results of the individual scaling solutions together with the results from the weighted and unweighted group solutions are summarized for A, B, and C in Tables 14, 15 and 16, respectively.

## Comparing Three Configurations

To assess the overall correspondence among the configurations A, B, and C, canonical correlations were computed between pairs of configurations. Table 17 shows that, in every case, the moderately high canonical correlations indicated an overall correspondence between pairs of configurations.

A procrustean procedure (Schönemann & Carroll, 1970) was also employed whereby one configuration was rotated to an orthogonal least squares fit to another configuration, allowing for translation of origin and central dilation and leaving invariant the relative magnitude of the interpoint distances. By arbitrarily rotating Configuration B to Configuration A, C to A, and C to B, these configurations were compared. The Pearson product-moment

## Table 14

## Comparing Three-Dimensional Weighted and Unweighted Group Solutions and Individual Solutions

## (Sample A)

| Solution | Unbiased Standard Error | Number of Parameters | Error df | Log Likelihood Function | Iterations to Convergence |
|---|---|---|---|---|---|
| Unweighted Group | .318 | 84 | 4506 | 3008.854 | 181 |
| Weighted Group | .261 | 156 | 4434 | 3955.209 | 310 |
| Individual | | | | | |
| 1 | .190 | 84 | 171 | 346.978 | 334 |
| 2 | .184 | 84 | 171 | 355.548 | 341 |
| 3 | .181 | 84 | 171 | 358.815 | 186 |
| 4 | .201 | 84 | 171 | 332.904 | 153 |
| 5 | .222 | 84 | 171 | 307.672 | 364 |
| 6 | .342 | 84 | 171 | 196.901 | 152 |
| 7 | .214 | 84 | 171 | 316.507 | 143 |
| 8 | .225 | 84 | 171 | 303.566 | 185 |
| 9 | .241 | 84 | 171 | 286.284 | 217 |
| 10 | .205 | 84 | 171 | 327.140 | 154 |
| 11 | .249 | 84 | 171 | 277.879 | 136 |
| 12 | .209 | 84 | 171 | 322.270 | 157 |
| 13 | .254 | 84 | 171 | 273.301 | 156 |
| 14 | .227 | 84 | 171 | 301.446 | 232 |
| 15 | .247 | 84 | 171 | 280.154 | 101 |
| 16 | .262 | 84 | 171 | 265.280 | 395 |
| 17 | .224 | 84 | 171 | 304.433 | 192 |
| 18 | .244 | 84 | 171 | 282.675 | 235 |
| Mean | .229 | | | 302.209 | 213 |

## Table 15

## Comparing Three-Dimensional Weighted and Unweighted Group Solutions and Individual Solutions

## (Sample B)

| Solution | Unbiased Standard Error | Number of Parameters | Error df | Log Likelihood Function | Iterations to Convergence |
|---|---|---|---|---|---|
| Unweighted Group | .377 | 84 | 4761 | 2352.133 | 204 |
| Weighted Group | .330 | 160 | 4685 | 3029.664 | 271 |
| Individual | | | | | |
| 1 | .245 | 84 | 171 | 281.984 | 192 |
| 2 | .349 | 84 | 171 | 191.623 | 168 |
| 3 | .224 | 84 | 171 | 305.346 | 165 |
| 4 | .257 | 84 | 171 | 270.279 | 373 |
| 5 | .274 | 84 | 171 | 253.543 | 132 |
| 6 | .295 | 84 | 171 | 235.013 | 129 |
| 7 | .272 | 84 | 171 | 255.616 | 179 |
| 8 | .267 | 84 | 171 | 260.526 | 182 |
| 9 | .253 | 84 | 171 | 273.594 | 439 |
| 10 | .254 | 84 | 171 | 272.780 | 297 |
| 11 | .287 | 84 | 171 | 241.627 | 223 |
| 12 | .254 | 84 | 171 | 272.540 | 313 |
| 13 | .224 | 84 | 171 | 305.508 | 177 |
| 14 | .249 | 84 | 171 | 277.542 | 261 |
| 15 | .342 | 84 | 171 | 197.155 | 75 |
| 16 | .227 | 84 | 171 | 301.375 | 191 |
| 17 | .331 | 84 | 171 | 205.332 | 113 |
| 18 | .260 | 84 | 171 | 267.238 | 125 |
| 19 | .296 | 84 | 171 | 233.980 | 244 |
| Mean | .272 | | | 258.032 | 209 |

## Table 16

## Comparing Three-Dimensional Weighted and Unweighted Group Solutions and Individual Solutions

## (Sample C)

| Solution | Unbiased Standard Error | Number of Parameters | Error df | Log Likelihood Function | Iterations to Convergence |
|---|---|---|---|---|---|
| Unweighted Group | .398 | 84 | 6801 | 2936.485 | 147 |
| Weighted Group | .329 | 192 | 6693 | 4316.233 | 367 |
| Individual | | | | | |
| 1 | .267 | 84 | 171 | 259.721 | 306 |
| 2 | .262 | 84 | 171 | 264.765 | 149 |
| 3 | .217 | 84 | 171 | 313.194 | 157 |
| 4 | .192 | 84 | 171 | 344.746 | 247 |
| 5 | .273 | 84 | 171 | 254.574 | 233 |
| 6 | .291 | 84 | 171 | 238.426 | 160 |
| 7 | .258 | 84 | 171 | 269.147 | 500[a] |
| 8 | .213 | 84 | 171 | 317.785 | 261 |
| 9 | .226 | 84 | 171 | 302.927 | 158 |
| 10 | .295 | 84 | 171 | 234.575 | 217 |
| 11 | .264 | 84 | 171 | 263.545 | 457 |
| 12 | .285 | 84 | 171 | 243.664 | 292 |
| 13 | .276 | 84 | 171 | 251.936 | 172 |
| 14 | .262 | 84 | 171 | 265.491 | 169 |
| 15 | .241 | 84 | 171 | 286.693 | 199 |
| 16 | .243 | 84 | 171 | 284.673 | 215 |
| 17 | .249 | 84 | 171 | 277.504 | 81 |
| 18 | .236 | 84 | 171 | 292.092 | 184 |
| 19 | .241 | 84 | 171 | 286.463 | 208 |
| 20 | .231 | 84 | 171 | 297.646 | 170 |
| 21 | .218 | 84 | 171 | 312.095 | 212 |
| 22 | .239 | 84 | 171 | 288.890 | 245 |
| 23 | .267 | 84 | 171 | 260.163 | 115 |
| 24 | .341 | 84 | 171 | 197.867 | 206 |
| 25 | .228 | 84 | 171 | 300.591 | 169 |
| 26 | .295 | 84 | 171 | 235.115 | 172 |
| 27 | .322 | 84 | 171 | 212.192 | 124 |
| Mean | .257 | | | 272.462 | 214 |

[a] The largest relative change at the end of 500 iterations in coordinate of matrix was .00680.

## Table 17

### Comparing Three Configurations

| Configuration | | Canonical Correlation | Wilk's Lambda | $\chi^2$ | df | Fit Index E | Fit Index L | Fit Index S |
|---|---|---|---|---|---|---|---|---|
| A and B or Fit B to A | 1 | .95 | .021 | $102.83^{**}$ | 9 | .0677 | .3350 | .3350 |
| | 2 | .80 | .213 | $40.99^{**}$ | 4 | | | |
| | 3 | .65 | .578 | $14.55^{**}$ | 1 | | | |
| A and C or Fit C to A | 1 | .96 | .023 | $100.13^{**}$ | 9 | .0765 | .4012 | .4012 |
| | 2 | .81 | .283 | $33.43^{**}$ | 4 | | | |
| | 3 | .44 | .810 | $5.60^{*}$ | 1 | | | |
| B and C or Fit C to B | 1 | .95 | .018 | $106.30^{**}$ | 9 | .0660 | .3358 | .3358 |
| | 2 | .83 | .194 | $43.40^{**}$ | 4 | | | |
| | 3 | .61 | .625 | $12.47^{**}$ | 1 | | | |

$^{*}p < .05$

$^{**}p < .001$

Note. $\chi^2$ test for canonical correlation is confined to descriptive purposes.

correlations between the three dimensions of A and the best fitted three dimensions of B were .82, .82, and .81. Those between the three dimensions of A and the best fitted three dimensions of C were .76, .78, and .79. Those between the three dimensions of B and the best fitted three dimensions of C were .65, .93, and .85.

Three indices of fit based on the residual sum of squares were also computed in Table 17. The original index suggested by Schönemann and Carroll (1970) was the normalized symmetric error E which provides an identical index regardless of whether A is fitted to B or B to A. This index however suffered from the fact that it is dependent on the norm of the target matrix. Thus Table 17 shows that C provided poorer fit to A than B to A, but does not allow comparison between the fit of B to A and C to B. Lingoes and Schönemann (1974) suggested two indices which are scale irvariant and do not depend on the norm of the target matrix. The index L is generally not symmetric. In this particular case where all the configurations under comparison had their origins at the centroid, L was also symmetric and was equivalent to the symmetric index S. Table 17 shows that both these indices indicated that the fit of B to A was as good as the fit of C to B, the fit of C to A was, however, poorer.

## Common Configuration

To assess further the commonality of the three configurations, each configuration was used to reproduce distances between pairs of stimuli. The reproduced distances from each configuration could then be regarded as equivalent to the observed dissimilarities between pairs of stimuli of an average individual from each sample (Green & Rao, 1972b). These distances of the three pseudoindividuals were then analyzed using MIMDS3. The resulting common configuration and weight matrix are shown in Table 18. Other scaling results are shown in Appendix 4. The weight matrix indicated that the average individual in A placed about equal weight on Dimension 1 and Dimension 2, but less weight (about 4/5) on Dimension 3 of the common space. The average individuals in B and C also placed about equal weight on Dimensions 1 and 2, but more weight (about 1 1/8) on Dimension 3. Figure 15 gives the plot of this weight matrix.

To investigate whether the group differences in the weighting of dimensions also occur at the level where individual data were analysed, we performed the following analysis. In this analysis, we assumed that all judges shared this common perceptual space, and individual differences in the perception of psychopathology could be parsimoniously expressed in terms of differential weighting of the dimensions of this space.

First, the total set of distances between all possible pairs of stimuli were computed from each judge's individual space obtained

# Table 18

## Common Configuration and Weight Matrix

| | | Dimension | |
|---|---|---|---|
| Stimulus | I | II | III |
| 1 Insomnia | -10.49 | -2.91 | -1.58 |
| 2 Headache Proneness | -11.86 | 2.68 | 1.63 |
| 3 Broodiness | -9.73 | 14.08 | 3.34 |
| 4 Cynicism | 15.01 | 6.91 | -12.65 |
| 5 Depression | -9.48 | 3.54 | -11.79 |
| 6 Desocialization | -5.85 | 6.51 | -3.47 |
| 7 Disorganization of Thinking | -5.55 | -16.77 | 6.68 |
| 8 Familial Discord | 2.96 | -4.44 | -14.05 |
| 9 Feelings of Unreality | -7.14 | -10.95 | 9.98 |
| 10 Health Concern | -22.84 | 11.17 | -3.75 |
| 11 Hostility | 18.83 | -10.45 | -3.86 |
| 12 Hypochondriasis | -24.94 | -9.72 | -5.60 |
| 13 Ideas of Persecution | .03 | -1.34 | -5.04 |
| 14 Impulsivity | 23.69 | -13.14 | 6.47 |
| 15 Irritability | -.84 | .55 | .51 |
| 16 Mood Fluctuation | -.04 | .20 | 15.24 |
| 17 Neurotic Disorganization | -.80 | -20.36 | 11.71 |
| 18 Panic Reaction | -15.41 | -8.00 | -2.83 |
| 19 Perceptual Distortion | -12.09 | -13.48 | 12.24 |
| 20 Rebelliousness | 24.69 | -3.83 | 5.17 |
| 21 Repression | 18.47 | 26.16 | 12.70 |
| 22 Sadism | 20.06 | .04 | -17.90 |
| 23 Self-Depreciation | -14.31 | 1.20 | -10.97 |
| 24 Shallow Affect | 15.24 | 4.04 | 28.97 |
| 25 Socially Deviant Attitudes | 29.72 | 3.67 | -11.61 |
| 26 Somatic Complaints | -20.64 | .12 | -.69 |
| 27 Defensiveness | -5.14 | 36.76 | 11.99 |
| 28 Type A | -10.17 | 2.00 | -7.74 |
| 29 Type B | .49 | .59 | -7.59 |
| 30 Type C | 18.12 | -4.81 | -5.50 |
| Pseudoindividual | | | |
| 1 | 1.10 | 1.01 | .84 |
| 2 | .55 | .55 | .61 |
| 3 | 1.22 | 1.30 | 1.39 |

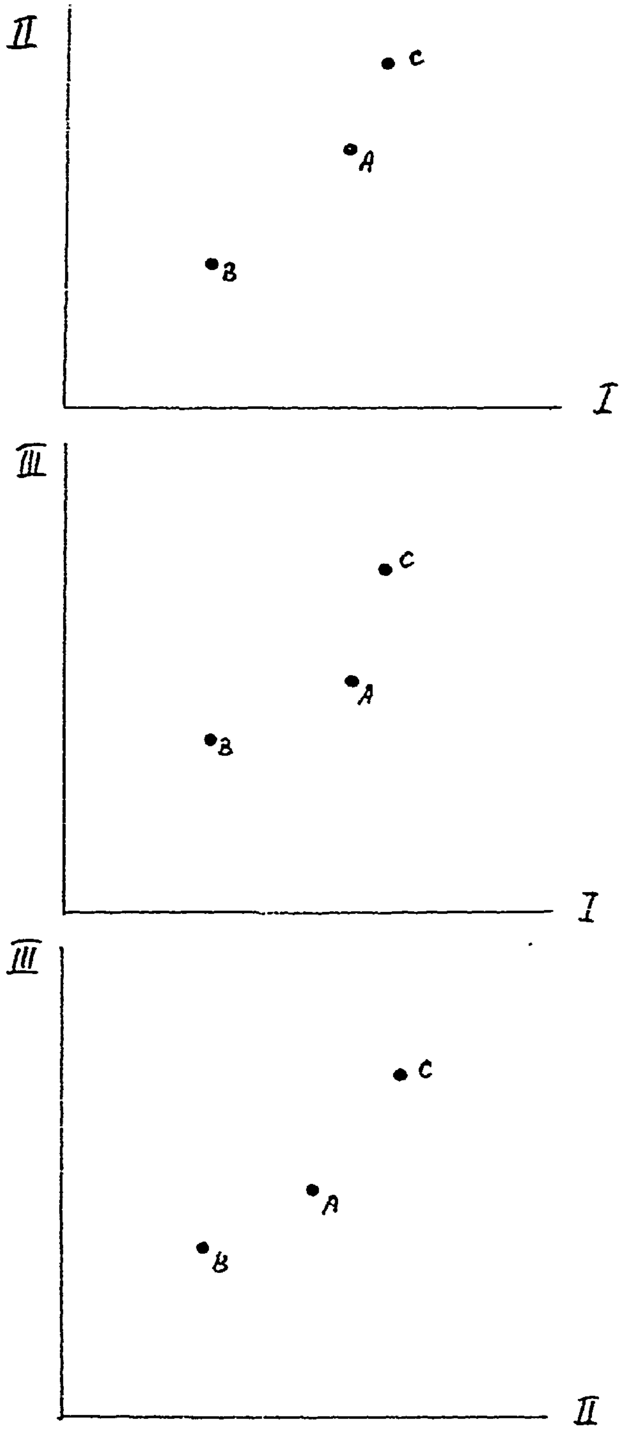

Figure 15. Plot of the weight matrix of the common configuration.

previously by separate scaling of each judge's incomplete set of dissimilarities. Each of the reproduced distance matrix was then transformed into a scalar product matrix. Using the common configuration, the weight matrix for the 64 judges was then estimated by the metric scaling procedure discussed in Chapter 3 (See Appendices 5 and 6). This procedure is similar to the one discussed by Kruskal and Wish (1978) for estimating dimensional weights for individuals not included in the original INSCAL analysis. A one-way MANOVA was performed using each judge's vector of weights as the dependent variables and the three samples as the factor. The resulting statistics were: Wilk's Lambda W = .909 and the associated Rao's F(6, 118) = .96; Lawley-Hotelling Trace T = .098, Roy's Largest Root R = .065 (s = 2, m = 0, n =$28\frac{1}{2}$). Thus, assuming that the interjudge comparison of weights was appropriate, the results indicated the three sample judges did not differ in the weighting of dimensions as groups. The estimated weight matrix was also plotted in Figures 16, 17, and 18, which show no clear separation of judges in terms of membership in different samples.

Table 19 shows the computed canonical correlations between the common configuration and the three configurations. In each case, the canonical correlations indicated an overall correspondence showing the adequacy of the common configuration in representing the three configurations.

The procrustean orthogonal rotational procedure was also

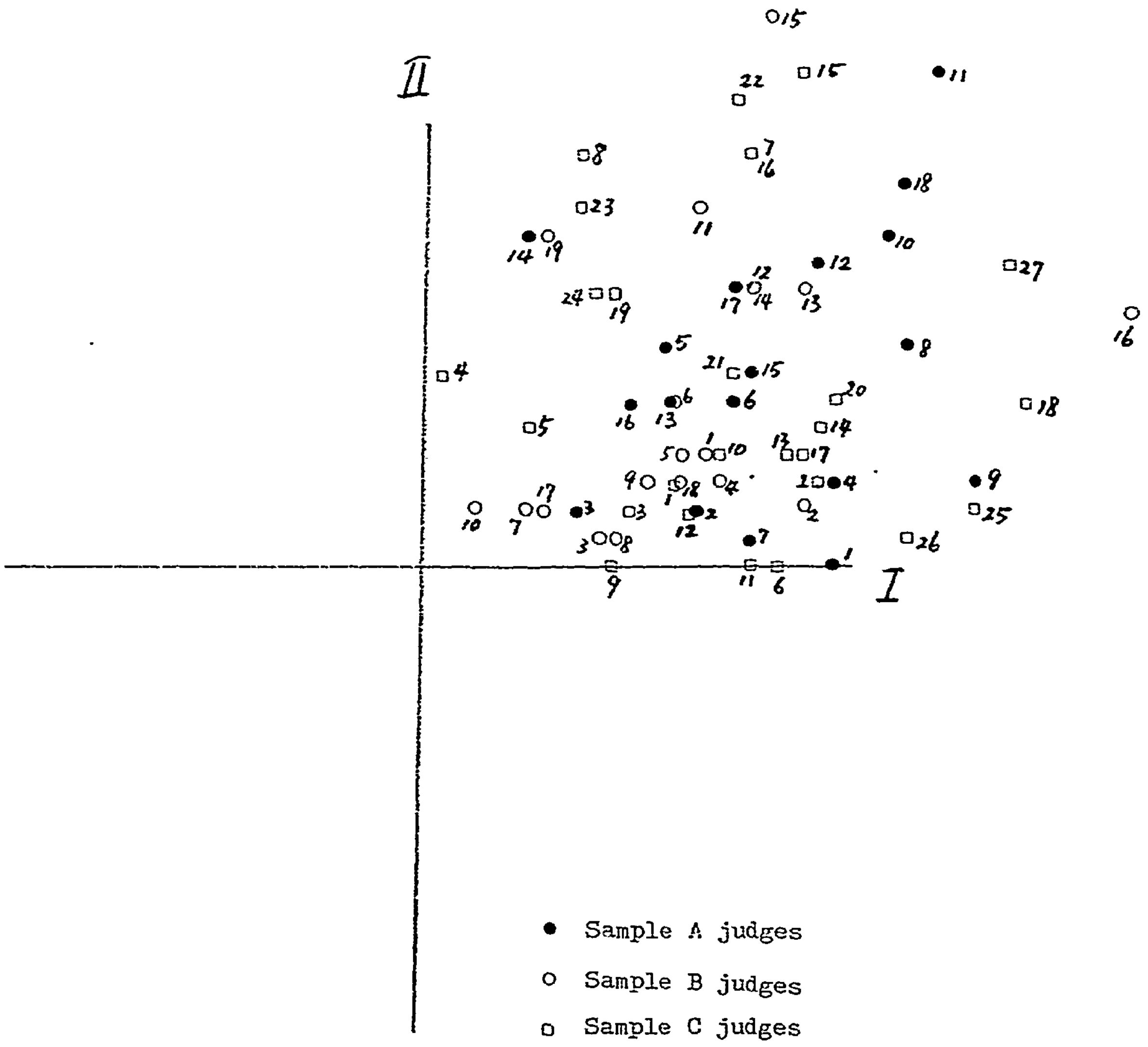

Figure 16. Plot of dimension 1 vs. dimension 2 of the estimated weight matrix of the common configuration.

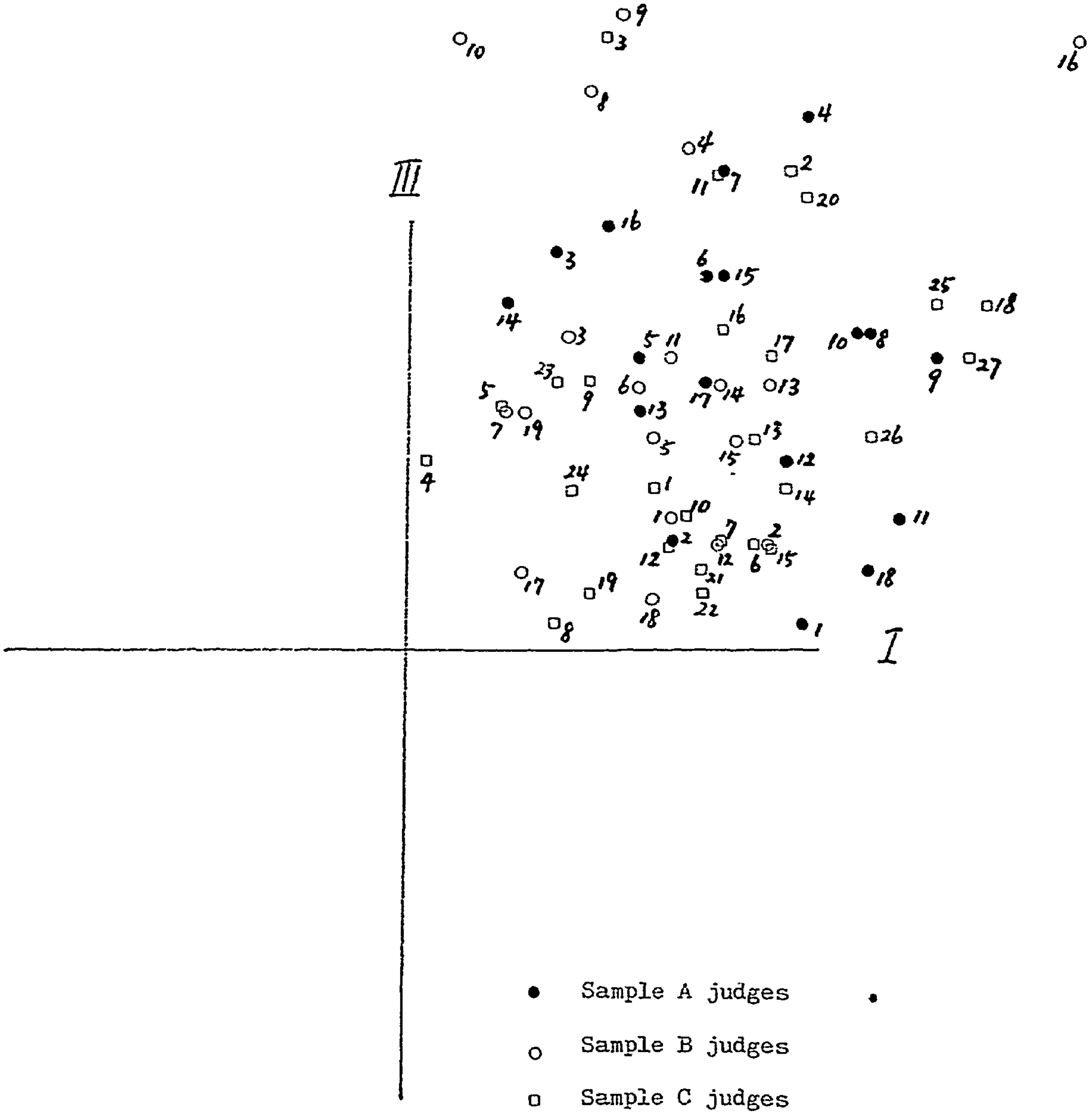

Figure 17. Plot of dimension 1 vs. dimension 3 of the estimated weight matrix of the common configuration.

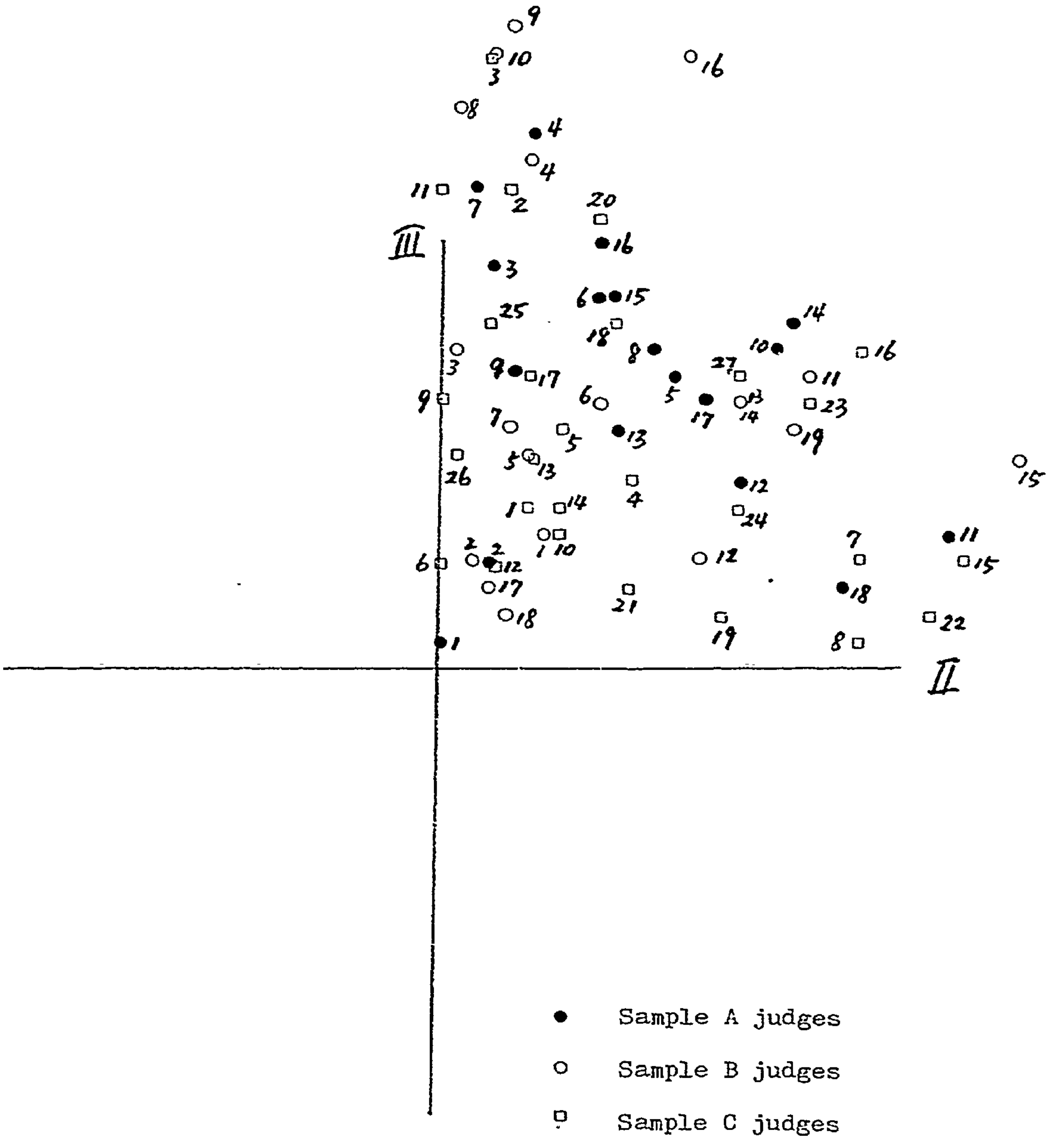

Figure 18. Plot of dimension 2 vs. dimension 3 of the estimated weight matrix of the common configuration.

## Table 19

## Comparing Three Configurations with the Common Configuration

| Configuration | | Canonical Correlation | Wilk's Lambda | $\chi^2$ | df | Fit Index E | L | S |
|---|---|---|---|---|---|---|---|---|
| A and Common/ | 1 | .99 | .003 | $152.40^{**}$ | 9 | .0643 | .2771 | .2771 |
| Fit A to | 2 | .92 | .112 | $58.13^{**}$ | 4 | | | |
| Common | 3 | .52 | .725 | $8.51^{*}$ | 1 | | | |
| B and Common/ | 1 | .99 | .001 | $173.42^{**}$ | 9 | .0637 | .2335 | .2335 |
| Fit B to | 2 | .94 | .062 | $73.56^{**}$ | 4 | | | |
| Common | 3 | .66 | .564 | $15.16^{**}$ | 1 | | | |
| C and Common/ | 1 | .99 | .000 | $238.79^{**}$ | 9 | .0326 | .0604 | .0604 |
| Fit C to | 2 | .98 | .005 | $138.87^{**}$ | 4 | | | |
| Common | 3 | .93 | .139 | $52.35^{**}$ | 1 | | | |

$^{*}p < .005$
$^{**}p < .001$

*Note*. $\chi^2$ test for canonical correlation is confined to descriptive purposes.

employed to fit Configurations A, B, and C to the common configuration. Pearson product-moment correlations between the three dimensions of this common configuration and the best fitted three dimensions of Configurations A, B, and C were .98, .89, and .55; .96, .76, and .86; .99, .96, and .95, respectively. The indices of fit are also shown in Table 19. Configuration C provided the best fit to this common configuration, and Configuration A the poorest.

### Interpreting the Perceptual Spaces of Psychopathology

To arrive at an appropriate interpretation of each space, we proceeded as follows. First, the spaces were related to some external property ratings (the mean ratings on the four bipolar scales) to identify directions in the spaces to aid interpretation. Second, the relative ordering of the projections of the constructs on the dimensions were examined. Third, clustering analysis was employed to identify relatively dense areas in the spaces as a further aid for interpretation.

Ratings on four bipolar scales. Mean ratings based on 34 judges of the 54 statements and three clinical types using the four bipolar scales were first computed for each scale. To help interpret the perceptual spaces of A, B, and C, Pearson product-moment correlations were computed between the mean ratings on the four bipolar scales and the coordinates of the three dimensions of the configurations. The pattern of results however did not provide compelling evidence for interpreting the dimensions in terms of these bipolar scales. The intercorrelations of the mean ratings on the four bipolar scales were also computed. In general, with the exception of the impulsive-controlled scale, the mean ratings on the other three scales were associated moderately highly with each other. These results are summarized in Table 20. The common configuration is also included for comparison.

The mean ratings on the scales were also employed to identify vector directions in each of the perceptual spaces. The procedure was one which maximized the correlations between the mean ratings on the properties and the projections of the stimuli on the fitted vectors (Miller, Shepard, & Chang, 1964). The results are shown in Table 21.

For A, only the multiple Rs for the impulsive-controlled and the confused-perceptive fitted vectors reached significance ($\underline{p} < .05$). The two fitted vectors were oblique to each other (64 degrees). Among the three dimensions, the impulsive-controlled vector was associated most highly with Dimension 1 whereas the confused-perceptive vector was associated most highly with Dimension 3 and was nearly orthogonal to Dimension 1. A similar pattern emerged in correlating scales with dimensions (see also Table 20).

For B, only the multiple Rs for the optimistic-pessimistic and the impulsive-controlled fitted vectors reached significance ($\underline{p} < .05$). The two fitted vectors were oblique to each other (64 degrees). The optimistic-pessimistic vector was not associated highly with any of the three dimensions and was nearly orthogonal to Dimension 3. The impulsive-controlled vector was associated most highly with Dimension 2 and was nearly orthogonal to Dimension 3.

## Table 20

## Mean Bipolar Ratings: Correlations with Coordinates of Dimensions of Configurations and Intercorrelations

| Configuration | Scale | Dimension I | Dimension II | Dimension III |
|---|---|---|---|---|
| A | Desirable-Undesirable | .04 | -.10 | -.30 |
|  | Optimistic-Pessimistic | -.14 | -.29 | -.20 |
|  | Impulsive-Controlled | -.81** | -.28 | .21 |
|  | Confused-Perceptive | -.02 | -.01 | .53** |
| B | Desirable-Undesirable | -.42* | .17 | -.02 |
|  | Optimistic-Pessimistic | -.50** | .44** | -.07 |
|  | Impulsive-Controlled | .05 | .72** | -.14 |
|  | Confused-Perceptive | .09 | -.10 | .30 |
| C | Desirable-Undesirable | -.53** | -.37* | .13 |
|  | Optimistic-Pessimistic | -.48** | -.59** | .04 |
|  | Impulsive-Controlled | .39* | -.63** | -.42* |
|  | Confused-Perceptive | .56** | .05 | .07 |
| Common | Desirable-Undesirable | -.19 | -.34* | -.52** |
|  | Optimistic-Pessimistic | -.33* | -.10 | -.58** |
|  | Impulsive-Controlled | -.42* | .77** | .01 |
|  | Confused-Perceptive | .25 | .49** | .21 |

|  | D | O | I |
|---|---|---|---|
| Optimistic-Pessimistic | .82** |  |  |
| Impulsive-Controlled | -.10 | .16 |  |
| Confused-Perceptive | -.78** | -.54** | .25 |

Note. D is desirable-undesirable, O is optimistic-pessimistic, I is impulsive-controlled.

$^{*}p < .05$, one-tailed
$^{**}p < .005$, one tailed

Table 21

Fitting Property Vectors to Configurations

| Configuration | Scale | Multiple R | Direction of fitted Cosine vector I | II | III | Cosine of Angle Between Vectors D | O | I |
|---|---|---|---|---|---|---|---|---|
| A | D | .31 | .20 | -.14 | -.97 | | | |
| | O | .33 | -.30 | -.83 | -.47 | .51 | | |
| | I | .87** | -.90 | -.25 | .36 | -.50 | .30 | |
| | C | .54* | -.04 | -.23 | .97 | -.92 | -.26 | .44 |
| B | D | .43 | -.97 | .26 | .06 | | | |
| | O | .62** | -.77 | .64 | .08 | .91 | | |
| | I | .74** | .24 | .97 | .05 | .02 | .44 | |
| | C | .31 | .26 | -.05 | .97 | -.03 | -.15 | .06 |
| C | D | .67** | -.76 | -.56 | .34 | | | |
| | O | .74** | -.55 | -.81 | .22 | .94 | | |
| | I | .88** | .55 | -.75 | -.37 | -.12 | .22 | |
| | C | .56* | 1.00 | -.03 | -.04 | -.75 | -.53 | .59 |
| Common | D | .63** | -.20 | -.48 | -.86 | | | |
| | O | .67** | -.36 | -.10 | -.93 | .92 | | |
| | I | .89** | -.39 | .92 | -.03 | -.34 | .07 | |
| | C | .58* | .33 | .87 | .37 | -.80 | -.55 | .66 |

*Note.* Multiple Rs are maximum correlations between the property ratings and the projections on the fitted vectors. D is Desirable-Undesirable, O is Optimistic-Pessimistic, I is Impulsive-Controlled, C is Confused-Perceptive.

*$p < .05$

**$p < .01$

For C, all four multiple Rs for the fitted vectors reached significance ($p < .05$). The desirable-undesirable vector was associated moderately highly with the optimistic-pessimistic vector (20 degrees) but was nearly orthogonal to the impulsive-controlled vector (97 degrees). None of the three dimensions were highly associated with the desirable-undesirable, the optimistic-pessimistic, and the impulsive-controlled vectors. The confused-perceptive vector was highly associated with Dimension 1 (3 degrees) and was nearly orthogonal to Dimension 2 and Dimension 3 (about 92 degrees for both).

For the common space, the multiple Rs for all the fitted vectors were significant ($p < .05$). The optimistic-pessimistic vector was moderately highly associated with the desirable-undesirable vector (24 degrees) and was nearly orthogonal to the impulsive-controlled vector (86 degrees). Dimension 2 was moderately associated with the impulsive-controlled and the confused-perceptive vectors, and was nearly orthogonal to the optimistic-pessimistic vector. Dimension 3 was moderately associated with the optimistic-pessimistic and the desirable-undesirable vector, and was orthogonal to the impulsive-controlled vector.

Perceived dimensions of psychopathology. The fact that the property vectors did not serve to interpret the spaces adequately suggested that the perceptual spaces might be more complex. To capture such possible complexity, an examination of the constructs in the spaces was in order. The configurations with fitted property vectors were plotted by pairs of dimensions in Figures 19 to 30.

The perceptual space of A is shown in Figures 19 to 21. Dimension 1 appeared to order a wide array of constructs from Hostility, Impulsivity, Mood Fluctuation, Socially Deviant Attitudes, Cynicism, and Rebelliousness to Shallow Affect, Self-Depreciation, Depression, Broodiness, Repression, and Defensiveness. This dimension contrasted socially deviant impulse expression against inhibition, withdrawal, and clinical depression. This interpretation was supported by the high association between Dimension 1 and the impulsive-controlled vector and the high correlation between the dimension with the corresponding scale.

Dimension 2 ordered constructs from Shallow Affect, Repression, Rebelliousness, Impulsivity, Neurotic Organization, Socially Deviant Attitudes to Panic Reaction, Somatic Complaints, Mood Fluctuation, Health Concern, and Hypochondriasis. Although it was difficult to label this bipolar array of constructs, it appeared appropriate to label one of the poles as denial of feelings with dysfunctional coping behavior, and the other pole as overconcern with health and reactivity implying resignation and a failure in active coping. The moderate association between the optimistic-pessimistic vector and this dimension lent support to this interpretation.

Dimension 3 arrayed Defensiveness, Sadism, Socially Deviant Attitudes, Cynicism, Familial Discord and Repression against

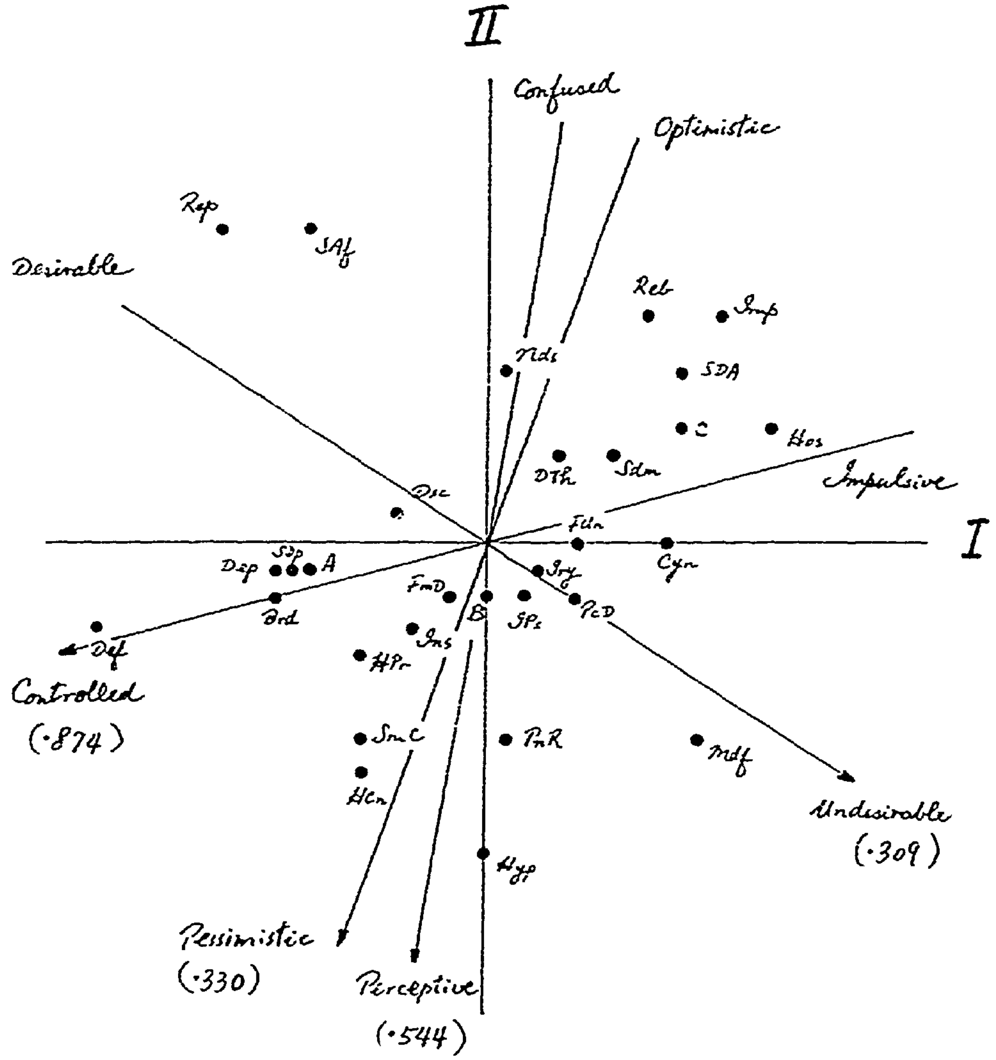

Figure 19. Plot of dimension 1 vs. dimension 2 of Configuration A with fitted property vectors.

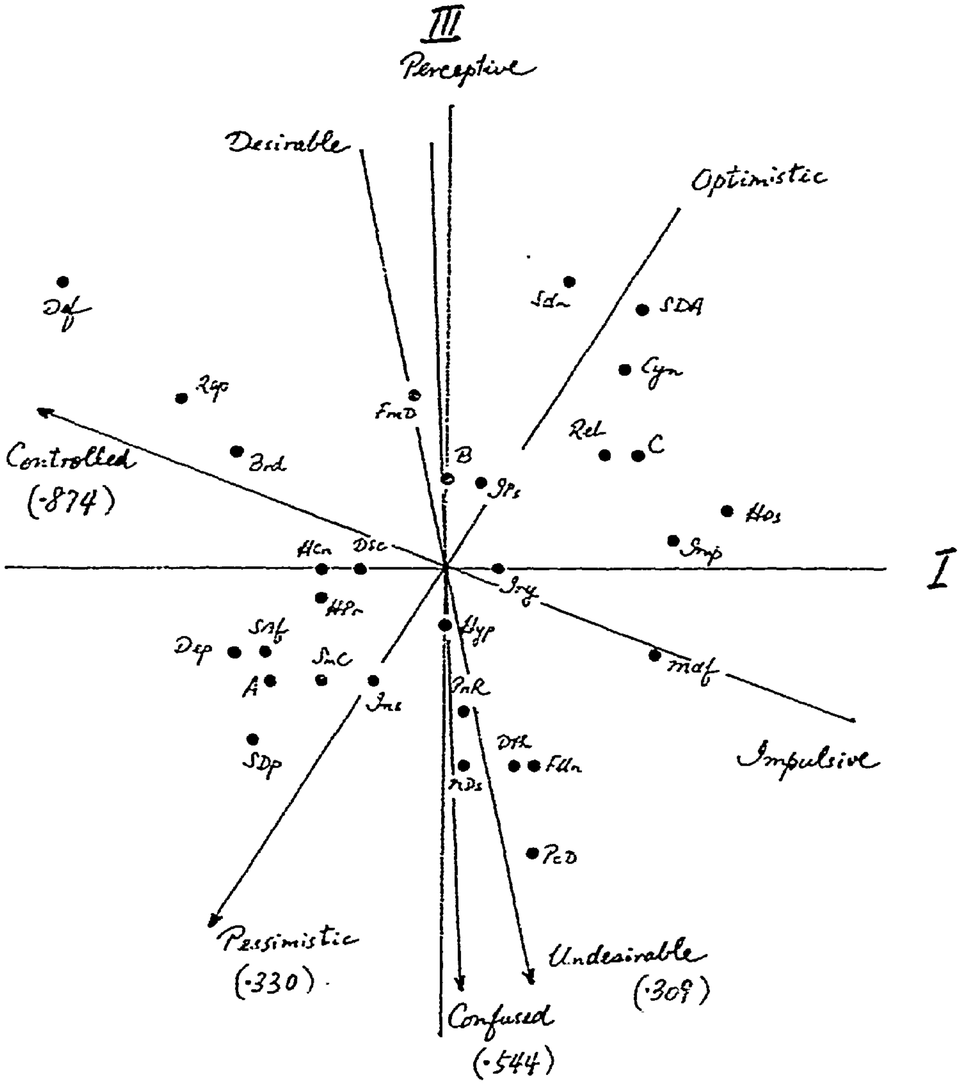

Figure 20. Plot of dimension 1 vs. dimension 3 of Configuration A with fitted property vectors.

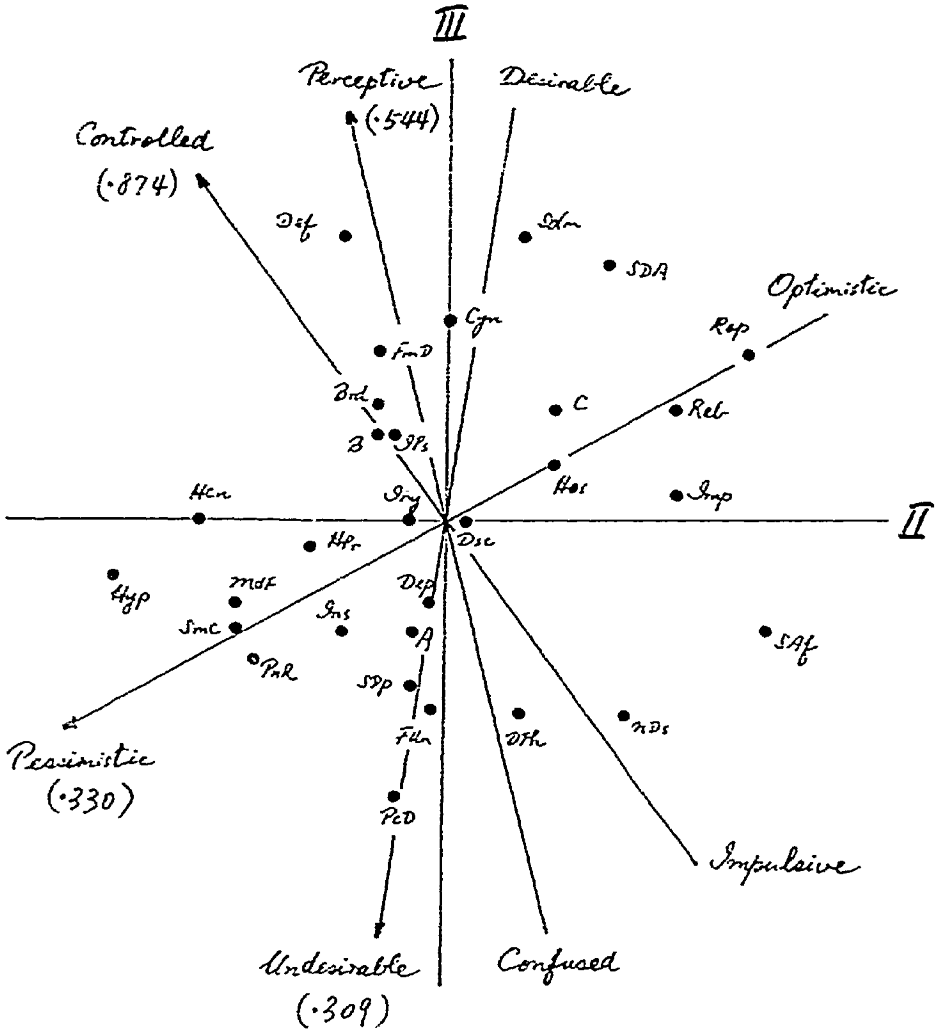

Figure 21. Plot of dimension 2 vs. dimension 3 of Configuration A with fitted property vectors.

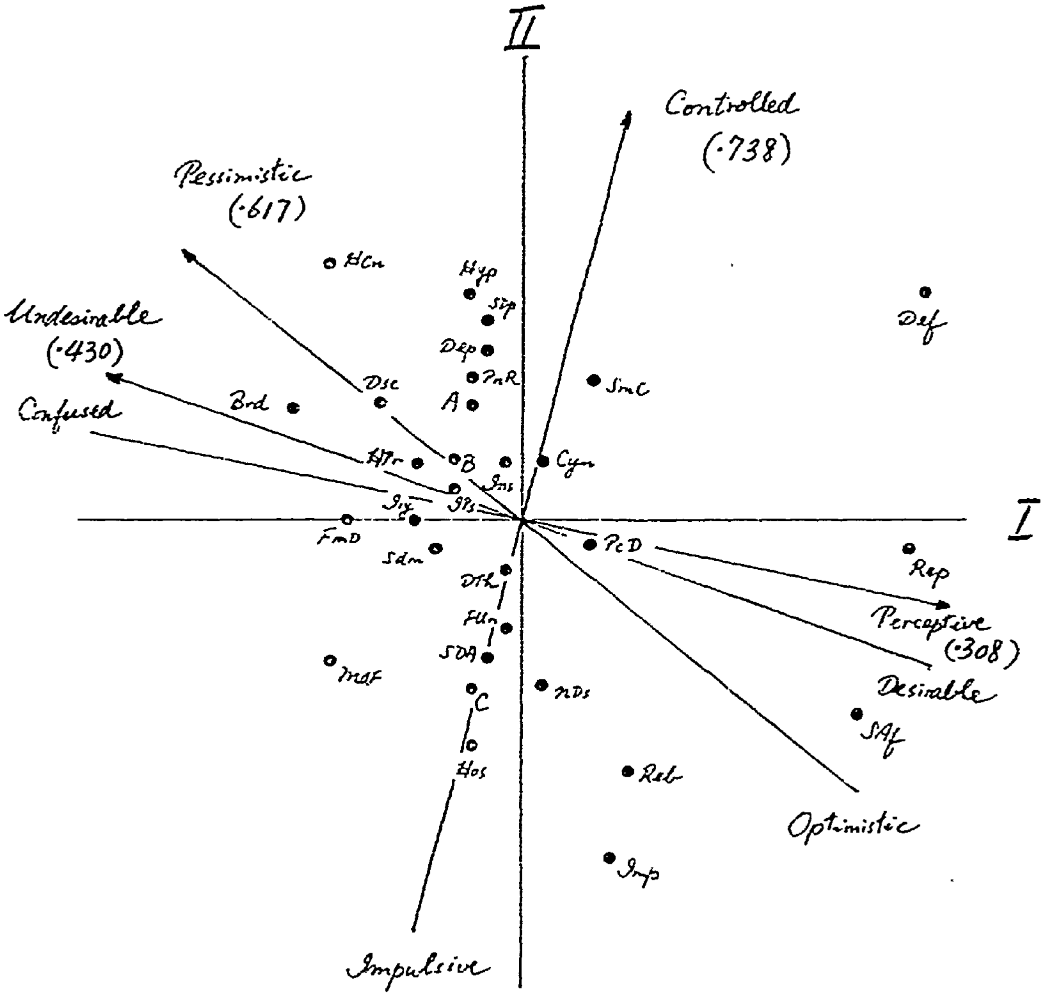

Figure 22. Plot of dimension 1 vs. dimension 2 of Configuration B with fitted property vectors.

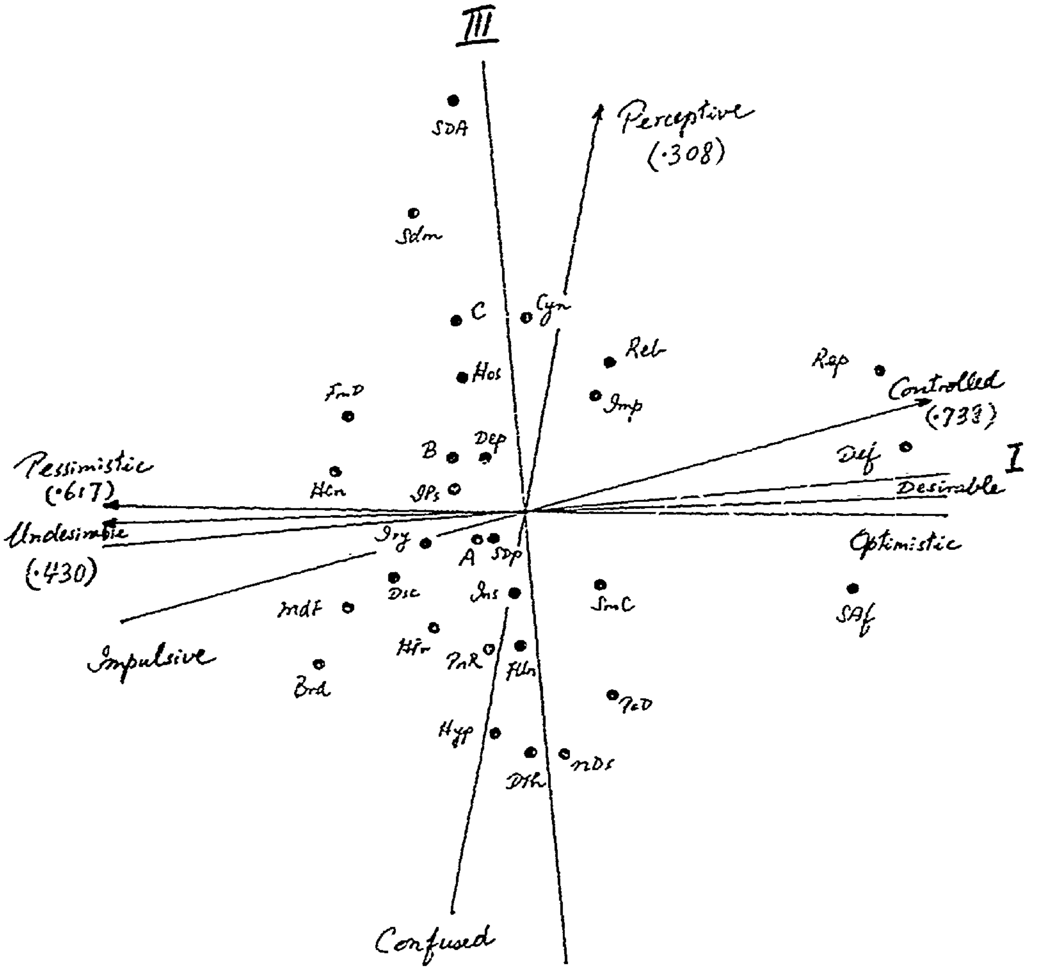

Figure 23. Plot of dimension 1 vs. dimension 3 of Configuration B with fitted property vectors.

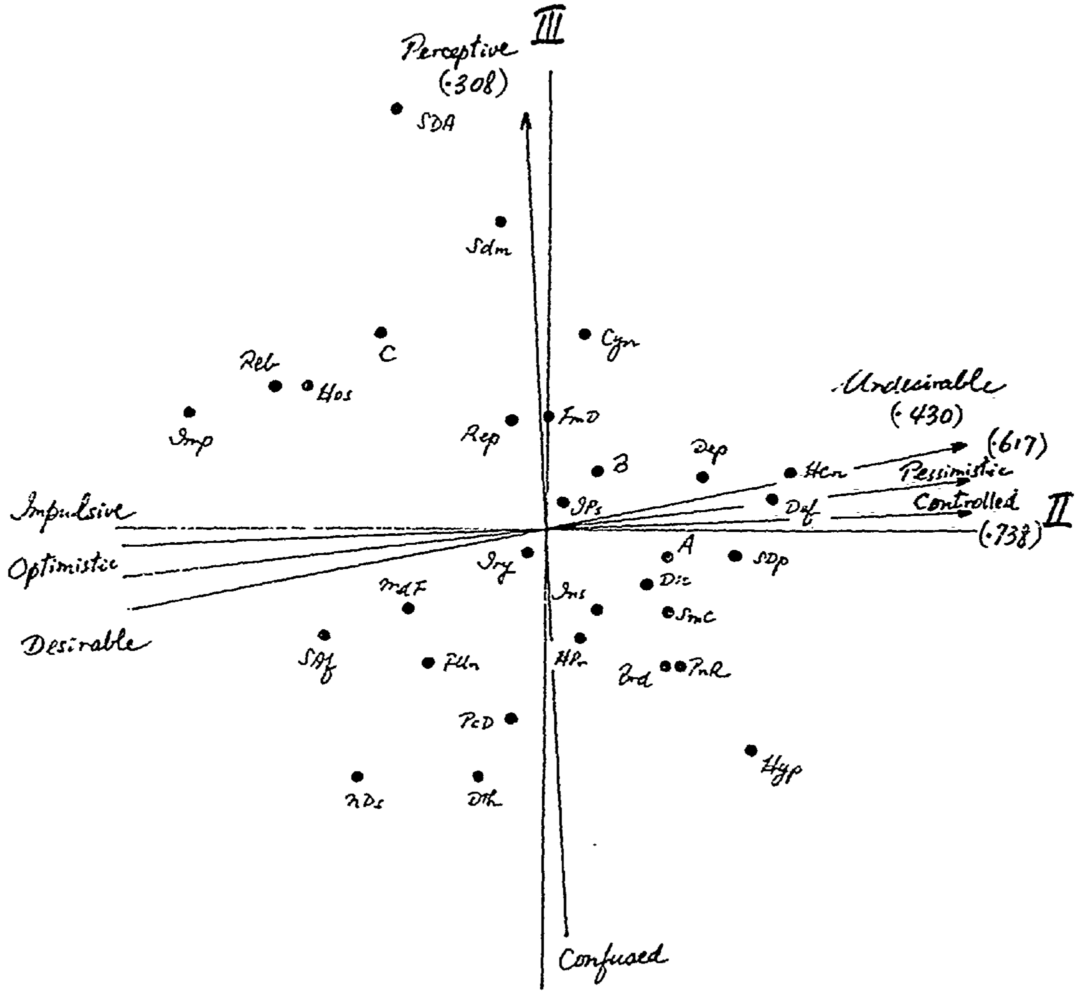

Figure 24. Plot of dimension 2 vs. dimension 3 of Configuration B with fitted property vectors.

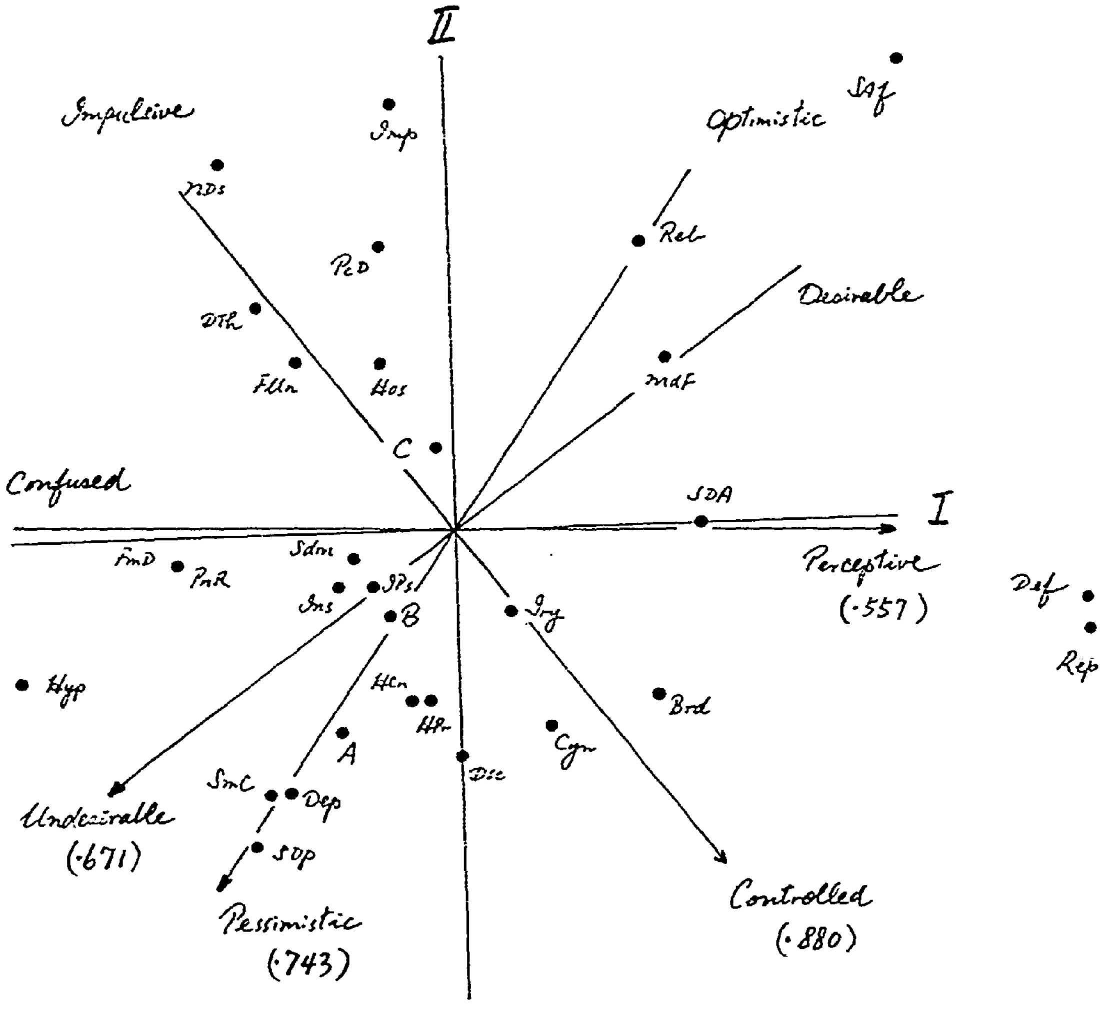

Figure 25. Plot of dimension 1 vs. dimension 2 of Configuration C with fitted property vectors.

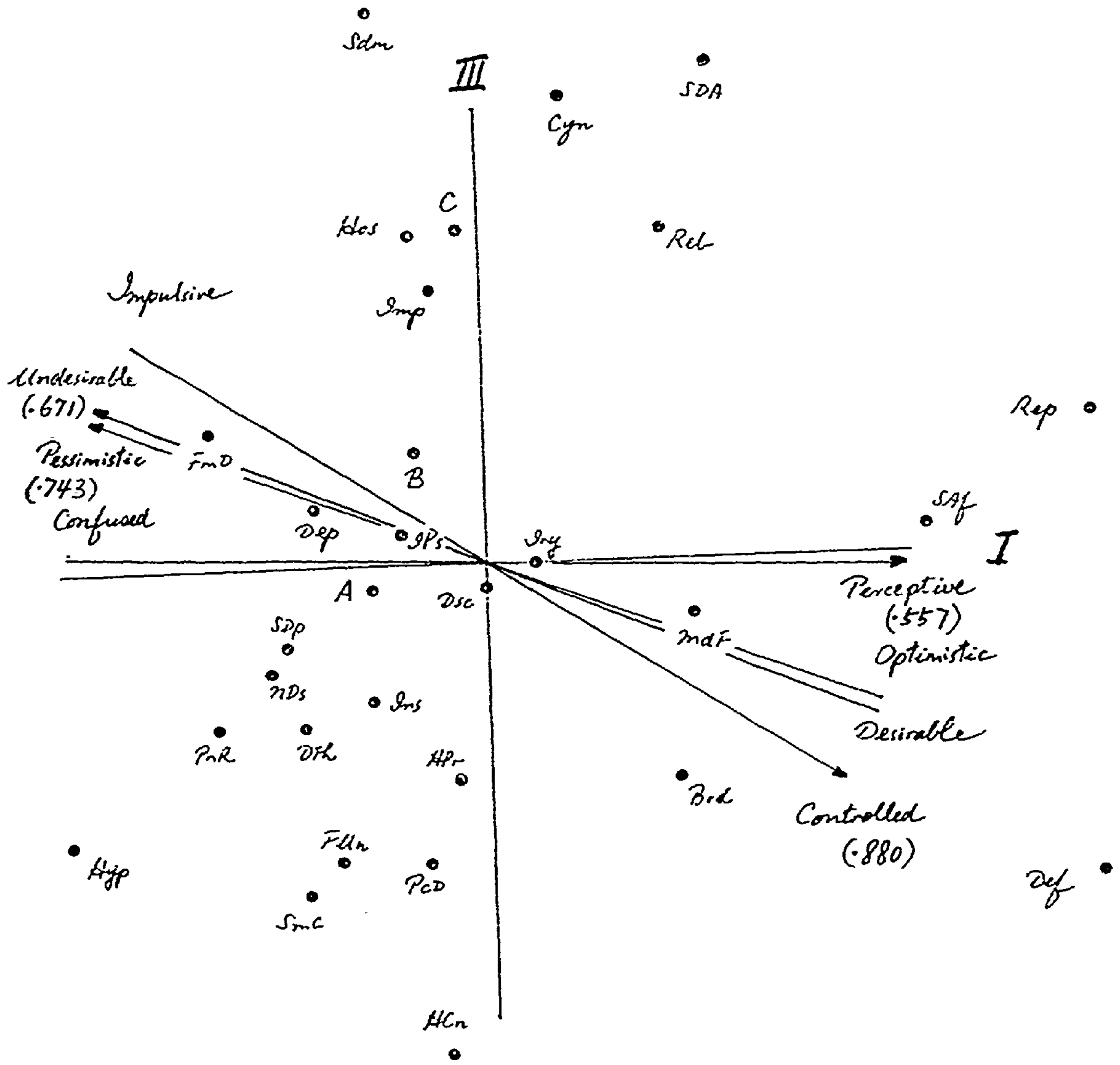

Figure 26. Plot of dimension 1 vs. dimension 3 of Configuration C with fitted property vectors.

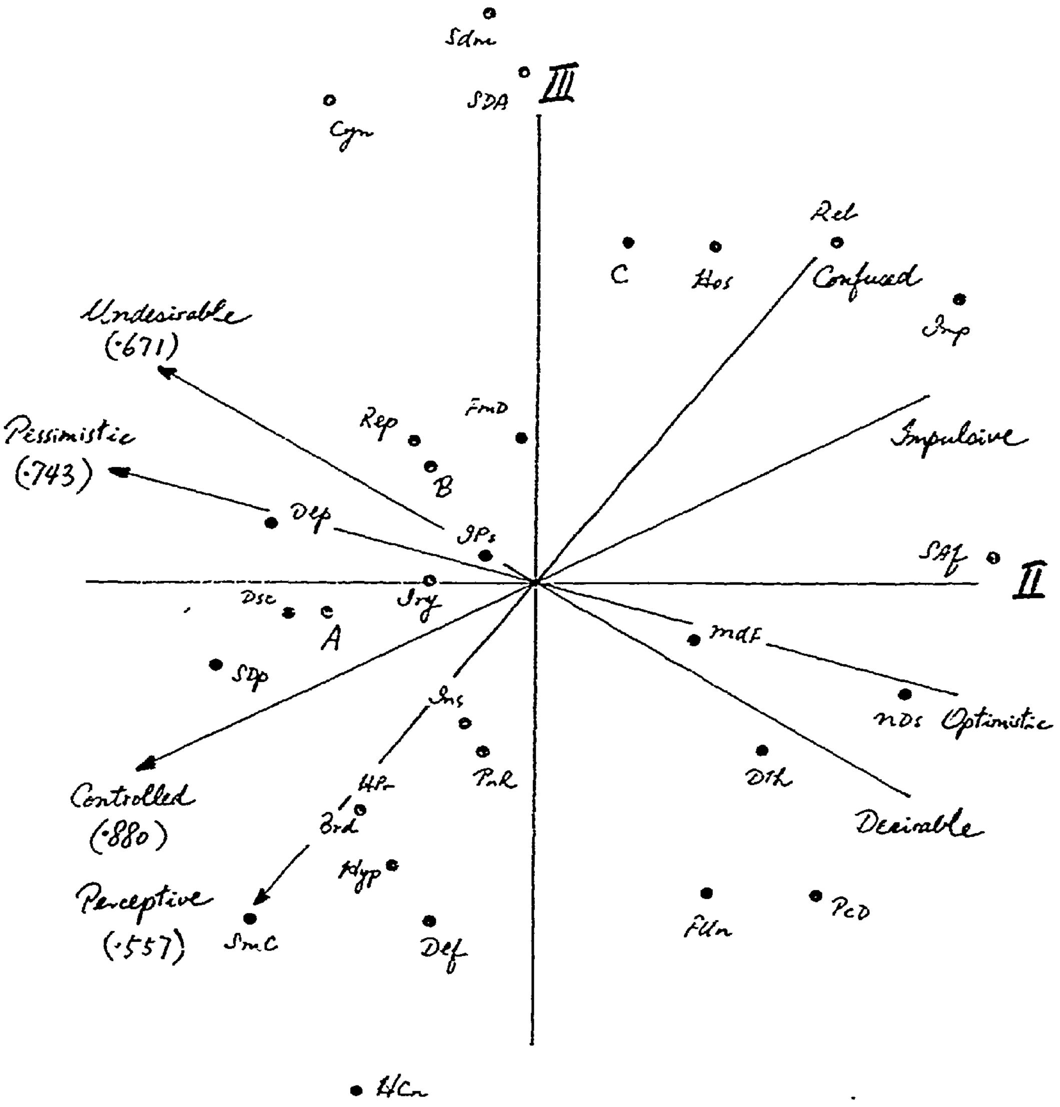

Figure 27. Plot of dimension 2 vs. dimension 3 of Configuration C with fitted property vectors.

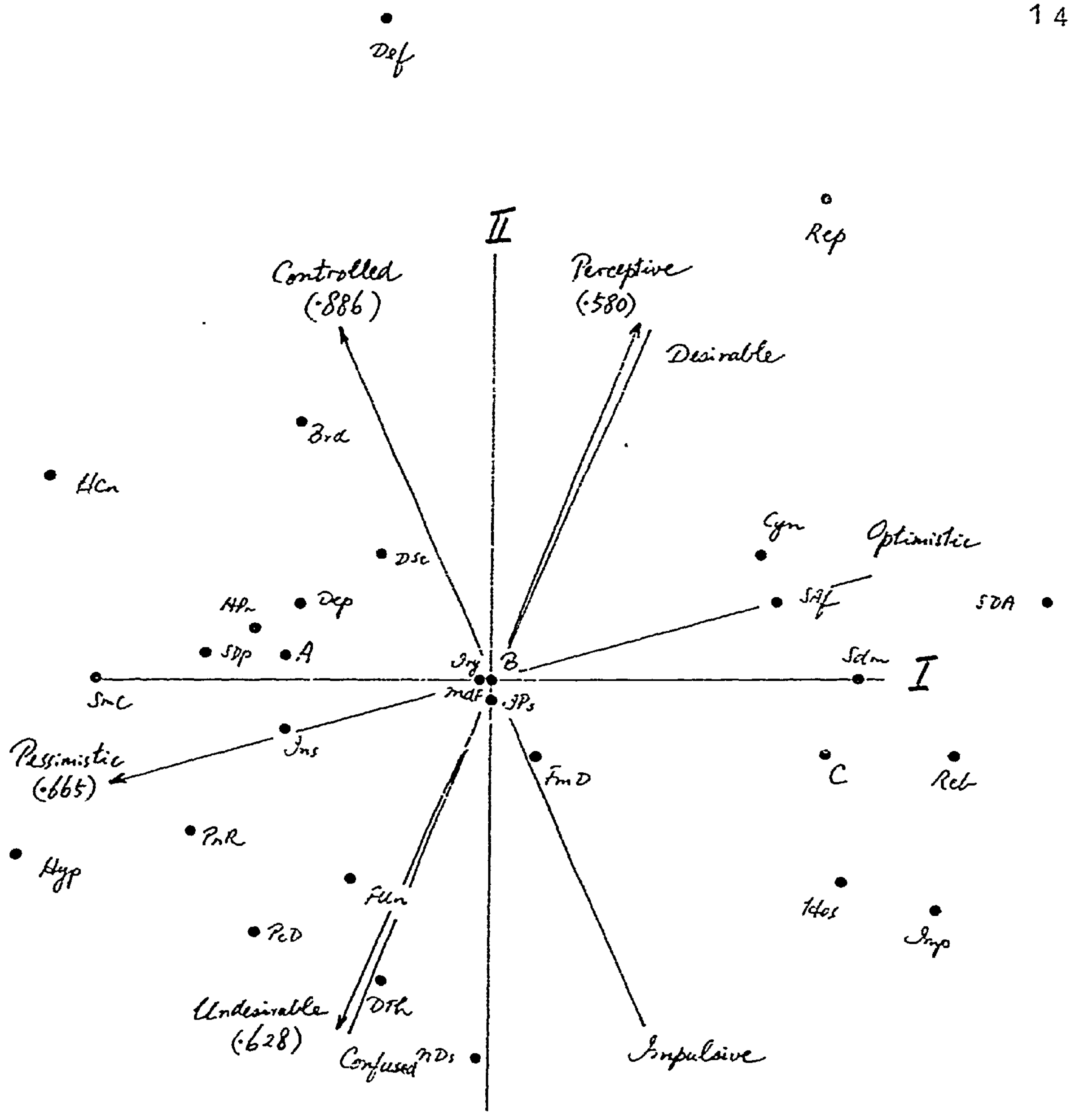

Figure 28. Plot of dimension 1 vs. dimension 2 of the common configuration with fitted property vectors.

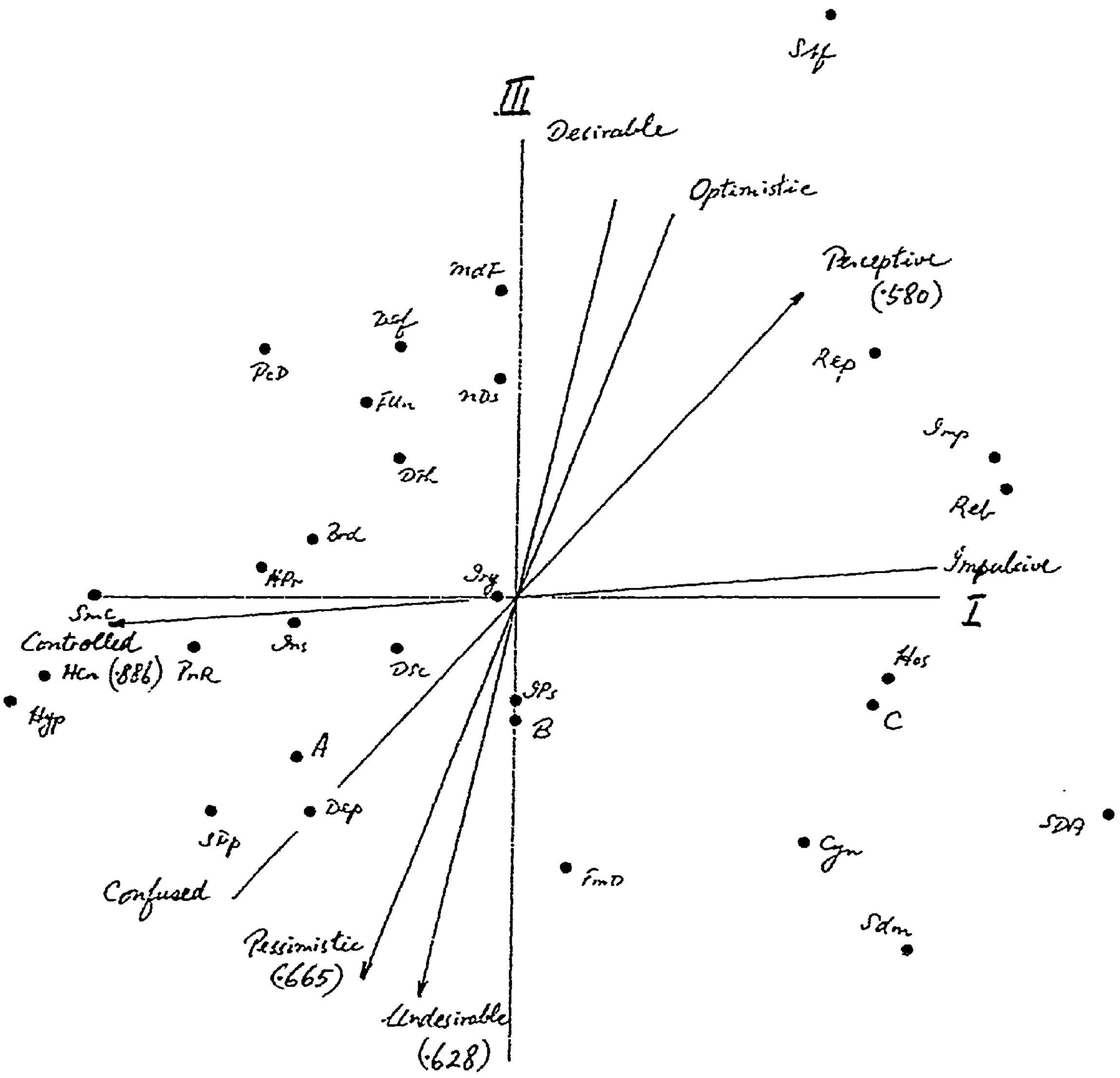

Figure 29. Plot of dimension 1 vs. dimension 3 of the common configuration with fitted property vectors.

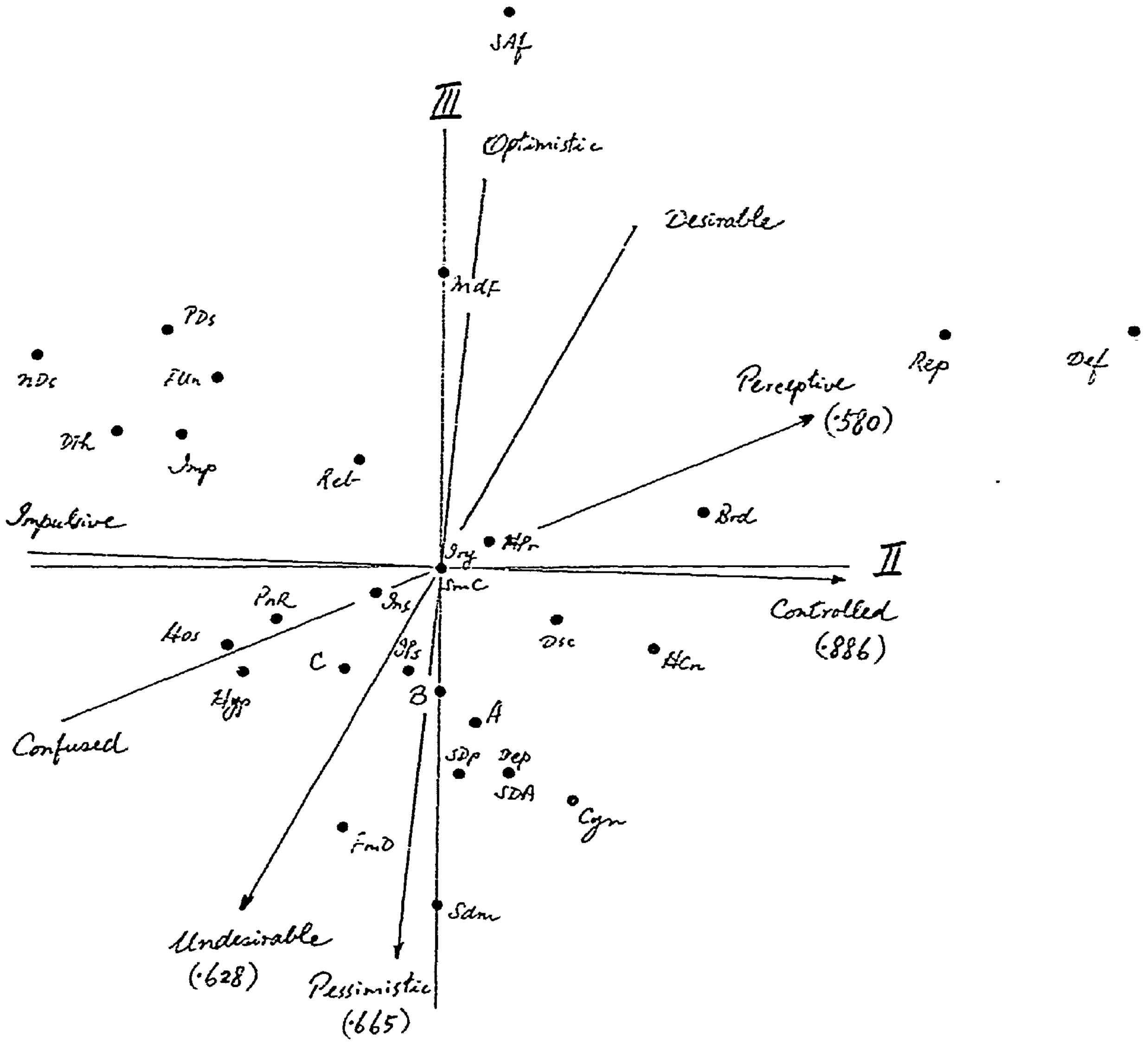

Figure 30. Plot of dimension 2 vs. dimension 3 of the common configuration with fitted property vectors.

Self-Depreciation, Disorganization of Thinking, Feelings of Unreality, Neurotic Disorganization, and Perceptual Distortion. The high association of this dimension with the confused-perceptive vector, and the significant correlation with the corresponding scale suggested the label of denial of psychopathology vs. cognitive dysfunctioning, contrasting the less severe forms of psychopathology with the more severe forms.

The perceptual space of B is shown in Figures 22 to 24. Dimension 1 appeared to be as complex as and similar to Dimension 2 of A. It ordered constructs such as Defensiveness, Repression, and Shallow Affect against Mood Fluctuation, Health Concern, Broodiness and Familial Discord. The label of blunted affect and denial of feelings vs. resignation and a failure in active coping could be applied. This dimension was highly associated with the desirable-undesirable vector, and moderately highly with the desirable-undesirable scale and the optimistic-pessimistic scale, suggesting an evaluative component was involved.

Dimension 2 was similar to Dimension 1 of A and could be similarly labelled as impulsive expression vs. inhibition, withdrawal and clinical depression. Thus, Health Concern, Defensiveness, Hypochondriasis, Self-Depreciation and Depression occupied one end of the dimension, whereas Impulsivity, Rebelliousness, Hostility, and Shallow Affect occupied the other end. This interpretation was supported by the high association of this dimension with the impulsive-controlled vector and the moderate association with the optimistic-pessimistic vector, and the corresponding moderately high correlations with the mean ratings of both scales.

Dimension 3 was similar to Dimension 3 of A. The dimension arrayed constructs of Socially Deviant Attitudes, Sadism, Cynicism against Perceptual Distortion, Hypochondriasis, Neurotic Disorganization, and Disorganization of Thinking, contrasting the less severe forms of psychopathology with the severe forms such as cognitive dysfunctioning. The appropriateness of this label was verified by the high association between this dimension and the confused-perceptive vector, and the approximate orthogonality of this fitted vector with the other fitted vectors.

The perceptual space of C is shown in Figures 25 to 27. Dimension 1 was relatively similar to the third dimension of A and B. It ordered constructs from Repression, Defensiveness, Shallow Affect, Socially Deviant Attitudes, Mood Fluctuation, Rebelliousness and Broodiness to Depression, Disorganization of Thinking, Somatic Complaints, Self-Depreciation, Neurotic Disorganization, Panic Reaction, Familial Discord and Hypochondriasis. This was a dimension contrasting the less severe forms of psychopathology against the severe forms such as cognitive dysfunctioning, overconcern with health and reactivity. The high association of this dimension with the confused-perceptive vector verified such labelling. However, the obliqueness of the other fitted vectors with this dimension, and the moderately high correlations with all four scales suggested that this dimension was not as distinct as the corresponding one in A and B.

Dimension 2 was similar to Dimension 1 of A, and closely similar to Dimension 2 of B. Shallow Affect, Impulsivity, Neurotic Disorganization, Rebelliousness were contrasted against Self-Depreciation, Somatic Complaints, Depression, Desocialization, and Cynicism. This was a dimension of impulse expression mixed with some cognitive dysfunctioning vs. inhibition, withdrawal and clinical depression. The moderately high association of this dimension with the optimistic-pessimistic and the impulsive-controlled vectors, and the significant correlations with the corresponding scales suggested this appropriate labelling.

Dimension 3 could not be as easily interpreted as Dimensions 1 and 2. It was relatively similar to Dimension 2 of A, and Dimension 1 of B. It correlated significantly with the mean ratings of the impulsive-controlled scale. Sadism, Socially Deviant Attitudes, Cynicism, Rebelliousness, Hostility and Impulsivity were contrasted against Health Concern, Somatic Complaints, Defensiveness, Feelings of Unreality, Perceptual Distortion, Hypochondriasis, Broodiness, Headache Proneness, Panic Reaction and Disorganization of Thinking. This dimension was more complex than its counterparts in A and B. However, the dimensional interpretation of dysfunctional coping vs. resignation and a failure in active coping again seemed appropriate.

In summary, three common dimensions were uncovered across the perceptual spaces of the three samples of judges. The first dimension was impulse expression vs. inhibition and withdrawal, one pole being characterized by the constructs of Impulsivity and Rebelliousness, and the other by Self-Depreciation and Depression mixed, at least in B and C, with health problems. The second dimension was a dimension of the general severity of psychopathology. The less severe forms such as the denial of psychopathology characterized by Defensiveness, Repression, and Socially Deviant Attitudes were contrasted against the more severe forms such as cognitive dysfunctioning characterized by Neurotic Disorganization and Disorganization of Thinking. The third dimension was less well-defined than the first two. One pole was defined by constructs of blunted affect such as Shallow Affect and Repression in A and B, and by constructs indicating dysfunctional coping such as Impulsivity, Rebelliouness and Socially Deviant Attitudes in B and C. The other pole was characterized by an overconcern with health, moodiness, and reactivity implying resignation and a failure in active coping. This dimension was less distinct in C.

The commonality of the three space was captured in the common perceptual space shown in Figures 28 to 30. The three dimensions of the common space could be interpreted similarly in the above order. Dimension 1 was the dimension of impulse expression vs. inhibition and withdrawal. Dimension 2 was the dimension of the general severity of psychopathology. Dimension 3 contrasted blunted affect with resignation and a failure in active coping.

Clustering analysis. Although similar labels were attached to the dimensions of the three perceptual spaces, differential spacing of the constructs was evident. To detect subtle differences in the spacing of the constructs in relation to each other, and to examine how the three particular clinical types were perceived in relation to these constructs, a clustering procedure was employed to identify "dense" regions in the spaces. The constructs or traits proximal to the perceived clinical types were then compared with the salient traits of their empirical counterparts called Modal Profiles. These Modal Profiles were identified by systematic classification procedure using self-reported data to the same set of constructs (Skinner, 1976). The discussion of these Modal Profiles will be postponed until Study 2.

Specifically, each of the three configurations was employed to reproduce the distances between pairs of stimuli resulting in three matrices of dissimilarities or distances for three pseudoindividuals. Each of these matrices was used as input to Johnson's hierarchical clustering procedure (Johnson, 1967). The diameter method was used since it yielded compact clusters. The resulting tree diagrams of the three pseudoindividuals are shown in Figures 31, 32, and 33. Selected clusters depicting constructs proximal to each other and the perceived clinical types are embedded in the spatial configurations in Figures 34 to 42.

Five common "nuclei" could be detected in the spaces of the three pseudoindividuals. They were described as clusters in the following.

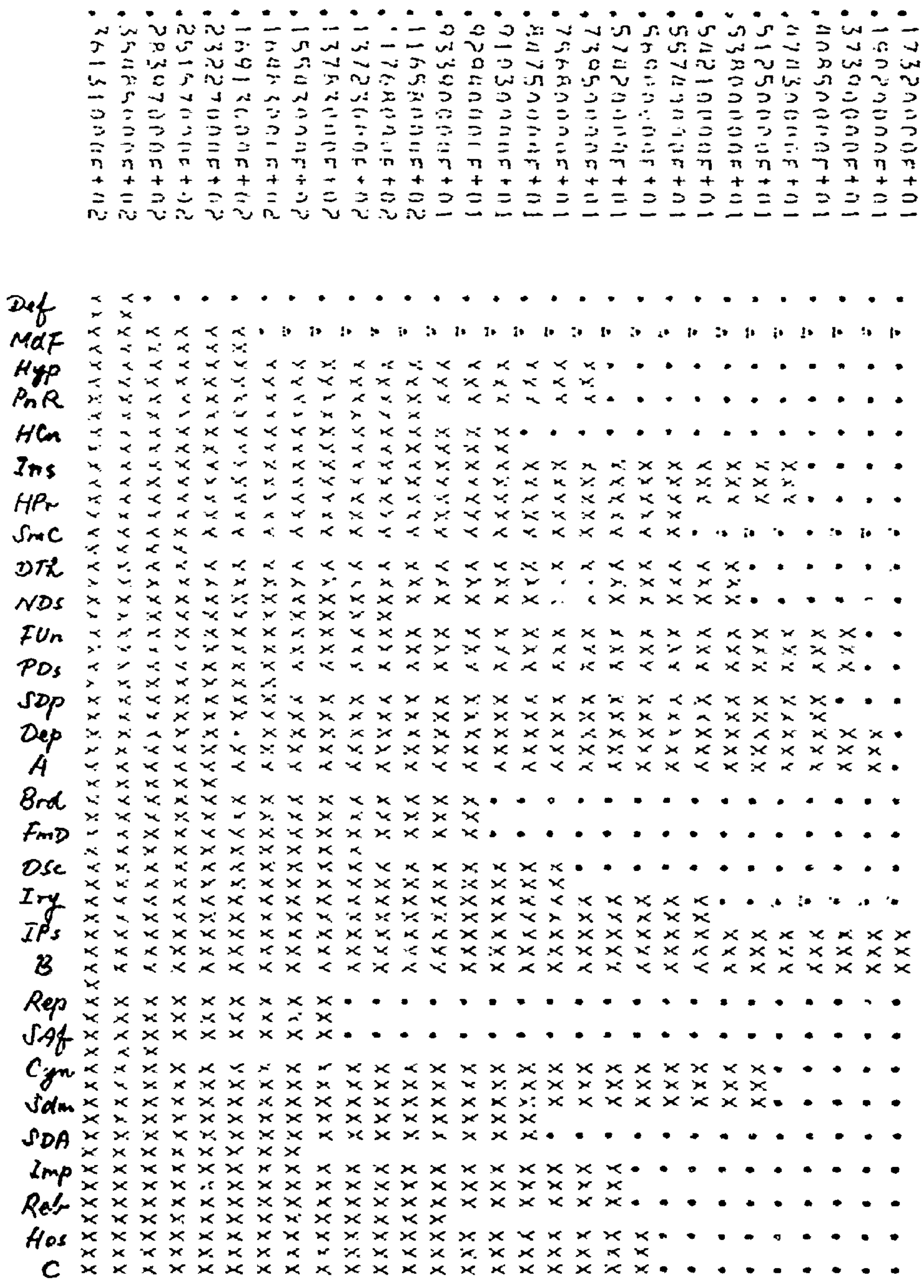

Figure 31. Tree diagram derived from the diameter method of hierarchical clustering of the dissimilarities of pseudoindividual A.

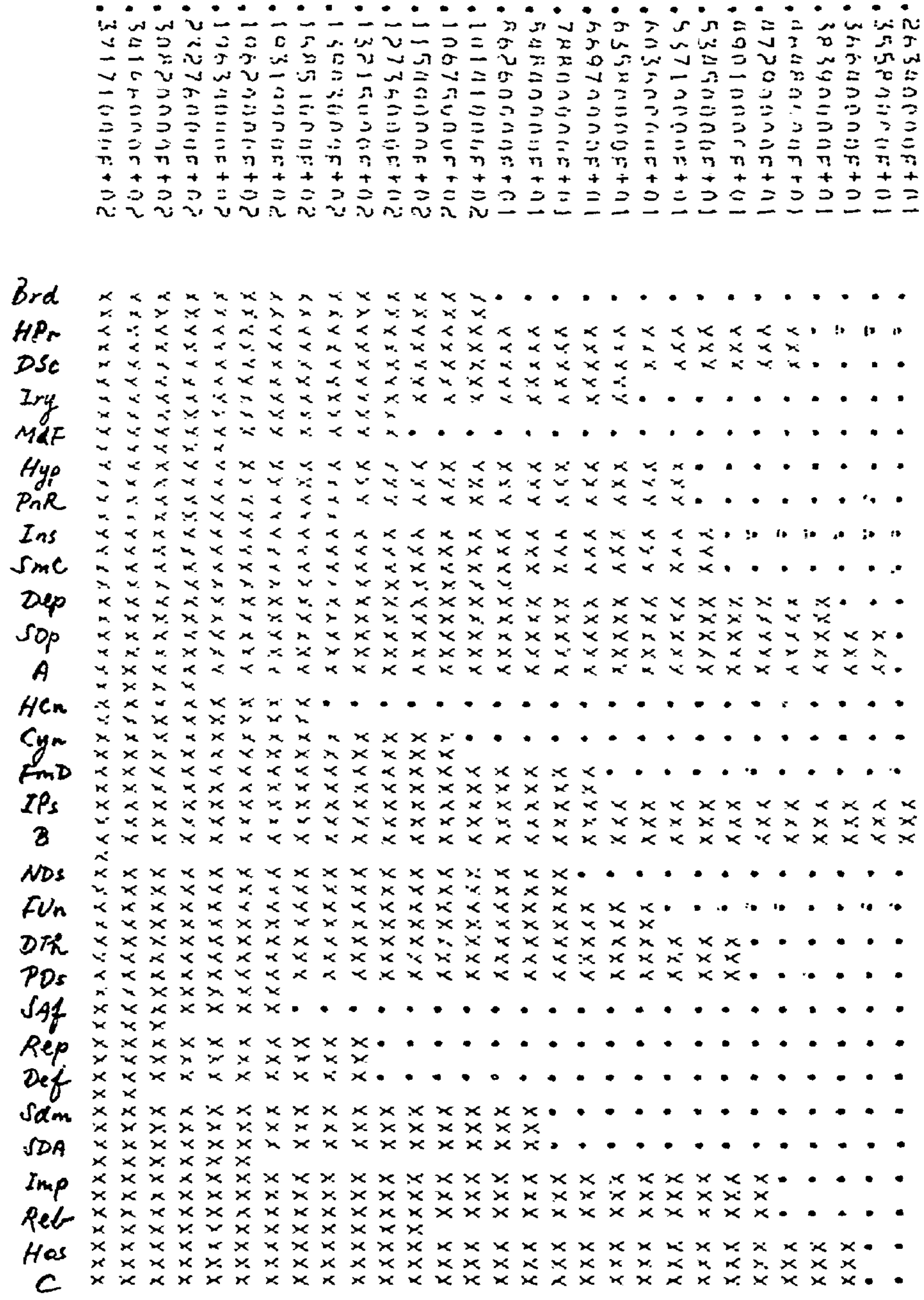

Figure 32. Tree diagram derived from the diameter method of hierarchical clustering of the dissimilarities of pseudoindividual B.

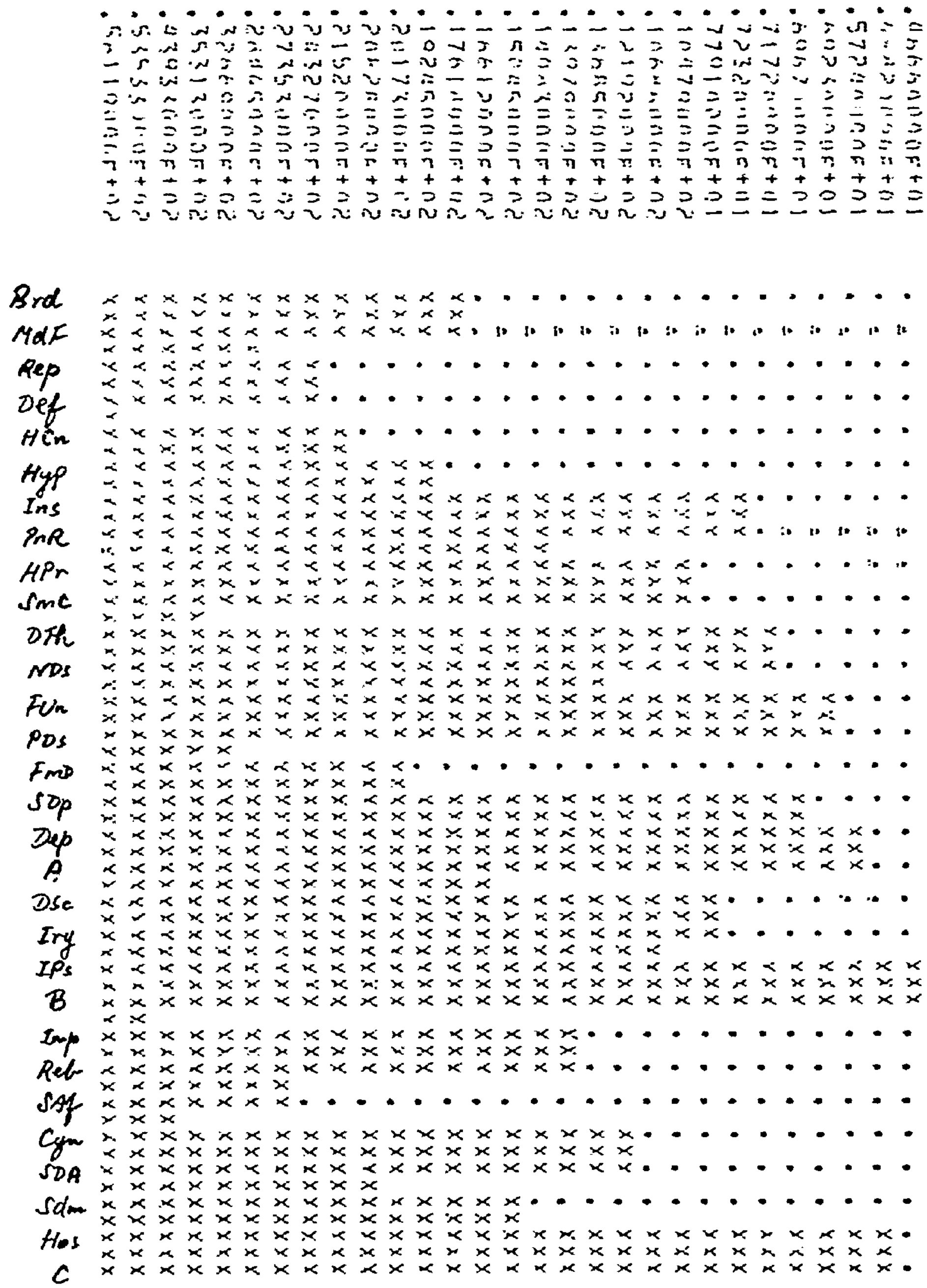

Figure 33. Tree diagram derived form the diameter method of hierarchical clustering of the dissimilarities of pseudoindividual C.

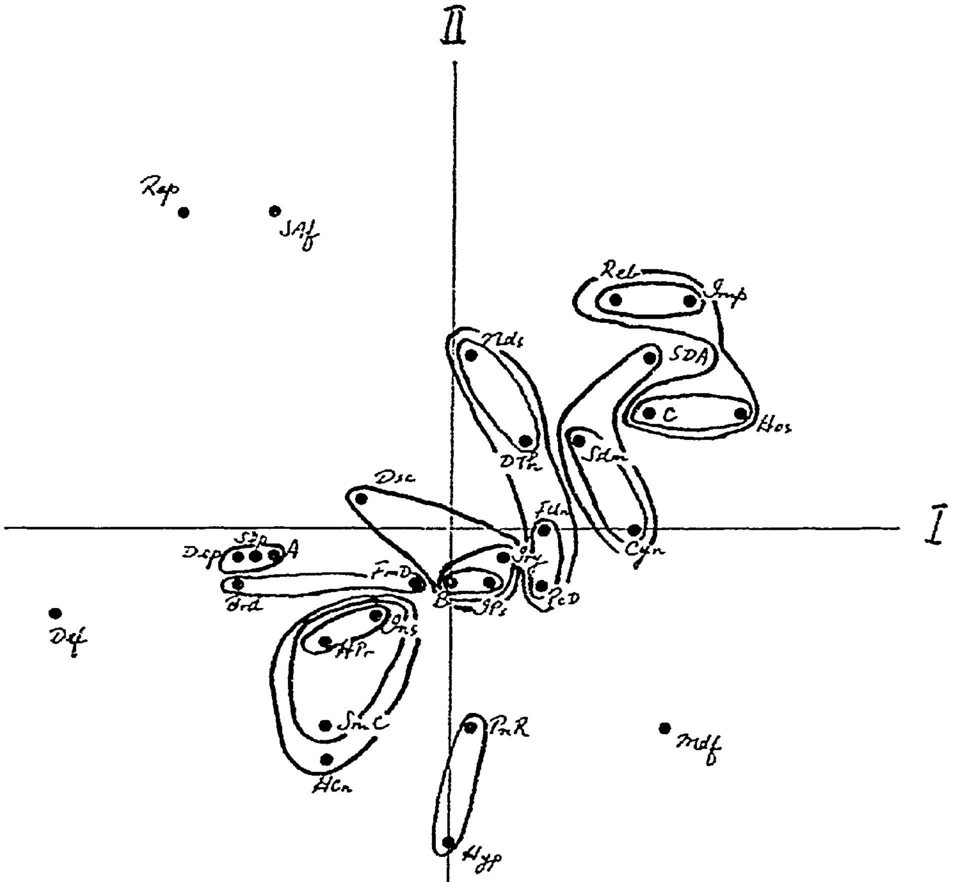

Figure 34. Plot of dimension 1 vs. dimension 2 with selected clusters embedded in the perceptual space of A.

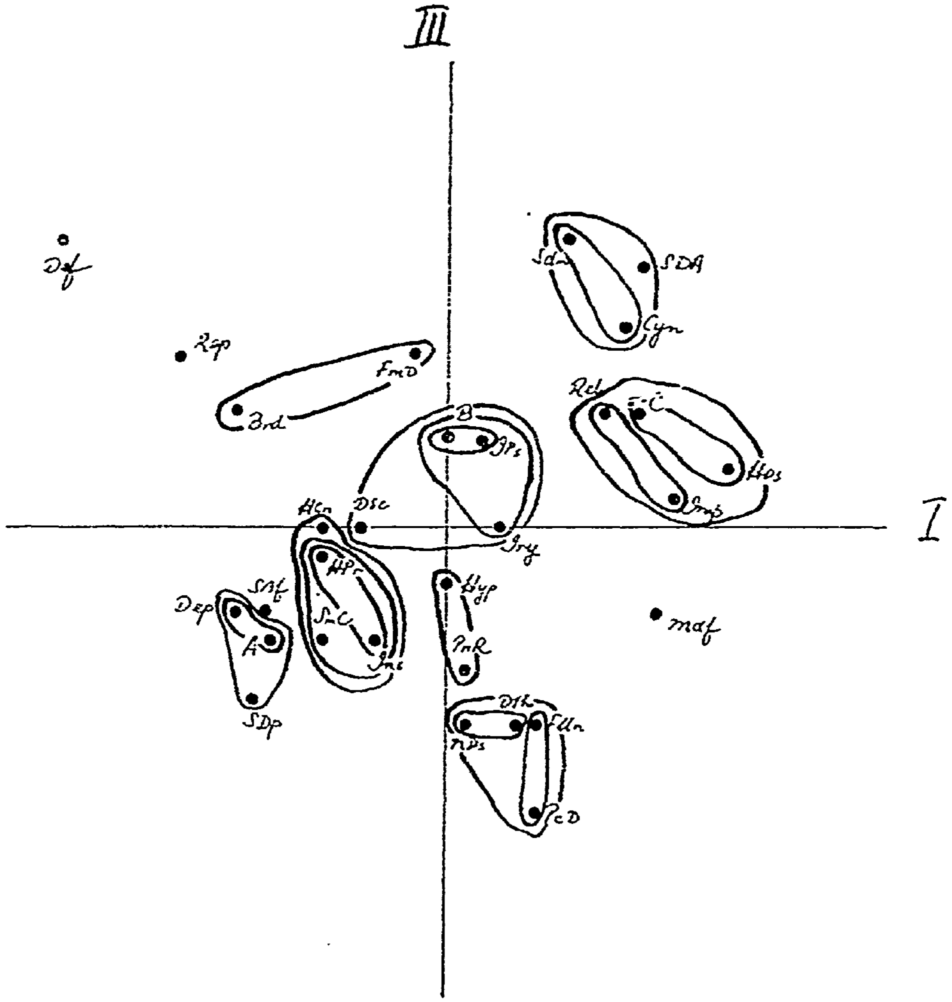

Figure 35. Plot of dimension 1 vs. dimension 3 with selected clusters embedded in the perceptual space of A.

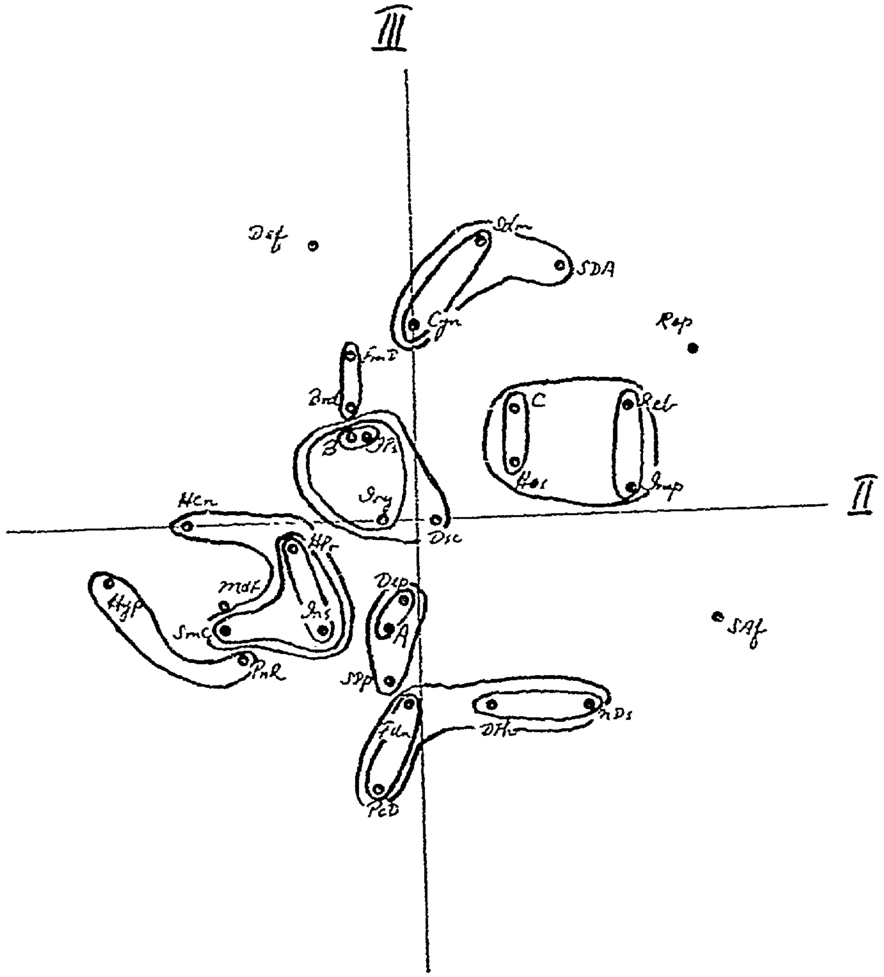

Figure 36. Plot of dimension 2 vs. dimension 3 with selected clusters embedded in the perceptual space of A.

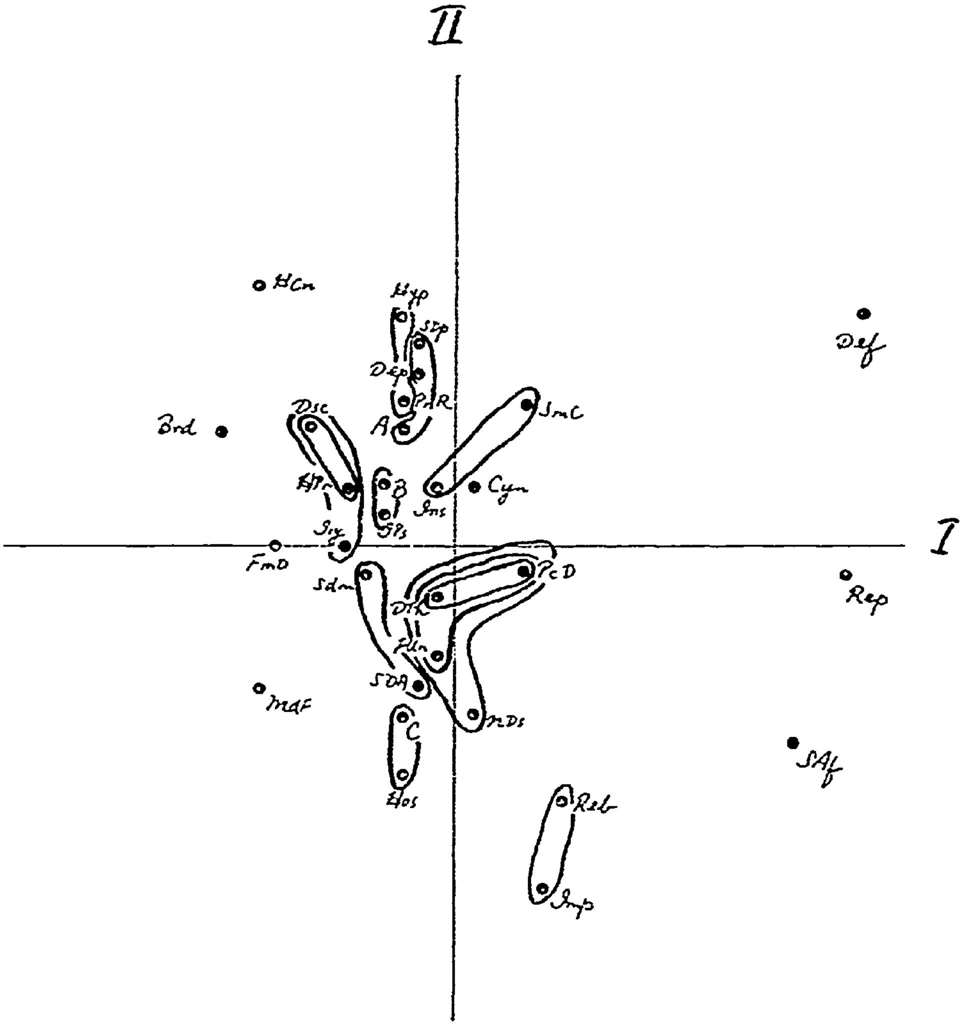

Figure 37. Plot of dimension 1 vs. dimension 2 with selected clusters embedded in the perceptual space of B.

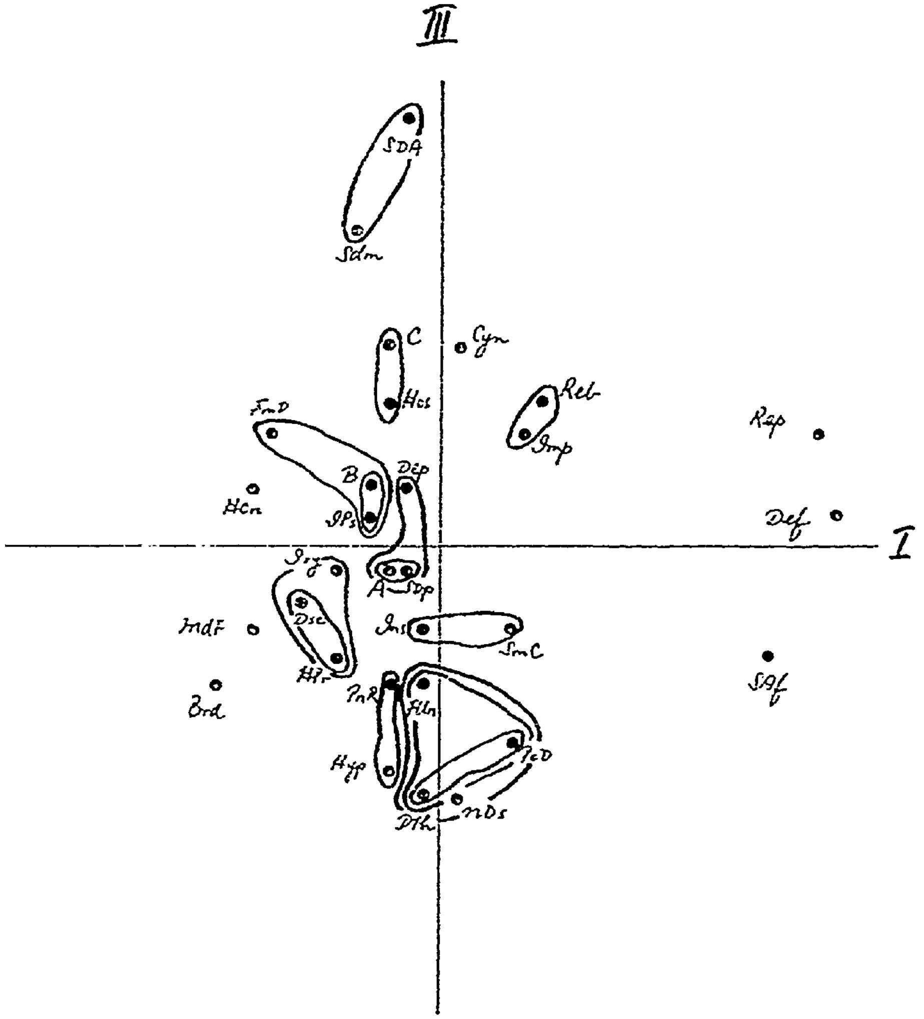

Figure 38. Plot of dimension 1 vs. dimension 3 with selected clusters embedded in the perceptual space of B.

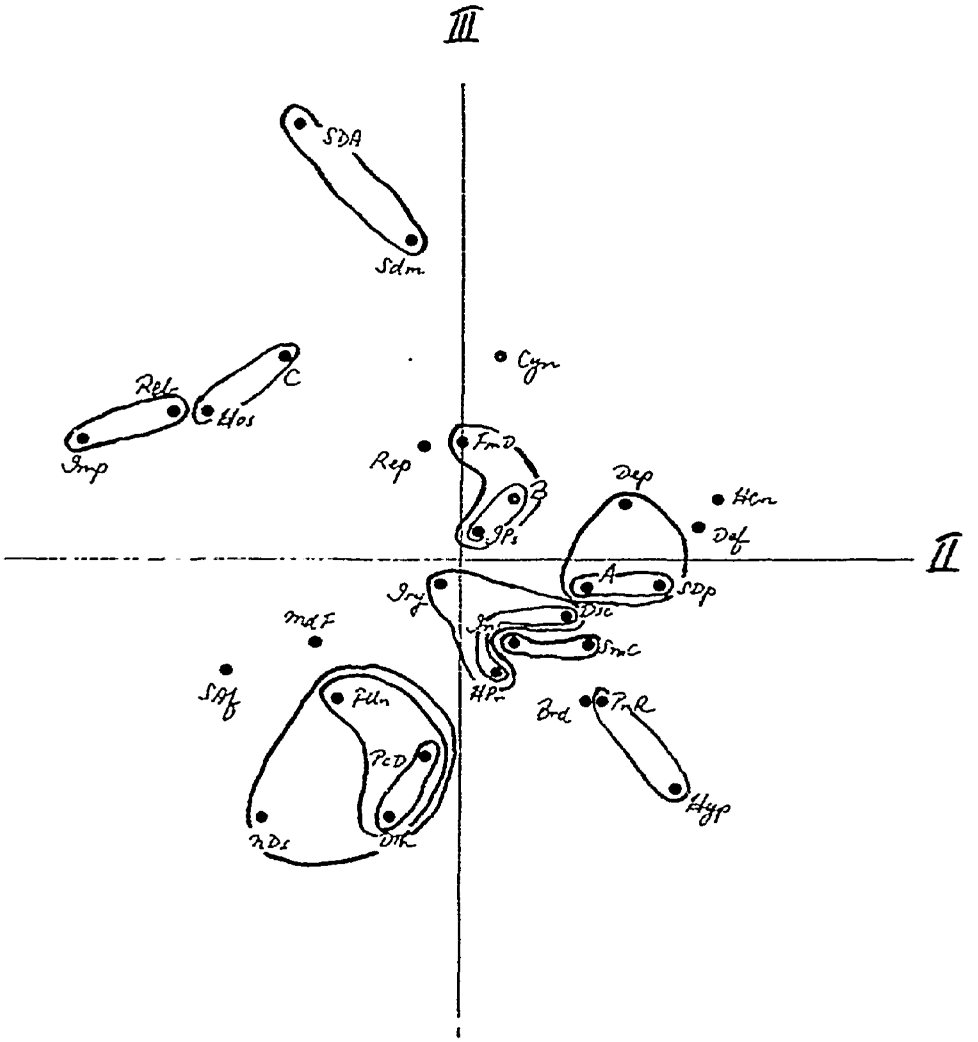

Figure 39. Plot of dimension 2 vs. dimension 3 with selected clusters embedded in the perceptual space of B.

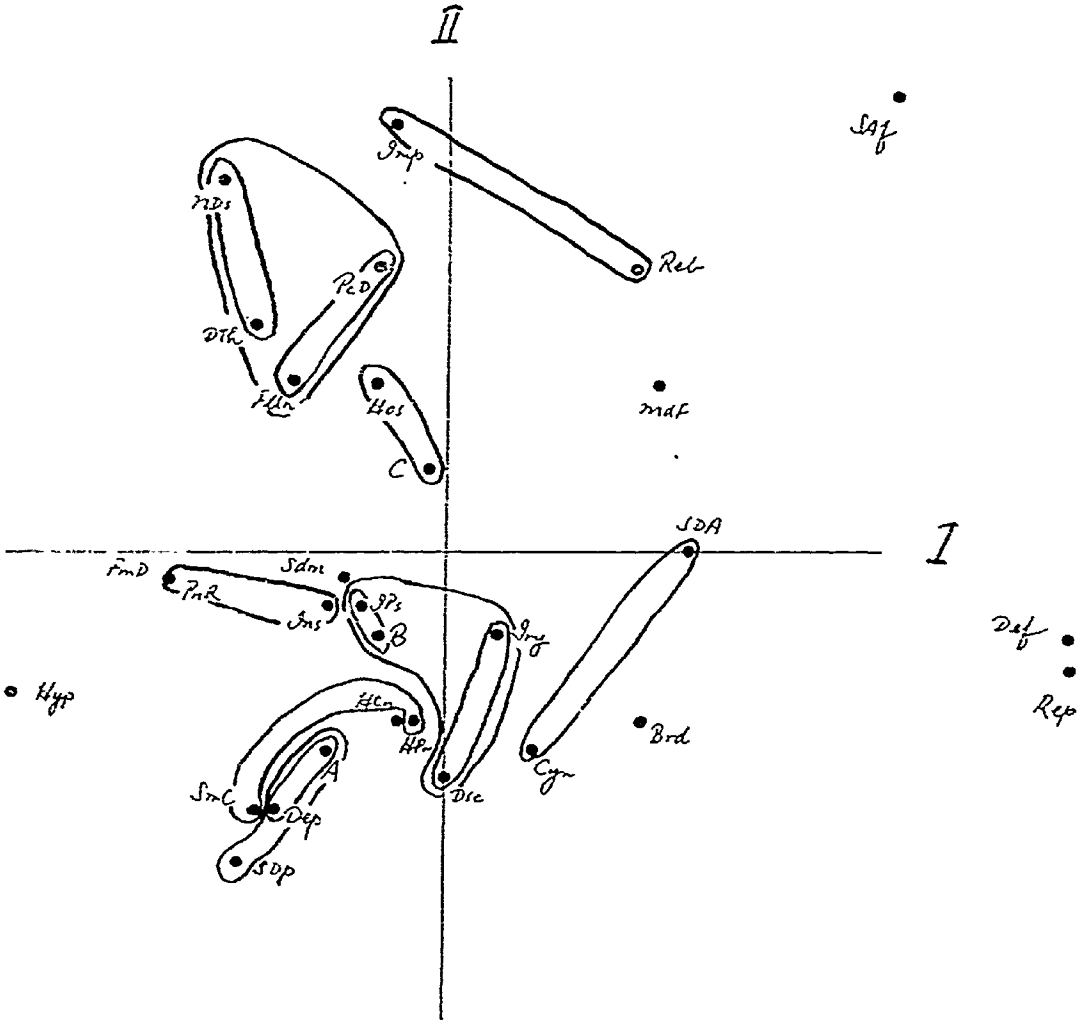

Figure 40. Plot of dimension 1 vs. dimension 2 with selected clusters embedded in the perceptual space of C.

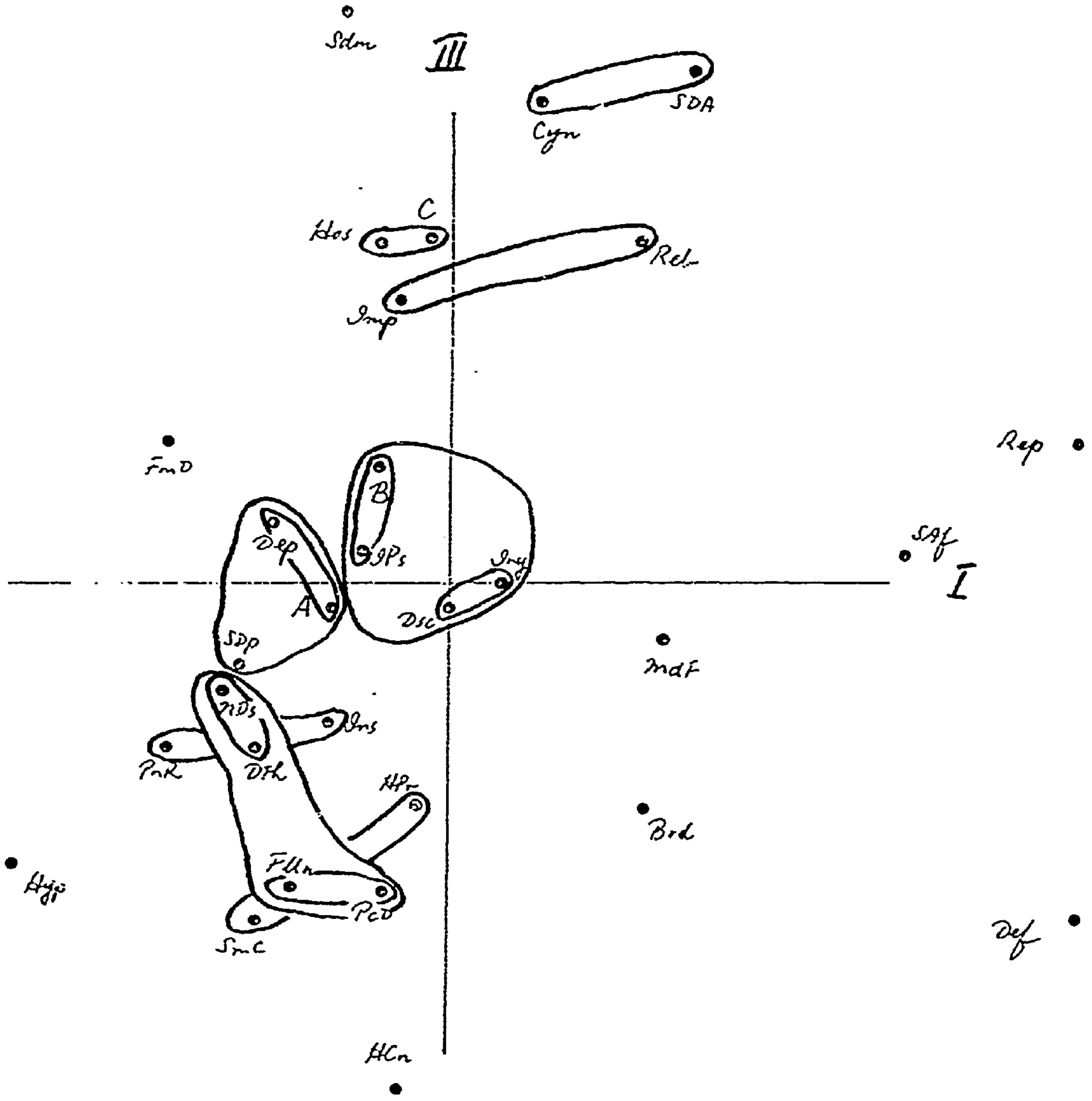

Figure 41. Plot of dimension 1 vs. dimension 3 with selected clusters embedded in the perceptual space of C.

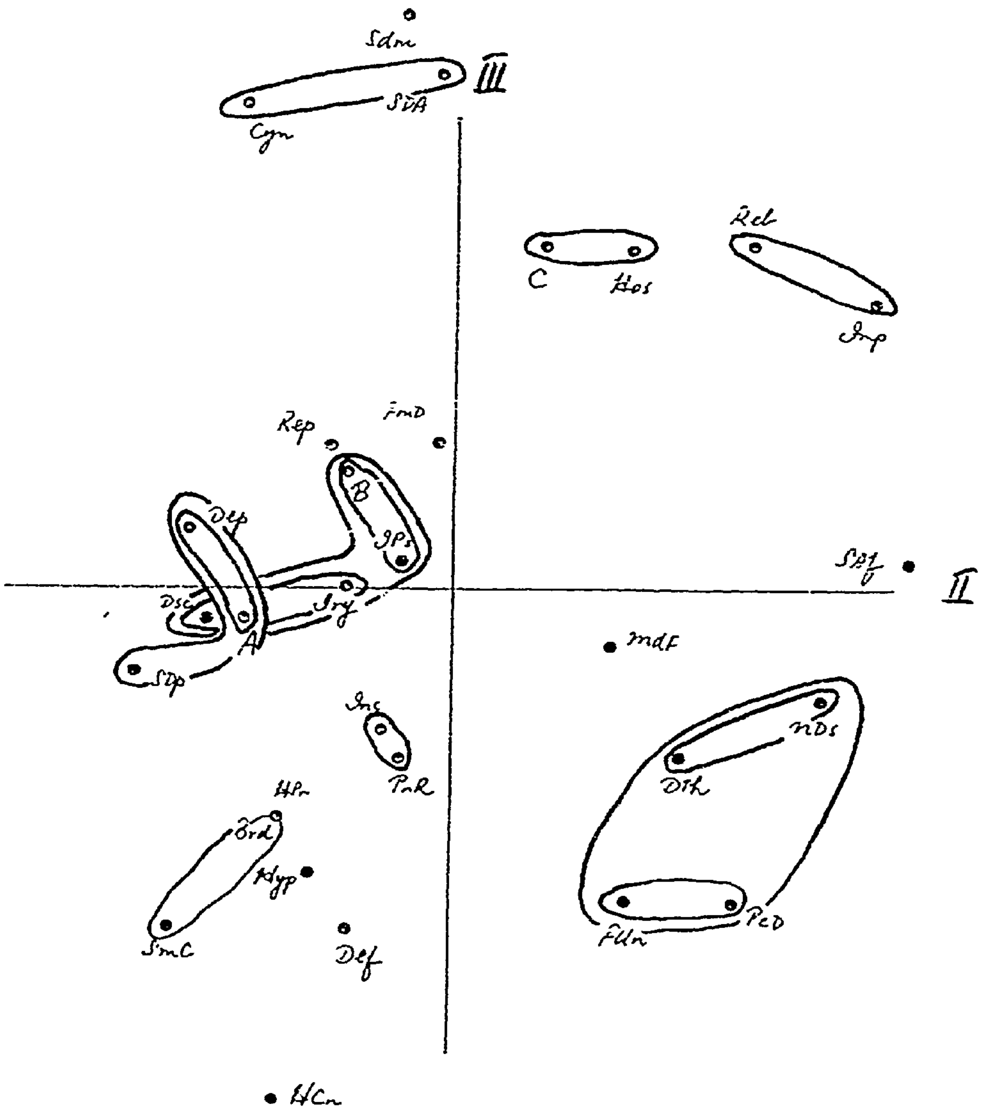

Figure 42. Plot of dimension 2 vs. dimension 3 with selected clusters embedded in the perceptual space of C.

The first cluster consisted of Ideas of Persecution and Type B (a person with a persecution complex). For pseudoindividuals A and C, it was perceived to be associated with Irritability, Desocialization, and for A to some extent with Familial Discord and Broodiness. For pseudoindividual B, it was perceived to be associated with Familial Discord and Cynicism. Thus the preparanoid was perceived as being socially isolated, withdrawn, irritated and characterized by problems of interpersonal conflicts. Compared with its empirical counterpart, this perceived "syndrome" was closely similar to the Modal Profile with salient scales of Ideas of Persecution, Familial Discord, Hypochondriasis, and Cynicism.

The second cluster consisted of Depression, Self-Depreciation, and Type A (a depressed person). For pseudoindividual B, this cluster was perceived to be associated with health complaints. Thus, it was no surprise that clinical depression was perceived as associated with low self-esteem complicated by health problems. The corresponding Modal Profile salient scales were Self-Depreciation, Disorganization of Thinking, Depression, Desocialization, and Panic Reaction, two of which were perceived to be associated with Type A.

The third cluster consisted of Perceptual Distortion, Feelings of Unreality, Neurotic Disorganization and Disorganization of Thinking. This cluster was characterized by constructs depicting the state of being out of touch with reality in seeing, thinking and feeling.

The fourth cluster consisted of three subclusters: Hostility and Type C (an assaultive person), Rebelliousness and Impulsivity, Socially Deviant Attitudes and Sadism. For pseudoindividual A and C, Cynicism was perceived to be associated with Sadism. For C, to some extent, Shallow Affect was perceived to be close to Rebelliousness and Impulsivity. Thus the psychopath was perceived to be hostile, impulsive and rebellious in behaviors and deviant and sadistic in attitudes. The corresponding Modal Profile has salient scales of Rebelliousness, Socially Deviant Attitudes, Hostility, and Sadism, all of which were perceived to be associated with Type C.

The fifth cluster consisted of Insomnia, Somatic Complaints, Hypochondriasis, and Panic Reaction. There were variations for the three pseudoindividuals. For A, Headache Proneness was perceived to be associated with Insomnia and Somatic Complaints, and to some extent with Health Concern. For B, Insomnia was perceived to be associated with Somatic Complaints. For C, Somatic Complaints was associated with Headache Proneness. These were more realistic health complaints. For A and B, Panic Reaction was perceived to be associated with Hypochondriasis. For C, Panic Reaction was perceived to be associated with Insomnia, and to some extent with Hypochondriasis and Health Concern. These were less realistic and more neurotic overreactivity or psychosomatic disorders.

Other differences in the spacing of the constructs were more subtle. For example, for A, Shallow Affect and Repression were perceived to be close together signifying a denial of feelings. Defensiveness and Mood Fluctuation could be regarded as outliners. For B and C, Repression and Defensiveness were associated reflecting a general denial of psychopathology rather than a denial of feelings. A separate cluster could be detected in the perceptual space of B: Desocialization was perceived as being associated with Headache Proneness and with Irritability, and to some extent with Broodiness and Mood Fluctuation. For C, Mood Fluctuation was also close to Broodiness. Thus social isolation with moodiness was distinguished from the affective disorders characterized by clinical depression and low self-esteem.

## Fitting Property Vectors to Individual Perceptual Spaces

Although the property vectors have been found to be inadequate in interpreting the three perceptual spaces, there were group differences in fit. To investigate whether these property vectors were adequate in helping to interpret individual perceptual spaces, and whether there were group differences of experienced and less experienced judges at this level, we employed the same mean ratings of the four properties to search for directions in the individual perceptual spaces of all the judges. The individual spaces were obtained previously via separate scaling of each judge's matrix of dissimilarities using MINDS1. The results of fitting these property vectors to individual spaces are presented in Tables 22, 23 and 24.

Significant multiple Rs between the mean ratings and the projections on fitted vectors for all four properties were found for only a few judges. They were Sample A judges 16 and 17, Sample B judges 6, 10, and 16, Sample C judges 4, 7, and 27. For most judges, a significant fit was obtained for the impulsive-controlled and the optimistic-pessimistic vectors.

In general, for most judges, the desirable-undesirable and the optimistic-pessimistic vectors were highly associated. Notable exceptions were subject 11 of Sample B, subjects 12 and 15 of Sample C though for them both fitted vectors had nonsignificant Rs. The fitted vectors of confused-perceptive and desirable-undesirable scales, and of confused-perceptive and optimistic-pessimistic scales were highly associated for a large number of judges with a lot of individual variations. The fitted impulsive-controlled vector was in general not highly associated with the other three vectors.

To test whether the more experienced Sample A judges and the less experienced Samples B and C judges differed with respect to the fit of the four property vectors in each judge's individual space, a one-way MANOVA was performed. Specifically, the multiple Rs of each judge were treated as a vector of dependent variables and the factor was the three samples. The resulting statistics were: Wilk's Lambda W = .866 and the associated Rao's F(8, 116) = 1.08 ; Lawley-Hotelling

## Table 22

## Fitting Property Vectors to Individual Spaces

## (Sample A Judges)

| | Fitted Vector | | | | Cosine of Angle Between Vectors | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Subject | D | O | I | C | (O,D) | (I,D) | (I,O) | (C,D) | (C,O) | (C,I) |
| 1 | .26 | .43 | .30 | .35 | .99 | .69 | .58 | -.65 | -.53 | -.98 |
| 2 | .37 | .29 | .52* | .50 | .62 | -.34 | .40 | -.80 | -.26 | .25 |
| 3 | .52* | .62** | .40 | .15 | .99 | .46 | .46 | -.58 | -.66 | -.79 |
| 4 | .48 | .69** | .64** | .17 | .95 | .08 | .17 | -.94 | -.94 | -.42 |
| 5 | .52* | .56* | .73** | .47 | .84 | -.27 | .18 | -.58 | -.11 | .43 |
| 6 | .54* | .67** | .70** | .42 | .99 | .11 | .28 | -.69 | -.68 | -.01 |
| 7 | .61** | .72** | .52* | .38 | .99 | .38 | .37 | -.89 | -.85 | -.74 |
| 8 | .44 | .65** | .69** | .14 | .98 | .49 | .49 | .06 | .08 | -.83 |
| 9 | .42 | .60** | .63** | .34 | 1.00 | .81 | .78 | -.51 | -.48 | -.89 |
| 10 | .45 | .59** | .63** | .44 | .97 | .39 | .44 | -.94 | -.83 | -.39 |
| 11 | .19 | .33 | .76** | .41 | .84 | -.02 | .49 | -.87 | -.49 | .36 |
| 12 | .44 | .46 | .50 | .62** | .64 | .02 | .78 | -.72 | -.16 | .34 |
| 13 | .48 | .45 | .58* | .30 | .94 | -.21 | .13 | -.89 | -.81 | .35 |
| 14 | .46 | .35 | .69** | .36 | .79 | .21 | .72 | -.49 | .08 | .44 |
| 15 | .28 | .35 | .59* | .13 | .87 | .24 | .62 | .38 | .11 | .13 |
| 16 | .71** | .67** | .58* | .69** | .89 | -.45 | -.13 | -.89 | -.67 | .33 |
| 17 | .51* | .56* | .60** | .52* | .79 | -.26 | .38 | -.69 | -.27 | .62 |
| 18 | .28 | .40 | .71** | .33 | .91 | .55 | .77 | -.97 | -.78 | -.35 |

Note. D is desirable-undesirable, O is optimistic-pessimistic, I is impulsive-controlled, C is confused-perceptive.

*$p < .05$

**$p < .01$

## Table 23

## Fitting Property Vectors to Individual Spaces

## (Sample B Judges)

| | Fitted Vector | | | | Cosine of Angle Between Vectors | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Subject | D | O | I | C | (O,D) | (I,D) | (I,O) | (C,D) | (C,O) | (C,I) |
| 1 | .40 | .57* | .50 | .36 | .97 | .61 | .42 | -.92 | -.82 | -.86 |
| 2 | .48 | .39 | .62** | .48 | .95 | .01 | .32 | -.95 | -.90 | -.12 |
| 3 | .55* | .69** | .40 | .34 | .96 | .74 | .51 | -.75 | -.57 | -.87 |
| 4 | .62** | .74** | .48 | .39 | .97 | -.20 | .04 | -.99 | -.92 | .33 |
| 5 | .43 | .48 | .49 | .23 | .99 | -.14 | -.10 | -.42 | -.50 | .58 |
| 6 | .61** | .76** | .71** | .52* | .81 | -.40 | -.09 | -.88 | -.45 | .40 |
| 7 | .51* | .54* | .24 | .49 | .84 | .10 | .54 | -.70 | -.39 | -.11 |
| 8 | .66** | .71** | .29 | .61** | .91 | .25 | .51 | -.82 | -.61 | -.29 |
| 9 | .65** | .68** | .55* | .35 | .93 | .25 | .51 | -.96 | -.81 | -.23 |
| 10 | .65** | .67** | .59* | .54* | .99 | .38 | .37 | -.78 | -.69 | -.43 |
| 11 | .13 | .21 | .78** | .23 | .40 | .41 | .86 | .50 | .50 | .05 |
| 12 | .49 | .49 | .69** | .57* | .87 | .02 | .48 | -1.00 | -.85 | .04 |
| 13 | .42 | .50 | .63** | .52* | .79 | -.49 | .08 | -.94 | -.62 | .51 |
| 14 | .44 | .66** | .55* | .25 | .93 | .25 | .60 | -.39 | -.21 | .37 |
| 15 | .45 | .49 | .83** | .68** | .86 | .28 | .66 | -.96 | -.71 | -.01 |
| 16 | .74** | .79** | .61* | .53* | .92 | -.27 | .08 | -.85 | -.68 | .19 |
| 17 | .33 | .46 | .55* | .36 | .91 | .98 | .81 | -.82 | -.85 | -.74 |
| 18 | .60** | .57 | .20 | .45 | .89 | .59 | .83 | -.85 | -.69 | -.60 |
| 19 | .48 | .37 | .80** | .26 | .84 | -.36 | -.05 | -.32 | .24 | .70 |

*Note*. D is desirable-undesirable, O is optimistic-pessimistic, I is impulsive-controlled, C is confused-perceptive.

$^{*}p < .05$

$^{**}p < .01$

## Table 24

## Fitting Property Vectors to Individual Spaces

## (Sample C Judges)

| | Fitted Vector | | | | Cosine of Angle Between Vectors | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Subject | D | O | I | C | (O,D) | (I,D) | (I,O) | (C,D) | (C,O) | (C,I) |
| 1 | .52* | .72** | .61** | .36 | .94 | .57 | .81 | -.80 | -.65 | -.23 |
| 2 | .60** | .76** | .52* | .40 | .99 | .81 | .74 | -.70 | -.64 | -.88 |
| 3 | .68** | .71** | .45 | .51* | .99 | -.16 | .00 | -.80 | -.86 | -.30 |
| 4 | .65** | .62** | .56* | .73** | .82 | -.08 | .37 | -.85 | -.46 | .60 |
| 5 | .47 | .52* | .53* | .36 | .90 | -.53 | -.15 | -.86 | -.57 | .71 |
| 6 | .54* | .54* | .39 | .45 | .99 | .58 | .68 | -.93 | -.97 | -.60 |
| 7 | .65** | .70** | .83** | .62** | .95 | -.27 | .05 | -.86 | -.73 | .43 |
| 8 | .53* | .38 | .74** | .65** | .71 | -.18 | .41 | -1.00 | -.68 | .24 |
| 9 | .52* | .72** | .39 | .41 | .97 | .34 | .20 | -.64 | -.50 | -.94 |
| 10 | .42 | .59** | .69** | .21 | .89 | .67 | .87 | -.49 | -.27 | -.45 |
| 11 | .56* | .74** | .37 | .35 | .97 | .31 | .43 | -.85 | -.86 | -.75 |
| 12 | .24 | .27 | .41 | .33 | .50 | -.80 | -.01 | -.68 | .03 | .50 |
| 13 | .48 | .59** | .26 | .48 | .96 | .02 | .12 | -.92 | -.93 | -.40 |
| 14 | .37 | .49 | .22 | .40 | .77 | .84 | .47 | -.71 | -.26 | -.97 |
| 15 | .18 | .19 | .69** | .45 | -.18 | -.81 | -.43 | -.75 | .23 | .60 |
| 16 | .45 | .56* | .69** | .47 | .93 | -.21 | .13 | -.69 | -.44 | .44 |
| 17 | .48 | .34 | .42 | .41 | 1.00 | -.30 | -.24 | -.88 | -.92 | -.14 |
| 18 | .37 | .38 | .52* | .28 | .96 | -.33 | -.08 | -.83 | -.92 | -.11 |
| 19 | .52* | .54* | .47 | .60** | .90 | -.56 | -.21 | -.97 | -.76 | .64 |
| 20 | .48 | .60** | .33 | .51* | .84 | .36 | .79 | -.68 | -.33 | -.01 |
| 21 | .49 | .43 | .30 | .47 | .96 | -.62 | -.38 | -.79 | -.71 | .53 |
| 22 | .34 | .35 | .72** | .51* | .91 | .04 | .35 | -.90 | -.62 | .35 |
| 23 | .50 | .59* | .64** | .44 | .88 | -.01 | .46 | -.86 | -.67 | .30 |
| 24 | .41 | .52* | .69** | .31 | 1.00 | .45 | .44 | .01 | -.06 | -.06 |
| 25 | .27 | .22 | .34 | .36 | .95 | .06 | .31 | -.63 | -.80 | -.81 |
| 26 | .16 | .23 | .40 | .12 | .71 | -.39 | .00 | .77 | .10 | -.58 |
| 27 | .60** | .60** | .55* | .66** | .91 | -.65 | -.31 | -.87 | -.68 | .60 |

_Note_. D is desirable-undesirable, O is optimistic-pessimistic, I is impulsive-controlled, C is confused-perceptive.

$^{*}p < .05$

$^{**}p < .01$

Trace T = .151, Roy's Largest Root R = .101 ($s = 2$, $m = \frac{1}{2}$, $n = 28$). All the criteria indicated no significant differences in fit among the samples.

## Correspondence between Perceptual Spaces and Self-Reported Data

To assess the relative "validity" of the perceptual spaces of psychopathology, self-reported data to the DPI from different samples were used as criteria. Specifically, principal component analyses were performed on each of the correlation matrices computed from the 27 DPI content scale scores from three abnormal samples (alcoholic patients, prison inmates, and psychiatric patients), and one normal sample (college students). For comparison, the total group correlation matrix was also analyzed. The derived component structures were regarded as the empirical self-reported structure of psychopathology against which the perceptual spaces could be compared.

The resulting principal components having eigenvalues exceeding unity were different for different samples. There were 6 for the alcoholic patient group (64.90% of the variance), 5 for the prison inmate group (62.80% of the variance), 5 for the psychiatric patient group (65.34% of the variance), 7 for the college student group (62.70% of the variance), and 5 for the total group (62.18% of the variance). For convenience, the first three components in each analysis were retained for comparison. The three components accounted for 50.80% of the variance in the alcoholic sample, 52.80% in the prison sample, 54.72% in the psychiatric sample, and 42.28% in the college sample. For the total sample, the three components accounted for 52.33% of the variance. The three varimax rotated components for each sample and the total sample are shown in Appendices 7 to 11.

To compare the configurations with these self-reported empirical structures, the first 27 stimuli of the configurations were used. Canonical correlations were computed between all pairs of configurations (A, B, C, and common) and the component structures (alcoholic, prison, psychiatric, college, and total). A procrustean rotational procedure (Schönemann & Carroll, 1970) was also employed to fit the inferential configurations to the empirical structures. The results are summarized in Tables 25 to 29.

In general, the canonical correlations for all paired comparisons indicated an overall correspondence between the inferential configurations of experienced and less experienced judges and the self-reported component structures generalizable across normal and abnormal groups. The Pearson product-moment correlations between the best fitted dimensions and the corresponding three varimax rotated components of each sample also indicated moderately high correspondence between dimensions and components. Comparing the different configurations with respect to the fit to a particular criterion sample, the fit indices did not differ very much from one

# Table 25

## Comparing Configurations with Self-Reported Data from Alcoholic Sample

| Configuration | Canonical Correlation | | Wilk's Lambda | $\chi^2$ | df | Correlation | Fit Index E | Fit Index L | Fit Index S |
|---|---|---|---|---|---|---|---|---|---|
| A | 1 | .88 | .123 | 49.25** | 9 | .71 | .0911 | .3340 | .5997 |
| | 2 | .68 | .531 | 14.88* | 4 | .58 | | | |
| | 3 | .15 | .976 | .56 | 1 | .66 | | | |
| B | 1 | .88 | .065 | 64.18** | 9 | .74 | .0912 | .3091 | .5550 |
| | 2 | .84 | .286 | 29.41** | 4 | .64 | | | |
| | 3 | .01 | 1.000 | .00 | 1 | .66 | | | |
| C | 1 | .91 | .067 | 63.68** | 9 | .73 | .0888 | .3210 | .5764 |
| | 2 | .78 | .394 | 21.91** | 4 | .48 | | | |
| | 3 | .03 | .999 | .02 | 1 | .80 | | | |
| Common | 1 | .91 | .059 | 66.67** | 9 | .73 | .0886 | .3185 | .5718 |
| | 2 | .81 | .341 | 25.25** | 4 | .49 | | | |
| | 3 | .00 | 1.000 | .00 | 1 | .82 | | | |

Note. Correlation denotes the Pearson product-moment correlation between the three best fitted dimensions and the varimax rotated three components. All are $p < .05$, one-tailed. $\chi^2$ test for canonical correlation is confined to descriptive purposes.

$^{*}p < .005$

$^{**}p < .001$

## Table 26

## Comparing Configurations with Self-Reported Data From Prison Sample

| Configuration |  | Canonical Correlation | Wilk's Lambda | $\chi^2$ | df | Correlation | Fit Index E | Fit Index L | Fit Index S |
|---|---|---|---|---|---|---|---|---|---|
| A | 1 | .88 | .061 | 65.89* | 9 | .76 | .0832 | .2339 | .4674 |
|  | 2 | .82 | .272 | 30.56* | 4 | .75 |  |  |  |
|  | 3 | .40 | .840 | 4.09 | 1 | .69 |  |  |  |
| B | 1 | .91 | .043 | 73.98* | 9 | .82 | .0893 | .2469 | .4934 |
|  | 2 | .85 | .259 | 31.78* | 4 | .85 |  |  |  |
|  | 3 | .22 | .951 | 1.17 | 1 | .43 |  |  |  |
| C | 1 | .90 | .077 | 60.18* | 9 | .78 | .0947 | .2775 | .5546 |
|  | 2 | .76 | .418 | 20.49* | 4 | .81 |  |  |  |
|  | 3 | .08 | .993 | .16 | 1 | $.30^{+}$ |  |  |  |
| Common | 1 | .90 | .067 | 63.51* | 9 | .80 | .0836 | .2680 | .5355 |
|  | 2 | .80 | .356 | 24.24* | 4 | .82 |  |  |  |
|  | 3 | .07 | .994 | .13 | 1 | $.31^{+}$ |  |  |  |

_Note_. Correlation denotes the Pearson product-moment correlation between the three best fitted dimensions and the varimax rotated three components. All except denoted by + are $p < .05$, one tailed.

$\chi^2$ test for canonical correlation is confined to descriptive purposes.

*$p < .001$

## Table 27

## Comparing Configurations with Self-Reported Data From Psychiatric Sample

| Configuration | | Canonical Correlation | Wilk's Lambda | $\chi^2$ | df | Correlation | Fit Index | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | E | L | S |
| A | 1 | .86 | .109 | 52.02* | 9 | .49 | .0901 | .3448 | .6200 |
| | 2 | .75 | .411 | 20.90* | 4 | .79 | | | |
| | 3 | .22 | .953 | 1.13 | 1 | .59 | | | |
| B | 1 | .87 | .084 | 58.10* | 9 | .68 | .0898 | .3413 | .6136 |
| | 2 | .81 | .340 | 25.37* | 4 | .74 | | | |
| | 3 | .11 | .989 | .26 | 1 | .42 | | | |
| C | 1 | .89 | .077 | 60.23* | 9 | .55 | .0895 | .3456 | .6214 |
| | 2 | .79 | .373 | 23.20* | 4 | .75 | | | |
| | 3 | .10 | .989 | .25 | 1 | .60 | | | |
| Common | 1 | .88 | .068 | 63.13* | 9 | .52 | .0960 | .3491 | .6276 |
| | 2 | .84 | .302 | 28.13* | 4 | .79 | | | |
| | 3 | .03 | .999 | .02 | 1 | .55 | | | |

Note. Correlation denotes the Pearson product-moment correlation between the three best fitted dimensions and the varimax rotated three components. All are $p < .05$, one-tailed.

$\chi^2$ test for canonical correlation is confined to descriptive purposes.

$^*p < .001$

## Table 28

## Comparing Configurations with Self-Reported Data From College Sample

| Configuration | | Canonical Correlation | Wilk's Lambda | $\chi^2$ | df | Correlation | Fit Index | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | E | L | S |
| A | 1 | .89 | .083 | 58.45* | 9 | .65 | .0844 | .2886 | .5259 |
| | 2 | .78 | .387 | 22.30* | 4 | .70 | | | |
| | 3 | .17 | .970 | .70 | 1 | .75 | | | |
| B | 1 | .94 | .029 | 83.22* | 9 | .76 | .0856 | .2686 | .4894 |
| | 2 | .87 | .235 | 34.03* | 4 | .70 | | | |
| | 3 | .13 | .983 | .39 | 1 | .72 | | | |
| C | 1 | .87 | .101 | 53.80* | 9 | .76 | .0884 | .3032 | .5525 |
| | 2 | .73 | .430 | 19.82* | 4 | .52 | | | |
| | 3 | .28 | .921 | 1.92 | 1 | .76 | | | |
| Common | 1 | .90 | .074 | 61.13* | 9 | .76 | .0851 | .2881 | .5250 |
| | 2 | .78 | .384 | 22.52* | 4 | .54 | | | |
| | 3 | .19 | .963 | .89 | 1 | .81 | | | |

Note. Correlation denotes the Pearson product-moment correlation between the three best fitted dimensions and the varimax rotated three components. All are $p < .05$, one-tailed. $\chi^2$ test for canonical correlation is confined to descriptive purposes.

*$p < .001$

## Table 29

## Comparing Configurations with Self-Reported Data From Total Sample (Alcoholic, Prison, Psychiatric, College)

| Configuration | | Canonical Correlation | Wilk's Lambda | $\chi^2$ | df | Correlation | Fit Index | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | E | L | S |
| A | 1 | .90 | .089 | 56.82* | 9 | .72 | .0883 | .2732 | .5333 |
| | 2 | .72 | .462 | 18.14* | 4 | .75 | | | |
| | 3 | .21 | .958 | 1.01 | 1 | .59 | | | |
| B | 1 | .91 | .049 | 70.84* | 9 | .77 | .0917 | .2650 | .5174 |
| | 2 | .85 | .281 | 29.80* | 4 | .73 | | | |
| | 3 | .07 | .995 | .12 | 1 | .60 | | | |
| C | 1 | .89 | .082 | 58.86* | 9 | .77 | .0935 | .2882 | .5627 |
| | 2 | .78 | .400 | 21.56* | 4 | .78 | | | |
| | 3 | .03 | .999 | .02 | 1 | .44 | | | |
| Common | 1 | .90 | .065 | 64.27* | 9 | .77 | .0853 | .2772 | .5413 |
| | 2 | .81 | .347 | 24.86* | 4 | .78 | | | |
| | 3 | .01 | 1.000 | .00 | 1 | .48 | | | |

Note. Correlation denotes the Pearson product-moment correlation between the three best fitted dimensions and the varimax rotated three components. All are $p < .05$, one-tailed. $\chi^2$ test for canonical correlation is confined to descriptive purposes.

$^*p < .001$

comparison to another. For A, the best fit was to the prison inmate group, and the second best was to the college student group, whereas for B and C, the best fit was to the college student group, and the second best was to the prison inmate group. For all configurations, the poorest fit was to the psychiatric patient group. Using the component structure of the total sample as the criterion, the configuration which gave the best fit was A when the index E was used, and was B when the indices L and S were used. C provided the poorest fit based on all the three indices.

## Discussion

This study, like the study of Chan and Jackson (1976), serves to expand the notion of implicit personality theory by extending it to include the notion of an implicit theory of psychopathology. In addition, this study sought to uncover significant individual differences in the perception of psychopathology, focusing on the comparison between an experienced group of judges and two less experienced groups of judges. The analysis performed on the self-reported measure of the experience of the judges with respect to observations of psychopathological behaviors and interactions with psychopathological groups showed that the difference between experienced and less experienced judges was small but in the right direction. It is recognized that the experienced judges, who are graduate students, are probably "brighter" and more motivated in performing the judgment tasks. These judges, in addition, may be more experienced in structuring, categorizing and organizing information.

Our multidimensional scaling analyses, using a weighted Euclidean model, revealed that there could be many statistically significant dimensions both for the perceptual spaces of the experienced and the less experienced groups. Since parsimony and visualizability would be better served at a lower dimensionality, and based on the criteria of interpretability of dimensions and goodness of fit indices, we indicated that at least three dimensions would be adequate for the representation of the perceptual space of the experienced judges, and two or possibly three dimensions would be adequate for the less experienced judges. For convenience, we chose three dimensions across the three groups for further analyses. We also compared the three-dimensional weighted group solutions with solutions obtained using an unweighted Euclidean model analyzed separately for each judge and for judges of the three samples as three groups. It was found that individual differences could be much more complex than simple weighting the dimensions of the group perceptual spaces. However, the solutions derived from this individual differences model (the weighted model) did represent a considerable improvement over the group solutions derived from the unweighted model.

To assess the similarity and differences of the implicit theories of the experienced and less experienced judges, we compared the perceptual spaces of the experienced and the less experienced groups. It appeared that the perceptual spaces of the three groups were not radically dissimilar. Multiple regression analysis using external bipolar ratings on four properties and clustering analysis were employed to help interpret the spaces. Despite differential spacing of the constructs or traits in the spaces, the three dimensions of each perceptual space were interpreted in a closely similar manner. A common perceptual space was also postulated for all judges.

The three common dimensions were tentatively labelled as impulse expression vs. inhibition and withdrawal, general severity of psychopathology, and denial of feelings and dysfunctional coping vs. resignation and a failure in active coping. These three dimensions, especially the first two, were similar to the dimensions in the TORSCA group solution reported by Chan and Jackson (1976) using the same set of constructs. The second dimension was also found in the Rosenberg and Cohen study (1977).

Further, the clustering analysis also revealed the perception of the three common clinical types in relation to the traits in the perceptual spaces. The traits which were found to be close to the clinical types were similar to the salient traits of empirically identified counterparts called Modal Profiles (Skinner, 1975), suggesting that people's perception of these clinical types might not be entirely invalid stereotypes.

Related to the examination of clinical types is the bearing of this study on the relative "validity" of the implicit theory of psychopathology, that is, the veridicality of the perception of the general covariation of psychopathological behaviors or characteristics in people. Using the three perceptual spaces and the common space, we found moderately high correspondence between the spaces and the component structures derived from self-reported data from alcoholic patients, prison inmates, psychiatric patients, and college students. The results suggested that instead of biasing the accurate judgments of others, the implicit theory of psychopathology may provide a relatively "valid" and meaningful basis for inferential judgments with respect to specific target persons. It is recognized that "validity," for our purposes, was used in a relatively restricted sense, being limited to assessing the implicit theory against self-reported data. The investigation of inferential judgments will be described in the next chapter.

# CHAPTER 6

# STUDY 2:

# INFERENTIAL JUDGMENTS OF PSYCHOPATHOLOGY

## Method

### Subjects

Four samples of subjects provided the inferential judgment data in the "person judgment" task. Samples A, B, and C were comprised of the same judges in Study 1. Sample D was comprised of 18 undergraduates at the University of Western Ontario. Judges in Samples C and D also completed the Jackson Personality Inventory (JPI) (Jackson, 1976), and received their personality profiles. Sample A was a group of volunteer psychology graduate students. Sample B, C, and D were groups of undergraduate students receiving credits toward fulfilment of requirement for an introductory psychology course. Sample D judges were kept separate from judges in Samples B and C as no similarity judgment data were previously obtained from them.

### Stimulus Materials

The same two sets of items used in Study 1 for the similarity judgment task were also employed for the inferential judgments with respect to three specific targets. These three specific targets were presented in the form of paragraph descriptions reflecting the salient scales of three abnormal Modal Profiles corresponding to the three clinical types in Study 1. A Modal Profile is defined as "a hypothetical profile pattern representative of frequently occurring persons in a population" (Skinner, 1975). The abnormal

Modal Profiles used in this study were empirically identified from classification procedures by Skinner (1975, 1976) based on a multiprofile-multisample analysis of DPI data from two alcoholic, two prison, and two psychiatric samples (N = 664).

Specifically, two targets, Jim Armstrong, and Jack Crawford, were adapted and modified from the descriptions of Jim Anderson and Jack Cole in Reed (1976), and one target, John Bradley, was adapted and modified from the description of John Bailey in Reed and Jackson (1975). The actual descriptions adapted for this study and their corresponding DPI salient scales on the corresponding Modal Profiles are shown in Table 30.

The JPI was chosen over other inventories for assessing judges' personality characteristics for two specific reasons. First, the JPI assesses personality characteristics relating to the interpersonal domain, which is important in perception and judgment. Second, the inventory was constructed in a similar manner as the construction of the PRF. An explicit concern for content saturation and suppression of response biases yield an inventory with scales of high validities and reliabilities (Jackson, 1976).

## Procedure

Each of the judges in all four samples were given the description of Jim Armstrong, and asked how likely this person, described as real, would respond "true" to each of the 27 items in Item Set A. Ratings were made on a nine point scale ranging from "not at all likely" (1)

## Table 30

## The Three Targets

Jim Armstrong (Modal Profile III+)

Recently Jim Armstrong has been feeling very downhearted and "blue". He engages in little activity, and is easily scared. He is rarely seen with other people, and he seldom talks to the few friends he has. Jim holds a very poor opinion of himself and generally thinks he is pretty worthless. When his friends try to talk to him about the ways he feels, Jim becomes noticeably uncomfortable and tries to change the subject. His friends say that he often appears markedly confused, and cannot remember even simple things from day to day. (Salient scales: Self-Depreciation, Disorganization of Thinking, Depression, Desocialization, Panic Reaction)

John Bradley (Modal Profile V-)

John Bradley is a very quiet person. He keeps his thought to himself and is extremely relunctant to share his ideas with others. This is due to a general mistrust of people and a lack of faith in their motives. Although he seems to love his wife, there are many unresolved conflicts in their marriage. John spends much time brooding over his problems, and thinks that he has an illness which he cannot exactly locate. He has become obsessed with the idea that his wife is "cheating" on him and is planning to leave him for another man. (Salient scales: Ideas of Persecution, Familial Discord, Hypochondriasis, Broodiness, Cynicism)

Jack Crawford (Modal Profile III-)

Jack Crawford has been arrested several times for theft. He says he does not feel guilty about his behavior, and does not appear to worry about being caught. Recently, Jack lost a job in a factory because he refused to take his lunch break at the specified time. In his personnel file are recorded several incidents in which he refused to cooperate with and even acted aggressively toward his supervisors. In addition, twice it was observed that Jack enjoyed playing rather cruel tricks on fellow workers. (Salient scales: Rebelliousness, Socially Deviant Attitudes, Hostility, Sadism) to "extremely likely" (9). This was repeated for John Bradley, and then for Jack Crawford. The whole procedure was then replicated with Item Set B. The replication approach was based on the notion that one item representing a construct might not be as reliable as was desired.

The JPI was administered to Sample C and D judges with standard instructions in another session. Some subjects were allowed to complete the inventory at home. All experimental sessions took place in small groups of less than twenty subjects, and each session lasted about 45 minutes.

## Results

Inferential judgments of each judge of Samples A, B, and C for Item Set A and Item Set B were aggregated and averaged cell by cell separately with respect to each target resulting in three sets of inferential judgments, one for each target. To examine how the perceptual space of psychopathology was utilized to arrive at the inferential judgments with respect to the three targets, two levels of analyses were undertaken.

### Common Perceptual Space Analysis

At the group level, a common perceptual space was employed. First, the reproduced distances of the first 27 stimuli for the three pseudoindividuals in Study 1 were reanalyzed for a three dimensional solution using MLMDS3. The results of the analysis are shown in Appendix 12. The resulting configuration was regarded as the common perceptual space of psychopathology for all judges in Samples A, B and C, and is shown in Table 31.

Second, the mean inferential judgments of judges of each sample (A, B, and C) with respect to each target were used as input to the metric version of PREFMAP. Specifically, four models, that is, the linear-quadratic hierarchy of models discussed in Chapter 4, were fitted to the inferential judgments with respect to each target. The most general model was applied in Phase 1, and most restricted model was applied in Phase 4.

Table 31

The Common Perceptual Space and Weight Matrix

| Stimulus | Dimension I | II | III |
|---|---|---|---|
| 1 Insomnia | -11.93 | -2.79 | -2.60 |
| 2 Headache Proneness | -13.20 | 3.45 | .70 |
| 3 Broodiness | -10.24 | 16.19 | 2.70 |
| 4 Cynicism | 17.93 | 7.85 | -14.69 |
| 5 Depression | -10.70 | 5.15 | -14.44 |
| 6 Desocialization | -6.36 | 7.21 | -4.85 |
| 7 Disorganization of Thinking | -6.54 | -18.83 | 6.37 |
| 8 Familial Discord | 3.49 | -2.77 | -16.42 |
| 9 Feelings of Unreality | -8.31 | -12.53 | 9.94 |
| 10 Health Concern | -25.75 | 13.02 | -4.07 |
| 11 Hostility | 20.93 | -12.94 | -6.16 |
| 12 Hypochondriasis | -28.31 | -9.59 | -7.44 |
| 13 Ideas of Persecution | -.29 | -1.27 | -6.49 |
| 14 Impulsivity | 26.84 | -16.70 | 4.85 |
| 15 Irritability | -1.11 | .59 | -.30 |
| 16 Mood Fluctuation | -.51 | .10 | 16.71 |
| 17 Neurotic Disorganization | -1.44 | -23.41 | 11.55 |
| 18 Panic Reaction | -17.55 | -8.01 | -4.16 |
| 19 Perceptual Distortion | -13.62 | -15.29 | 12.66 |
| 20 Rebelliousness | 28.45 | -6.49 | 3.95 |
| 21 Repression | 23.42 | 27.61 | 15.94 |
| 22 Sadism | 23.24 | .78 | -21.39 |
| 23 Self-Depreciation | -15.95 | 2.30 | -13.30 |
| 24 Shallow Affect | 19.21 | .64 | 32.28 |
| 25 Socially Deviant Attitudes | 34.50 | 3.17 | -14.47 |
| 26 Somatic Complaints | -23.09 | .82 | -1.62 |
| 27 Defensiveness | -3.13 | 41.93 | 14.76 |
| **Pseudoindividual** | | | |
| 1 | 1.03 | 1.01 | .86 |
| 2 | .54 | .53 | .56 |
| 3 | 1.29 | 1.30 | 1.39 |

Phase 1 allowed idiosyncratic rotation and differential weighting of the axes of the common perceptual space. Phase 2 allowed idiosyncratic differential weighting of the axes of the common perceptual space only. Phase 3 allowed equal weighting of the axes of the common perceptual space. Phase 4 implemented the vector model. Table 32 shows the goodness of fit indices (multiple Rs) for all four phases for the three sample average judges with respect to Jim Armstrong (JA), John Bradley (JB), and Jack Crawford (JC). The corresponding between-phase F-ratios were used to ascertain the significance of adding the additional parameters required by the more general model. Thus the significantly better fit of a more general model than a more restricted model could be conceptualized as greater complexity in the judgment process was required to locate the particular target in the perceptual space. For the present purpose, "better fit" was arbitrarily determined by using a $\underline{p} < .05$ criterion for the between-phase F-ratios.

In all three samples, it was found that significantly better fit was provided by the general unfolding model for JA. Thus reorientation of the axes or reference frame of the common perceptual space, and stretching and contracting the resulting axes might be employed to locate JA in the common perceptual space.

For JB, only the simple unfolding model provided a better fit than the vector model across the three samples, indicating that, in comparison with JA, less complexity was required in the judgment process to locate JB in the common perceptual space.

## Table 32

## Fitting Mean Inferential Judgments to the Common Perceptual Space

| | | Phase Multiple R | | | | Between Phase F-Ratio | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | df (3,17) | (2,20) | (1,22) |
| Average Individual | Target | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $F_{12}$ | $F_{23}$ | $F_{34}$ |
| A | JA | .86 | .72 | .70 | .53 | 4.72* | .71 | 8.88** |
| | JB | .80 | .79 | .77 | .71 | .21 | .83 | 4.71* |
| | JC | .92 | .91 | .90 | .89 | .66 | 2.08 | 1.00 |
| B | JA | .91 | .83 | .81 | .72 | 5.04* | .95 | 8.54** |
| | JB | .91 | .91 | .91 | .81 | .20 | .24 | 20.53** |
| | Jc | .89 | .88 | .88 | .88 | .13 | .31 | .06 |
| C | JA | .90 | .81 | .78 | .60 | 4.57* | 1.46 | 13.57** |
| | JB | .88 | .86 | .85 | .73 | .86 | .46 | 15.52** |
| | JC | .90 | .90 | .88 | .87 | .15 | 1.61 | 1.93 |

_Note_. All multiple Rs are $p < .05$ .
*$p < .05$
**$p < .01$

For JC, in all three samples, no improvement was made by employing the more general models than the vector model indicating that among the three targets the least complexity was required to locate JC in the common perceptual space.

However the above results also suggested that complexity defined in this manner might be a result of judging a complex target rather than a result of complex processing on the part of a particular judge. Thus, complexity in this case might be an attribute residing more in the target than in the judge.

To examine whether JA was indeed more complex than JB and JC, real individuals corresponding most closely to JA, JB and JC were identified using Skinner's Modal Profile analysis procedure (Skinner, 1976) from the three abnormal samples and the normal sample described in Study 1. Specifically, attempts were made to identify the individual most similar in profile shape to each of the targets from the self-reported data of the abnormal and normal samples. For JA, there was no corresponding real individual identified as closely similar from the alcoholic sample. Similarly, no individuals were identified to be closely similar to JB from the college sample, and to JC from the alcoholic sample. Thus three real individuals were selected to represent each target. The Pearson product-moment correlations between the score profiles of the nine real individuals based on 25 scales and the corresponding Modal Profiles were: .64 (JA1, college student), .65 (JA2, prison inmate), .70 (JA3, psychiatric patient); .56 (JB1, prison inmate), .54 (JB2, alcoholic patient), .65 (JB3, psychiatric patient); .77 (JC1, college student), .86 (JC2, prison inmate), .69 (JC3, psychiatric patient).

For comparison, the scale scores of the 27 content scales of the nine individuals were used as input to PREFMAP such that the nine individuals were located as points or vectors in the common perceptual space. The goodness of fit indices for the four phases and the between-phase F-ratios are shown in Table 33. The results indicated that individuals JA1, JA3, and JC1 were the only individuals who could be represented by the simple unfolding model significantly better than the vector model. Since the criterion for evaluating the between-phase F-ratios was far from conservative, it appeared that the targets could be adequately represented by either the simple unfolding model or the vector model.

To summarize and focus on the results of phase 3 and phase 4, for the average individuals of Samples A, B, and C, the judged targets JA and JB could be adequately represented as points in the common perceptual space (AJA, BJA, CJA, and AJB, BJB, CJB). With respect to JA, for the average individuals' judged target locations, the points were saddle points, negative weights being attached to Dimension 3 of the common perceptual space. That is, increasing distance in the space between the judged target locations and traits corresponded to decreasing likelihood of trait attribution along Dimension 1 and Dimension 2, but increasing likelihood of trait

## Table 33

## Fitting Self-Reported Data to the Common Perceptual Space

| Real Individual | Phase Multiple R | | | | Between Phase F-Ratio df (3,17) | (2,20) | (1,22) |
|---|---|---|---|---|---|---|---|
| | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $F_{12}$ | $F_{23}$ | $F_{34}$ |
| JA1 | .79* | .69* | .69* | .55* | 2.01 | .05 | 7.37* |
| JA2 | .65 | .60 | .47 | .25 | .67 | 2.24 | 4.28 |
| JA3 | .84* | .76* | .69* | .48 | 2.62 | 2.33 | 10.05* |
| JB1 | .78* | .68* | .66* | .65* | 2.18 | .50 | .58 |
| JB2 | .53 | .46 | .44 | .44 | .50 | .23 | .08 |
| JB3 | .74 | .66 | .66* | .61* | 1.28 | .12 | 2.05 |
| JC1 | .85* | .79* | .75* | .68* | 1.96 | 1.71 | 4.79* |
| JC2 | .87* | .81* | .78* | .74* | 2.17 | 1.29 | 3.50 |
| JC3 | .71 | .60 | .57 | .56* | 1.56 | .56 | .29 |

Note. JA1 and JC1 are college students; JA2, JB1 and JC2 are prison inmates; JA3, JB3 and JC3 are psychiatric patients; JB2 is alcoholic patient.

*$p < .05$

attribution along Dimension 3 of the common perceptual space. For all three average individuals, the judged target JC could be represented adequately by vector directions in the space (AJC, BJC, CJC). For the nine real individuals, only three of them JA1 and JA3 representing the real counterpart of JA, and JC1 representing the real counterpart of JC were represented as points in the space. JC1 was an anti-ideal point, negative weights being attached to all three dimensions. The other six individuals (JA2, JB1, JB2, JB3, JC2, JC3) were all represented as vector directions in the space. The geometric representations of these points and vector directions are presented in Figures 43 to 45. In general, as points or vector directions, the judged target locations or directions were close to the locations or directions of the selected real individuals. The coordinates and direction cosines of these judged targets and real individuals are presented in Appendix 13.

Since the inferential judgments of individual judges might not be captured by the average judges, we performed a similar analysis at the individual level. Employing the same common perceptual space, inferential judgments of each judge of Samples A, B, and C were used as input to the metric version of PREFMAP. Again the four models were fitted to the inferential judgments as described previously. The significantly better fit of a more general model than a more restricted model was determined for each judge with respect to each target using a similar criterion.

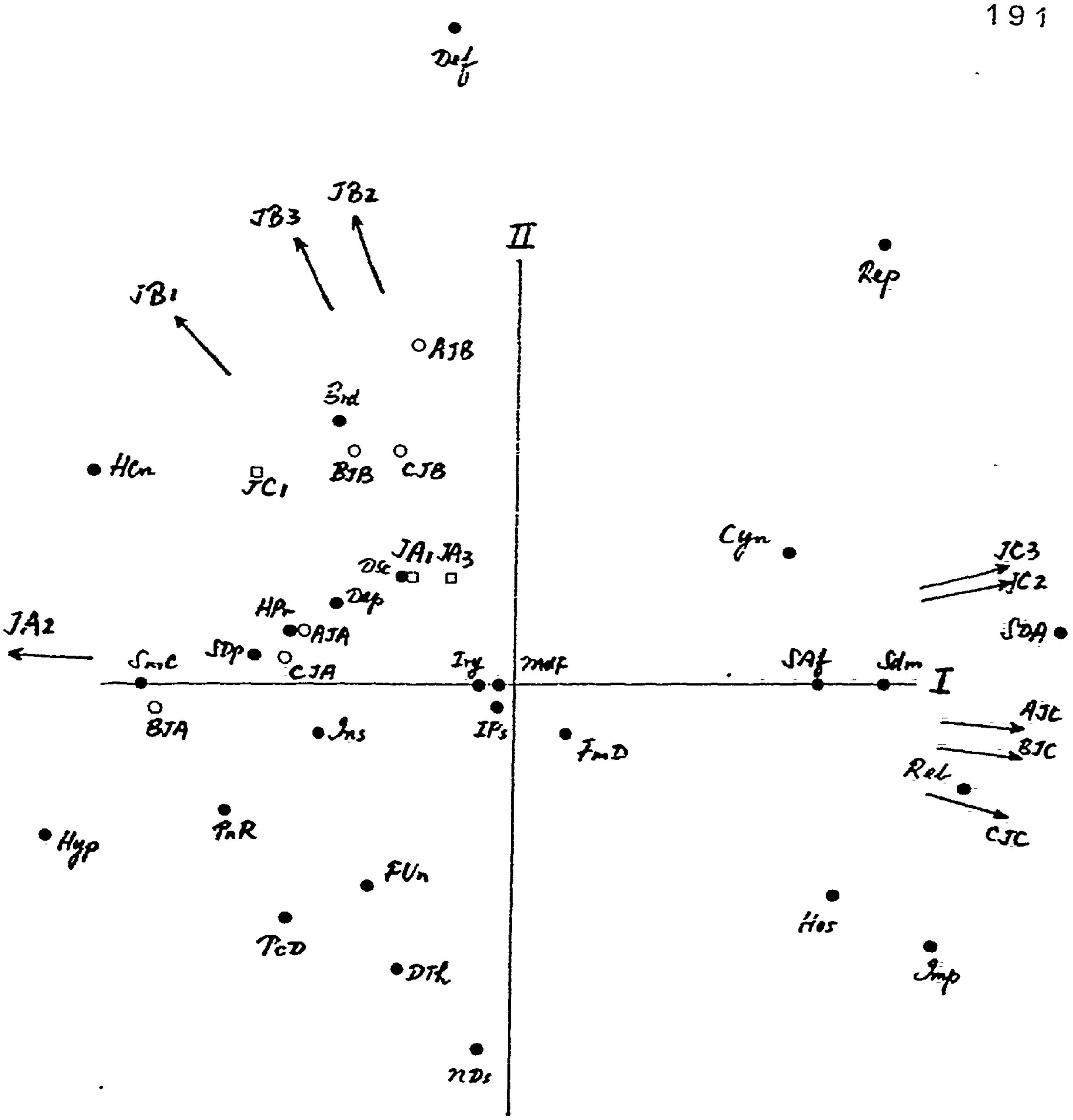

Figure 43. Plot of dimension 1 vs. dimension 2 of the common perceptual space with average judged targets and real individuals (AJA, BJA, CJA, AJB, BJB, CJB, AJC, BJC, CJC are judged targets; JA1, JA2, JA3, JB1, JB2, JB3, JC1, JC2, JC3 are real individuals; JC1 is an anti-ideal point).

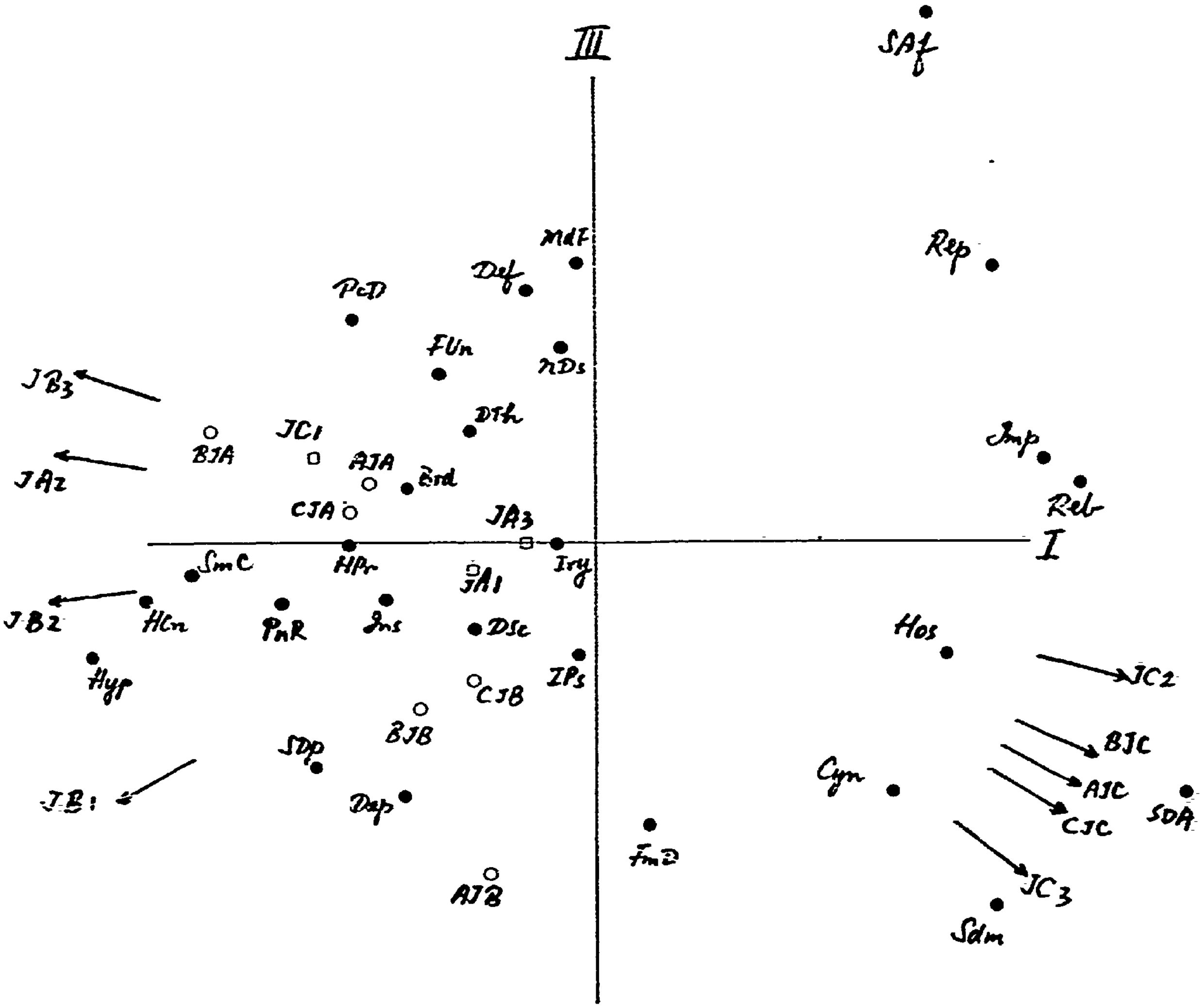

Figure 44. Plot of dimension 1 vs. dimension 3 of the common perceptual space with average judged targets and real individuals (AJA, BJA, CJA, AJB, BJB, CJB, AJC, BJC, CJC are judged targets for whom negative weight is attached to dimension 3; JA1, JA2, JA3, JB1, JB2, JB3, JC1, JC2, JC3 are real individuals; JC1 is an anti-ideal point).

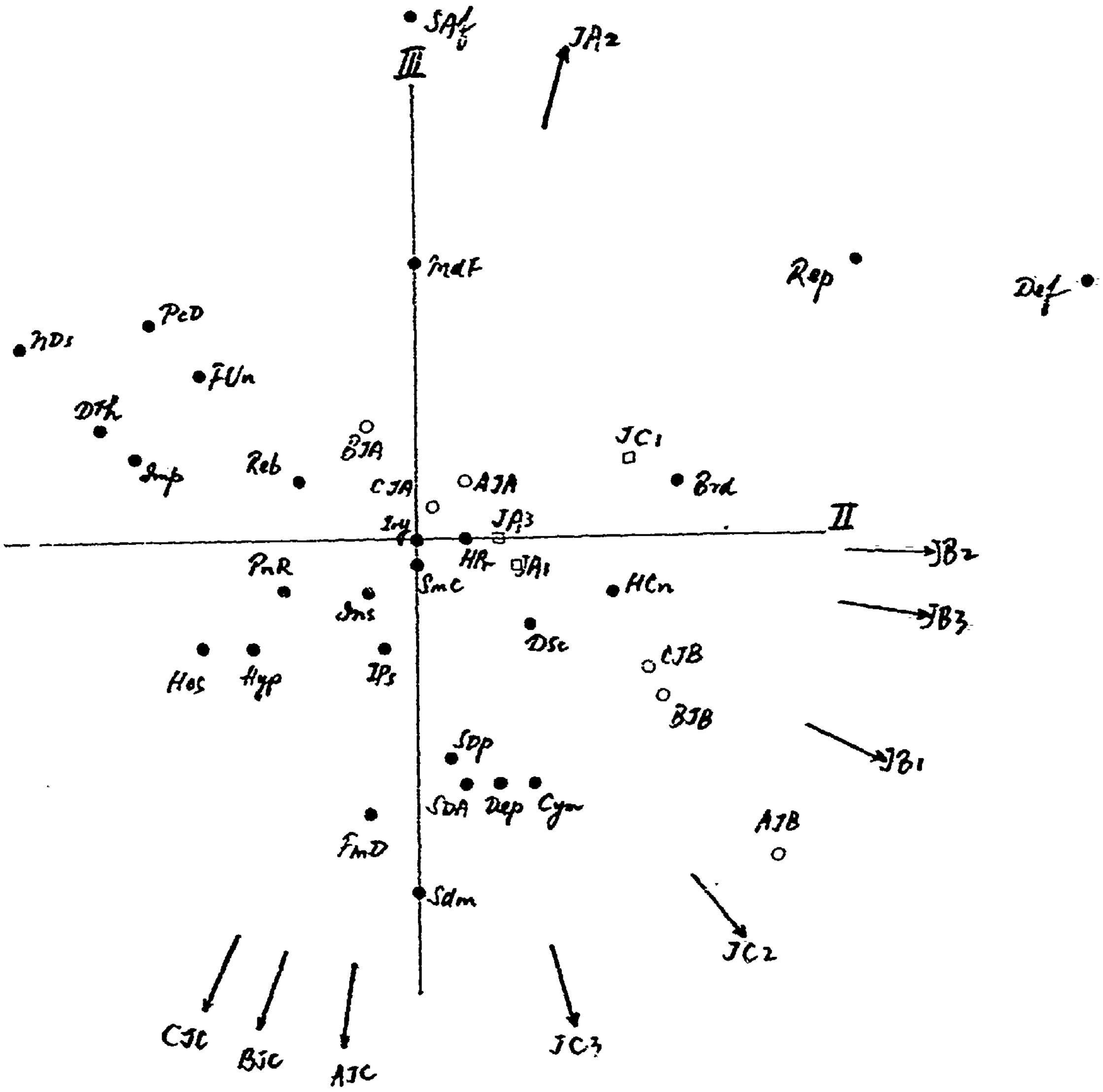

Figure 45. Plot of dimension 2 vs. dimension 3 of the common perceptual space with average judged targets and real individuals (AJA, BJA, CJA, AJB, BJB, CJB, AJC, BJC, CJC are judged targets for whom negative weight is attached to dimension 3; JA1, JA2, JA3, JB1, JB2, JB3, JC1, JC2, JC3 are real individuals; JC1 is an anti-ideal point).

The results of the analysis summarized in Tables 34 to 39 indicated that there were considerable inter-individual variations in the goodness of fit across the four phases and for different targets. An examination of the between-phase F-ratios revealed that about half of the judges (30 out of 64) required reorientation of the common perceptual space and differential weighting of the rotated axes in their inferential judgments with respect to JA. In contrast, only a small number of judges required such reorientation of the common perceptual space in their inferential judgments with respect to JB and JC. By and large, the inferential judgments of most judges with respect to the three targets could be adequately represented by either the simple unfolding model or the vector model. Table 40 shows the number of judges assigned to the four models separately for each of the three targets when the common perceptual space was assumed to be shared by all the judges.

Focusing only on the results of Phase 3 and Phase 4 in which the simple unfolding model and the vector model were fitted to the inferential judgments data, we contrasted the point and vector representations of the judged targets in the common perceptual space. It was found that the inferential judgments of over half of the judges could be represented more adequately by the point model than by the vector model with respect to the judgment of JA (37 points vs. 27 vectors). The reverse was true for the judgment of JB (28 points vs. 36 vectors). For JC, only a small number of judges

### Table 34

### Fitting Individual Inferential Judgments to the Common Perceptual Space

### Goodness of Fit Indices (Sample A)

| | JA | | | | JB | | | | JC | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subject | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ |
| 1 | .83* | .66 | .63* | .34 | .79* | .77* | .69* | .59* | .90* | .85* | .84* | .80* |
| 2 | .77* | .59 | .58 | .45 | .62 | .59 | .55 | .54* | .84* | .82* | .75* | .75* |
| 3 | .86* | .73* | .70* | .48 | .83* | .79* | .74* | .70* | .86* | .78* | .69* | .68* |
| 4 | .84* | .80* | .73* | .45 | .76* | .69* | .68* | .51 | .96* | .93* | .93* | .91* |
| 5 | .80* | .67* | .66* | .43 | .80* | .75* | .74* | .68* | .91* | .89* | .87* | .85* |
| 6 | .84* | .75* | .71* | .40 | .86* | .77* | .72* | .63* | .86* | .83* | .79* | .78* |
| 7 | .79* | .70* | .68* | .61* | .77* | .70* | .66* | .66* | .91* | .90* | .86* | .86* |
| 8 | .66 | .57 | .54 | .36 | .76* | .59 | .54 | .50 | .90* | .89* | .89* | .90* |
| 9 | .94* | .88* | .79* | .75* | .86* | .82* | .79* | .68* | .92* | .90* | .89* | .89* |
| 10 | .79* | .71* | .68* | .65* | .69 | .64 | .64* | .64* | .75 | .70* | .67* | .66* |
| 11 | .89* | .56 | .54 | .28 | .80* | .78* | .77* | .76* | .86* | .85* | .83* | .83* |
| 12 | .84* | .77* | .73* | .70* | .72 | .68* | .59* | .57* | .92* | .91* | .87* | .86* |
| 13 | .76* | .65 | .58* | .51 | .78* | .75* | .74* | .63* | .88* | .84* | .82* | .82* |
| 14 | .82* | .74* | .69* | .68* | .68 | .62 | .56 | .52 | .92* | .88* | .84* | .84* |
| 15 | .69 | .48 | .42 | .19 | .74 | .67* | .59* | .51 | .94* | .90* | .89* | .90* |
| 16 | .77* | .58 | .53 | .42 | .74 | .66 | .62* | .34 | .89* | .88* | .87* | .86* |
| 17 | .72 | .54 | .51 | .30 | .80* | .72* | .63* | .63* | .91* | .90* | .83* | .82* |
| 18 | .86* | .75* | .71* | .67* | .79* | .76* | .73* | .67* | .87* | .82* | .80* | .75* |
| Root Mean Square | .81 | .68 | .64 | .51 | .77 | .71 | .67 | .61 | .89 | .86 | .83 | .82 |

*p < .05

## Table 35

## Fitting Individual Inferential Judgments to the Common Perceptual Space

## Between-Phase F-Ratios (Sample A)

| | JA | | | JB | | | JC | | |
|---|---|---|---|---|---|---|---|---|---|
| Subject | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ |
| 1 | 4.42* | .67 | 10.38* | .43 | 2.71 | 5.18* | 2.62 | .17 | 5.32* |
| 2 | 3.46* | .27 | 4.24 | .29 | .76 | .21 | .46 | 3.53* | .00 |
| 3 | 4.69* | 1.09 | 10.79* | 1.17 | 2.00 | 2.69 | 2.62 | 3.33 | .79 |
| 4 | 1.46 | 3.10 | 15.26* | 1.41 | .08 | 8.46* | 3.14 | .55 | 4.16 |
| 5 | 2.87 | .47 | 9.37* | 1.43 | .33 | 3.69 | 1.30 | 1.59 | 4.04 |
| 6 | 2.81 | 1.49 | 14.73* | 3.18 | 1.90 | 5.41* | .81 | 2.21 | 1.03 |
| 7 | 2.09 | .54 | 3.48 | 1.58 | .88 | .01 | .71 | 3.13 | .00 |
| 8 | 1.22 | .47 | 4.98* | 3.21* | .88 | 1.26 | .53 | .55 | .00 |
| 9 | 5.65* | 6.12 | 3.27 | 1.44 | 1.24 | 9.62* | .89 | .80 | .01 |
| 10 | 1.92 | .77 | 1.83 | .65 | .04 | .03 | .78 | .79 | .64 |
| 11 | 12.41* | .31 | 6.80* | .65 | .42 | .96 | .24 | 1.78 | .00 |
| 12 | 2.21 | 1.15 | 2.48 | .69 | 2.01 | 1.05 | .52 | 4.02* | 2.70 |
| 13 | 2.09 | 1.44 | 2.73 | .71 | .42 | 6.57* | 1.51 | 1.04 | .60 |
| 14 | 2.11 | 1.66 | .53 | .85 | 1.23 | 1.44 | 2.90 | 2.45 | .09 |
| 15 | 2.59 | .66 | 3.78 | 1.19 | 1.74 | 3.03 | 2.77 | .72 | 1.07 |
| 16 | 3.64* | .86 | 3.12 | 1.50 | .73 | 9.78* | .52 | .96 | 1.83 |
| 17 | 2.71 | .39 | 5.02 | 1.89 | 2.67 | .17 | .64 | 7.33* | .90 |
| 18 | 4.12* | 1.19 | 2.73 | .70 | 1.07 | 3.63 | 2.23 | 1.08 | 4.14 |

_Note_. Degrees of freedom for F-ratios are $F_{12}(3, 17)$, $F_{23}(2, 20)$, and $F_{34}(1, 22)$.

*$p < .05$

## Table 36

## Fitting Individual Inferential Judgments to the Common Perceptual Space

## Goodness of Fit Indices (Sample B)

| | JA | | | | JB | | | | JC | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subject | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ |
| 1 | .90* | .85* | .73* | .60* | .88* | .86* | .82* | .72* | .76* | .61 | .51 | .51 |
| 2 | .74 | .63 | .62* | .57* | .68 | .65 | .65* | .54* | .92* | .91* | .90* | .90* |
| 3 | .70 | .69* | .69* | .61* | .83* | .75* | .73* | .64* | .66 | .65 | .58 | .57* |
| 4 | .62 | .58 | .52 | .51 | .65 | .64 | .64* | .60* | .73 | .73* | .72* | .72* |
| 5 | .77* | .65 | .54 | .53* | .66 | .63 | .59* | .49 | .48 | .39 | .21 | .16 |
| 6 | .92* | .81* | .77* | .31 | .87* | .85* | .83* | .70* | .74 | .65 | .62* | .61* |
| 7 | .90* | .86* | .84* | .76* | .89* | .80* | .77* | .73* | .77* | .75* | .75* | .75* |
| 8 | .82* | .64 | .60* | .54* | .88* | .87* | .86* | .85* | .84* | .82* | .81* | .81* |
| 9 | .88* | .75* | .75* | .58* | .83* | .80* | .78* | .66* | .90* | .89* | .88* | .88* |
| 10 | .79* | .68* | .65* | .63* | .80* | .77* | .73* | .70* | .82* | .75* | .71* | .68* |
| 11 | .92* | .84* | .81* | .80* | .86* | .84* | .84* | .73* | .94* | .91* | .89* | .88* |
| 12 | .86* | .71* | .70* | .61* | .82* | .71* | .68* | .68* | .85* | .82* | .80* | .80* |
| 13 | .91* | .80* | .78* | .75* | .87* | .83* | .83* | .82* | .87* | .83* | .83* | .81* |
| 14 | .84* | .68* | .67* | .56* | .79* | .74* | .68* | .63* | .90* | .90* | .89* | .89* |
| 15 | .90* | .76* | .76* | .73* | .77* | .73* | .71* | .58* | .85* | .83* | .83* | .83* |
| 16 | .86* | .80* | .77* | .74* | .85* | .81* | .79* | .77* | .87* | .86* | .83* | .83* |
| 17 | .86* | .81* | .77* | .72* | .58 | .55* | .51 | .46 | .87* | .84* | .83* | .83* |
| 18 | .95* | .92* | .90* | .71* | .80* | .78* | .75* | .63* | .91* | .77* | .74* | .70* |
| 19 | .76* | .68* | .65* | .43 | .76* | .75* | .61* | .54* | .77* | .67* | .56 | .56* |
| Root Mean Square | .84 | .75 | .72 | .63 | .80 | .76 | .73 | .66 | .82 | .78 | .75 | .74 |

*$p < .05$

## Table 37

## Fitting Individual Inferential Judgments to the Common Perceptual Space

## Between-Phase F-Ratios (Sample B)

| | JA | | | JB | | | JC | | |
|---|---|---|---|---|---|---|---|---|---|
| Subject | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ |
| 1 | 2.67 | 7.07* | 8.57* | .90 | 2.56 | 10.37* | 2.73 | 1.63 | .06 |
| 2 | 1.93 | .15 | 2.20 | .46 | .01 | 5.15* | .58 | .81 | .47 |
| 3 | .09 | .13 | 4.43* | 2.44 | .73 | 5.68* | .09 | 1.50 | .42 |
| 4 | .44 | 1.01 | .42 | .15 | .06 | 1.72 | .15 | .08 | .01 |
| 5 | 2.29 | 2.43 | .08 | .45 | .74 | 3.63 | .57 | 1.24 | .49 |
| 6 | 6.53* | 1.79 | 27.72* | 1.05 | 1.12 | 13.72* | 1.63 | .81 | .10 |
| 7 | 2.06 | .83 | 10.10* | 3.73* | 1.49 | 2.89 | .38 | .06 | .11 |
| 8 | 4.43* | .83 | 2.56 | .18 | .65 | 2.15 | .90 | .44 | .07 |
| 9 | 5.78* | .02 | 11.33* | .84 | .77 | 9.51* | .77 | .70 | .00 |
| 10 | 2.37 | .64 | .99 | .74 | 1.30 | 2.48 | 1.84 | 1.31 | 2.00 |
| 11 | 5.41* | 1.43 | 1.26 | .89 | .11 | 12.48* | 2.62 | 1.38 | 2.14 |
| 12 | 5.15* | .53 | 4.90* | 3.08 | .76 | .05 | .92 | .74 | .10 |
| 13 | 6.82* | .57 | 2.95 | 1.45 | .23 | 1.40 | 1.77 | .15 | 1.62 |
| 14 | 4.52* | .39 | 5.31* | 1.08 | 1.94 | 2.39 | .08 | .98 | .05 |
| 15 | 7.37* | .07 | 2.48 | .88 | .72 | 7.30* | .66 | .03 | .18 |
| 16 | 2.12 | 1.41 | 2.25 | .52 | 1.16 | 2.16 | .52 | 1.68 | .05 |
| 17 | 1.70 | 1.98 | 3.41 | .28 | .58 | 1.52 | .94 | .83 | .05 |
| 18 | 3.80* | 2.02 | 34.40* | .39 | 1.19 | 8.47* | 7.41* | .93 | 2.96 |
| 19 | 1.59 | .73 | 8.81* | .12 | 4.32* | 2.88 | 2.14 | 2.35 | .04 |

Note. Degrees of freedom for F-ratios are $F_{12}(3, 17)$, $F_{23}(2, 20)$, and $F_{34}(1, 22)$.

*$p < .05$

## Table 38

## Fitting Individual Inferential Judgments to the Common Perceptual Space

## Goodness of Fit Indices (Sample C)

| | JA | | | | JB | | | | JC | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subject | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ |
| 1 | .81* | .74* | .72* | .71* | .76* | .62 | .62* | .61 | .85* | .84* | .80* | .79* |
| 2 | .87* | .72* | .72* | .64* | .80* | .78* | .75* | .75* | .90* | .87* | .87* | .87* |
| 3 | .92* | .83* | .82* | .59* | .93* | .91* | .73* | .59* | .85* | .84* | .84* | .83* |
| 4 | .86* | .83* | .60* | .54* | .81* | .80* | .77* | .54* | .58 | .55 | .54 | .40 |
| 5 | .74 | .66 | .57 | .50 | .56 | .52 | .50 | .47 | .67 | .66 | .62* | .54* |
| 6 | .85* | .74* | .72* | .64* | .90* | .89* | .87* | .85* | .86* | .84* | .84* | .84* |
| 7 | .72 | .55 | .52 | .41 | .88* | .87* | .86* | .61* | .86* | .85* | .83* | .80* |
| 8 | .84* | .72* | .71* | .57* | .90* | .88* | .86* | .83* | .90* | .90* | .87* | .86* |
| 9 | .74 | .69* | .61* | .52 | .89* | .89* | .88* | .78* | .84* | .83* | .80* | .80* |
| 10 | .83* | .67* | .64* | .54* | .76* | .73* | .64* | .64* | .81* | .80* | .75* | .75* |
| 11 | .89* | .86* | .85* | .71* | .82* | .77* | .74* | .69* | .87* | .86* | .78* | .77* |
| 12 | .76* | .65 | .58 | .45 | .83* | .78* | .73* | .62* | .91* | .89* | .88* | .88* |
| 13 | .90* | .79* | .74* | .47 | .84* | .68* | .57 | .43 | .84* | .81* | .76* | .70* |
| 14 | .86* | .71* | .54 | .43 | .64 | .61 | .58 | .34 | .85* | .84* | .81* | .78* |
| 15 | .88* | .77* | .74* | .50 | .73 | .66 | .62* | .38 | .86* | .83* | .78* | .73* |
| 16 | .81* | .71* | .64* | .44 | .80* | .76* | .75* | .30 | .82* | .78* | .73* | .73* |
| 17 | .94* | .88* | .82* | .59* | .75 | .50 | .43 | .38 | .70 | .57 | .52 | .27 |
| 18 | .83* | .76* | .76* | .60* | .72 | .65 | .64* | .62* | .88* | .86* | .82* | .76* |
| 19 | .88* | .80* | .72* | .62* | .81* | .76* | .74* | .65* | .89* | .88* | .87* | .80* |
| 20 | .90* | .80* | .79* | .64* | .70 | .63 | .57 | .45 | .87* | .85* | .82* | .81* |
| 21 | .87* | .84* | .83* | .76* | .84* | .83* | .77* | .59* | .82* | .79* | .76* | .76* |
| 22 | .82* | .80* | .77* | .69* | .86* | .78* | .72* | .65* | .90* | .89* | .89* | .88* |
| 23 | .76* | .68* | .65* | .50 | .76* | .74* | .73* | .73* | .87* | .84* | .83* | .78* |
| 24 | .78* | .55 | .42 | .13 | .58 | .39 | .38 | .37 | .78* | .67* | .59* | .51 |
| 25 | .87* | .84* | .76* | .55* | .57 | .53 | .41 | .33 | .76* | .74* | .73* | .73* |
| 26 | .85* | .68* | .62* | .39 | .68 | .60 | .58* | .48 | .86* | .82* | .80* | .79* |
| 27 | .88* | .72* | .70* | .56* | .82* | .67* | .65* | .55* | .86* | .84* | .82* | .82* |
| Root Mean Square | .84 | .74 | .69 | .56 | .78 | .72 | .68 | .58 | .83 | .81 | .78 | .75 |

*$p < .05$

## Table 39

## Fitting Individual Inferential Judgments to the Common Perceptual Space

## Between-Phase F-Ratios (Sample C)

| Subject | | JA | | | JB | | | JC | |
|---|---|---|---|---|---|---|---|---|---|
| | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ |
| 1 | 1.83 | .56 | .76 | 2.62 | .17 | .12 | .56 | 2.38 | .27 |
| 2 | 5.18* | .06 | 4.83* | .56 | 1.00 | .00 | 1.55 | .01 | .13 |
| 3 | 5.21* | .55 | 21.60* | 1.66 | 18.53* | 8.86* | .40 | .13 | .94 |
| 4 | 1.44 | 10.16* | 2.36 | .25 | 1.17 | 15.97* | .34 | .06 | 4.14 |
| 5 | 1.47 | 1.88 | 2.49 | .33 | .31 | .72 | .24 | .89 | 3.03 |
| 6 | 3.61* | .75 | 4.74* | .47 | 2.11 | 2.00 | .40 | .34 | .04 |
| 7 | 2.62 | .40 | 3.23 | .32 | .80 | 30.63* | .17 | 1.34 | 3.62 |
| 8 | 3.62* | .33 | 8.19* | 1.01 | 1.31 | 4.39* | .41 | 2.20 | 1.83 |
| 9 | .82 | 2.06 | 3.71 | .04 | 1.06 | 14.67* | .08 | 1.54 | .06 |
| 10 | 4.36* | .71 | 4.04 | .59 | 2.54 | .01 | .30 | 2.05 | .14 |
| 11 | 1.81 | .78 | 16.01* | 1.59 | .88 | 4.04 | .37 | 4.90* | .96 |
| 12 | 2.21 | 1.58 | 4.34* | 1.60 | 1.70 | 7.03* | 1.39 | .73 | .36 |
| 13 | 5.22* | 1.96 | 16.26* | 4.41* | 2.61 | 4.42* | .82 | 2.16 | 4.81 |
| 14 | 4.99* | 4.14* | 3.12 | .34 | .54 | 7.38* | .53 | 1.50 | 3.03 |
| 15 | 4.65* | 1.35 | 13.93* | 1.20 | .94 | 8.48* | 1.18 | 2.64 | 3.43 |
| 16 | 2.45 | 2.02 | 8.23* | 1.13 | .20 | 23.95* | .93 | 2.14 | .14 |
| 17 | 5.15* | 4.34* | 21.24* | 4.02* | .91 | 1.04 | 1.95 | .83 | 5.70* |
| 18 | 2.00 | .20 | 10.58* | 1.08 | .32 | 1.01 | .81 | 2.49 | 6.28* |
| 19 | 3.29* | 3.26 | 5.52* | 1.54 | .64 | 6.08* | .24 | .94 | 11.28* |
| 20 | 4.90* | .32 | 12.14* | 1.14 | 1.19 | 3.87 | .53 | 2.33 | .33 |
| 21 | 1.37 | .56 | 7.97* | .29 | 3.06 | 13.08* | .91 | 1.26 | .03 |
| 22 | .46 | 1.33 | 6.44* | 3.07 | 2.31 | 4.44* | .27 | .14 | 1.92 |
| 23 | 1.45 | .73 | 6.85* | .46 | .05 | .04 | 1.29 | .40 | 6.11* |
| 24 | 4.20* | 1.83 | 4.37* | 1.61 | .08 | .09 | 2.22 | 1.82 | 3.00 |
| 25 | 1.13 | 4.79* | 14.03* | .41 | 1.48 | 1.63 | .34 | .30 | .00 |
| 26 | 5.06* | 1.70 | 8.03* | 1.17 | .31 | 3.82 | 1.50 | 1.07 | .35 |
| 27 | 6.35* | .54 | 7.17* | 3.65* | .51 | 4.43* | .82 | .87 | .00 |

Note. Degrees of freedom for F-ratios are $F_{12}(3, 17)$, $F_{23}(2, 20)$, and $F_{34}(1, 22)$.

*$p < .05$

# Table 40

## Classification of Judges by Inferential Judgments Using the Common Perceptual Space

| Target | Sample | General Unfolding Model | Weighted Unfolding Model | Simple Unfolding Model | Vector Model |
|---|---|---|---|---|---|
| JA | A | 7 | 0 | 5 | 6 |
| | B | 9 | 1 | 3 | 6 |
| | C | 14 | 2 | 7 | 4 |
| JB | A | 1 | 0 | 6 | 11 |
| | B | 1 | 1 | 8 | 9 |
| | C | 3 | 1 | 11 | 12 |
| JC | A | 0 | 3 | 1 | 14 |
| | B | 1 | 0 | 0 | 18 |
| | C | 0 | 1 | 5 | 21 |

required the point representations of their judgments (6 points vs. 58 vectors). The geometric representations of these points or vector directions are presented separately for each target in Figures 46 to 48 for JA, 49 to 51 for JB, and 52 to 54 for JC. Only the salient traits were labelled for each particular target.

In Figures 46 to 48, the point representations of the judged locations of JA for all judges were saddle points, negative weights being attached to Dimension 3 of the common perceptual space by all the judges. Without exception, the judged target locations of the 64 judges all clustered around the salient traits (Self-Depreciation, Disorganization of Thinking, Depression, Desocialization, Panic Reaction) of JA, and the vector directions all pointed to the same general direction. Individual differences in inferential judgments however could be more readily detected in the plot of Dimension 2 vs. Dimension 3. Notable deviation from the group was the inferential judgments of A15 (subject 15 of Sample A). His relatively low goodness of fit indices across the four phases suggested that either he did not utilize the common perceptual space effectively in his judgments or his individual perceptual space was markedly different from the common perceptual space. Generally, no clear separation of judges from the three samples could be easily detected.

In Figures 49 to 51, as the salient traits of JB (Ideas of Persecution, Familial Discord, Hypochondriasis, Broodiness, Cynicism)

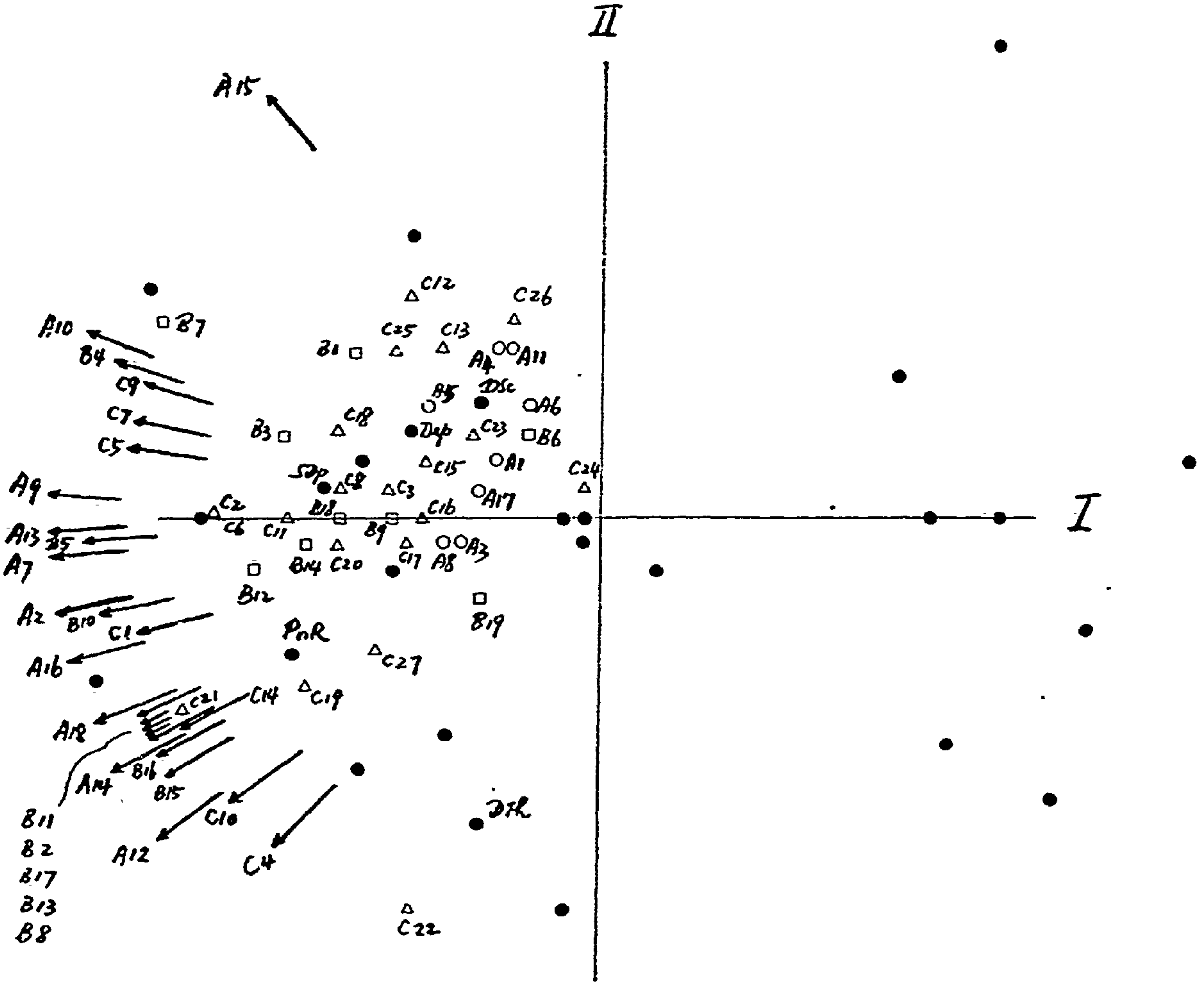

Figure 46. Plot of dimension 1 vs. dimension 2 of the common perceptual space with the judged target locations and vector directions for Jim Armstrong JA (A, B, and C denote the sample; the numbers denote the subject number in each sample).

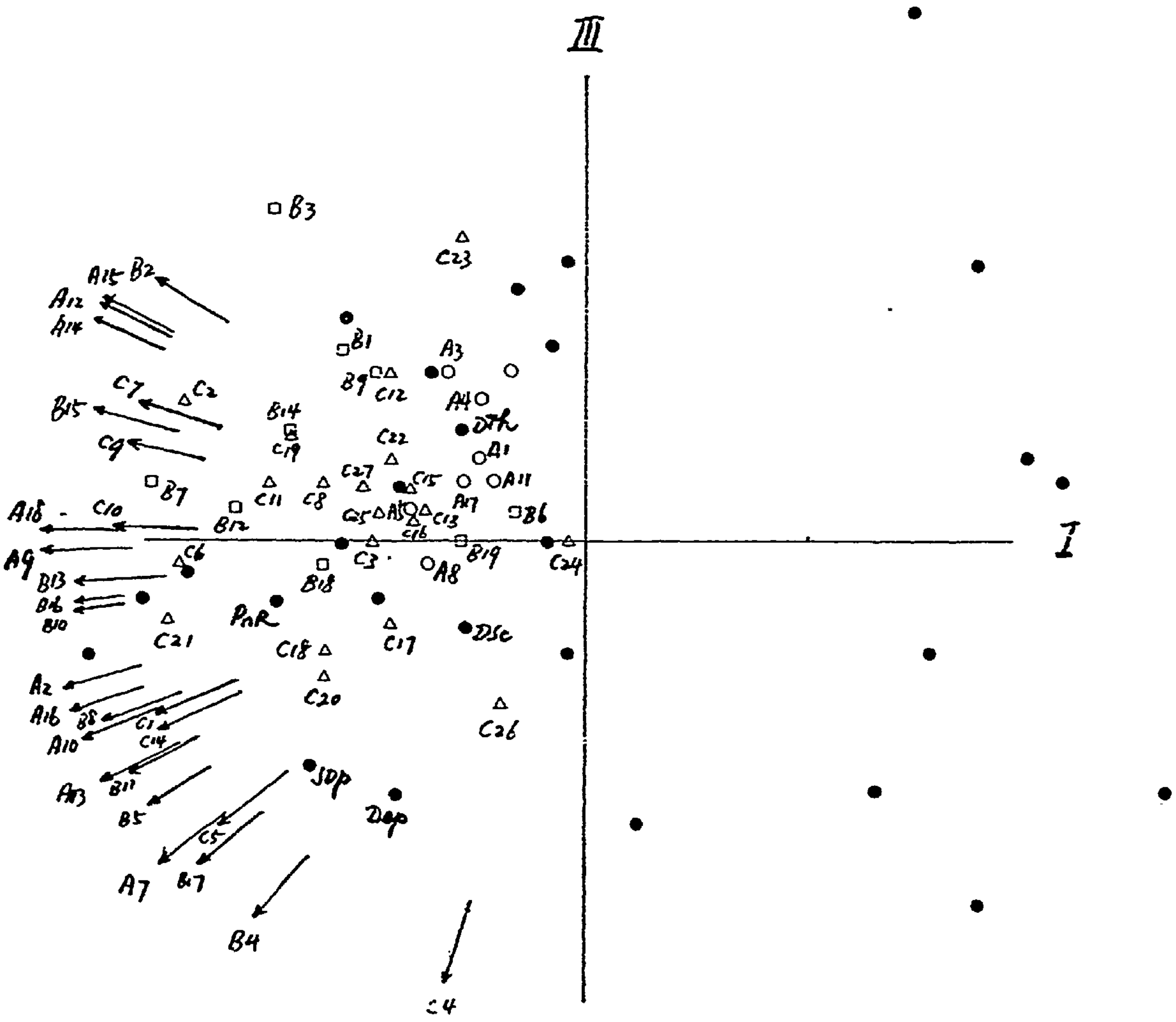

Figure 47. Plot of dimension 1 vs. dimension 3 of the common perceptual space with the judged target locations and vector directions for Jim Armstrong JA (All point locations for targets are saddle points, negative weights being attached to dimension 3; A, B, and C denote the sample; the numbers denote the subject number in each sample).

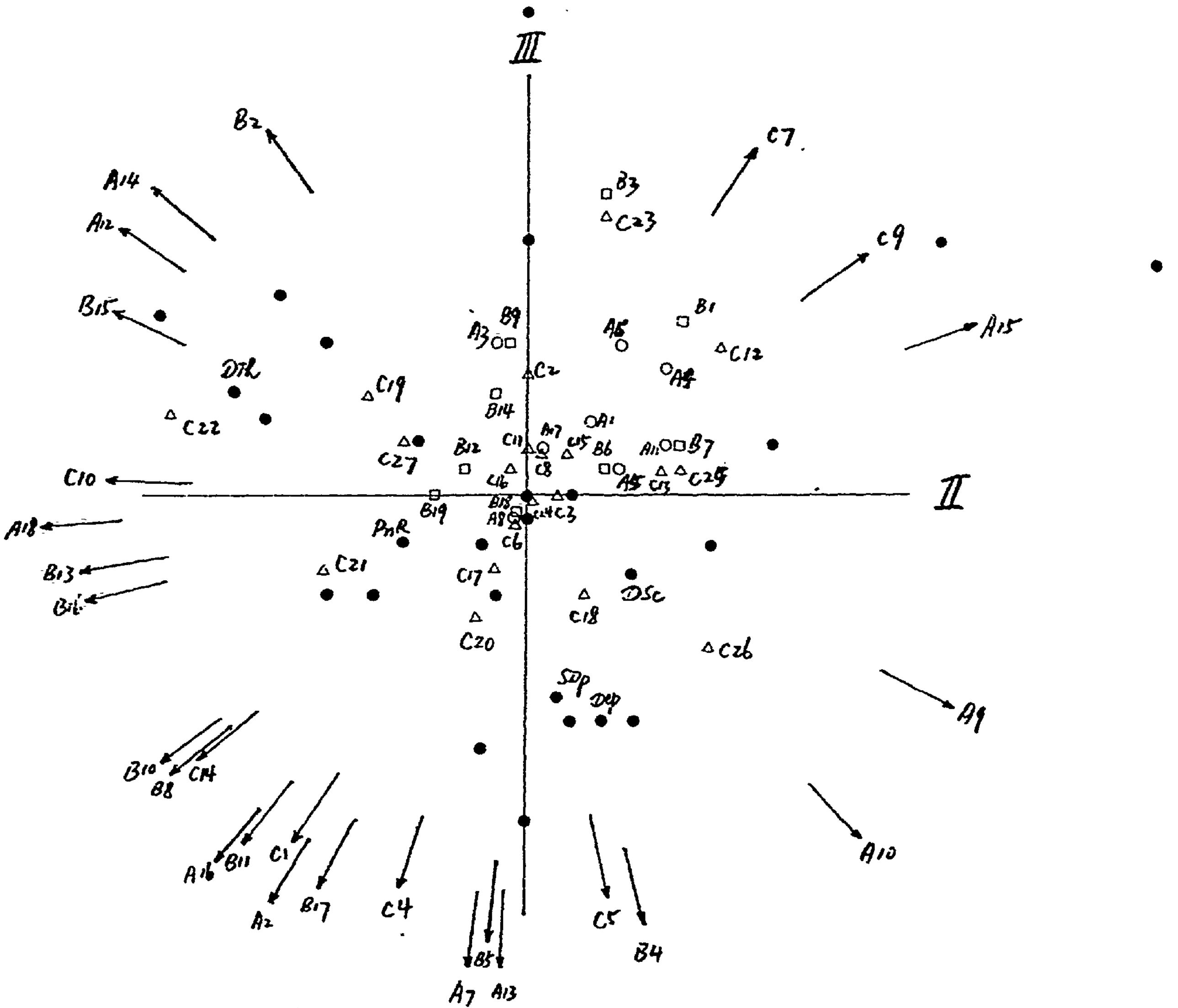

Figure 48. Plot of dimension 2 vs. dimension 3 of the common perceptual space with the judged target locations and vector directions for Jim Armstrong JA (All point locations for targets are saddle points, negative weights being attached to dimension 3; A, B, and C denote the sample; the numbers denote the subject number in each sample).

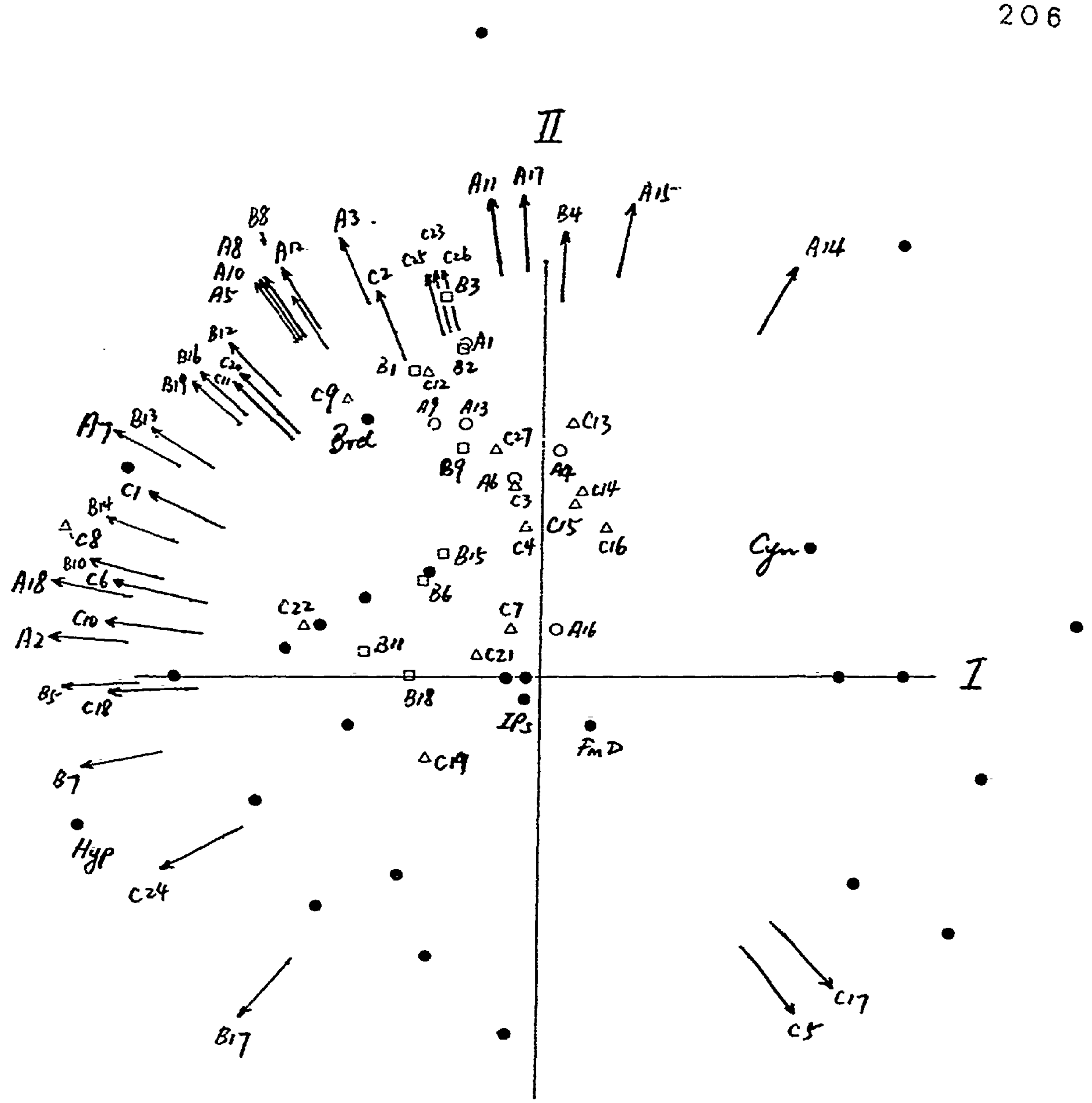

Figure 49. Plot of dimension 1 vs. dimension 2 of the common perceptual space with the judged target locations and vector directions for John Bradley JB (A, B, and C denote the sample; the numbers denote the subject number in each sample).

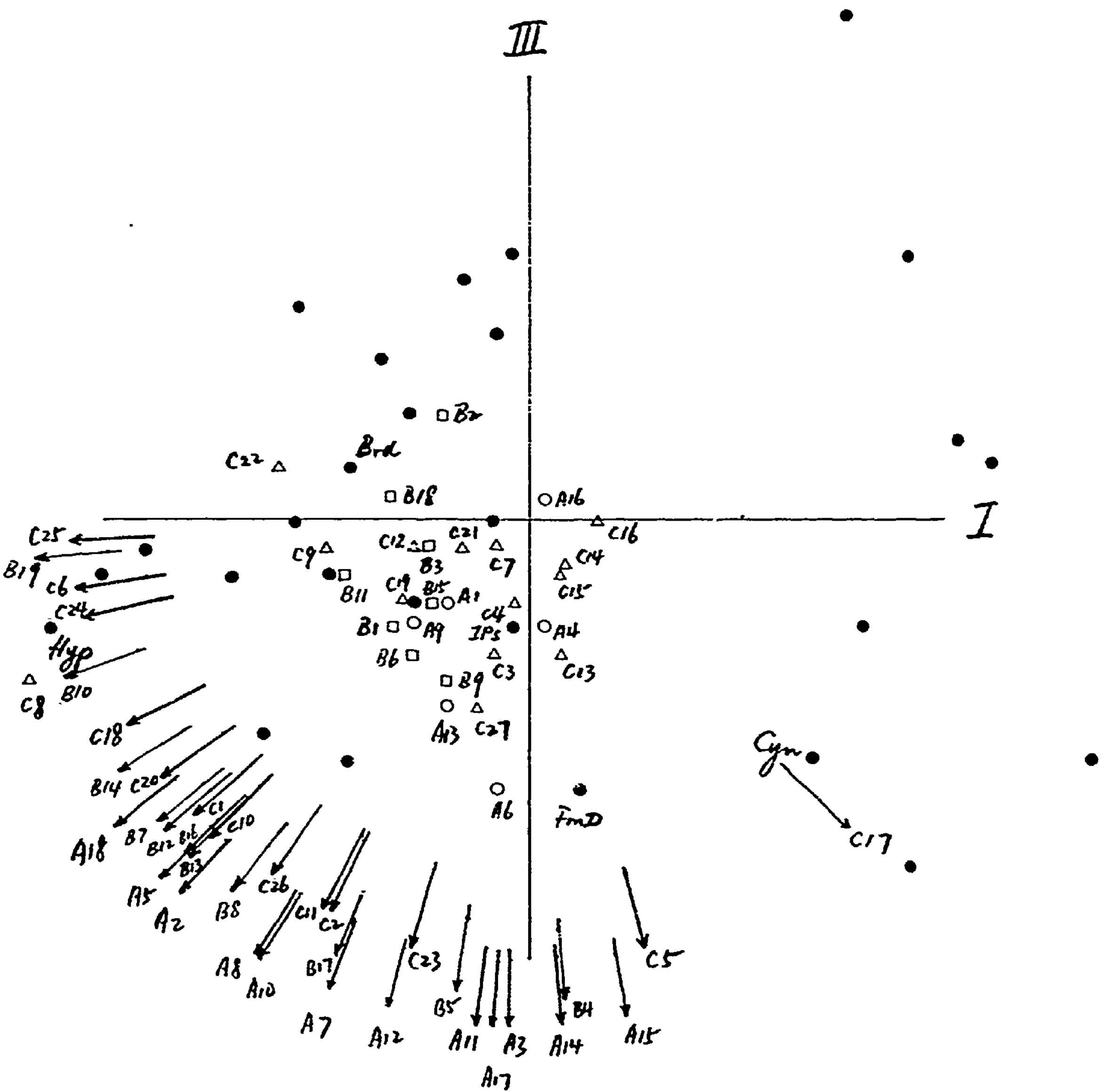

Figure 50. Plot of dimension 1 vs. dimension 3 of the common perceptual space with the judged target locations and vector directions for John Bradley JB (A, B, and C denote the sample; the numbers denote the subject number in each sample).

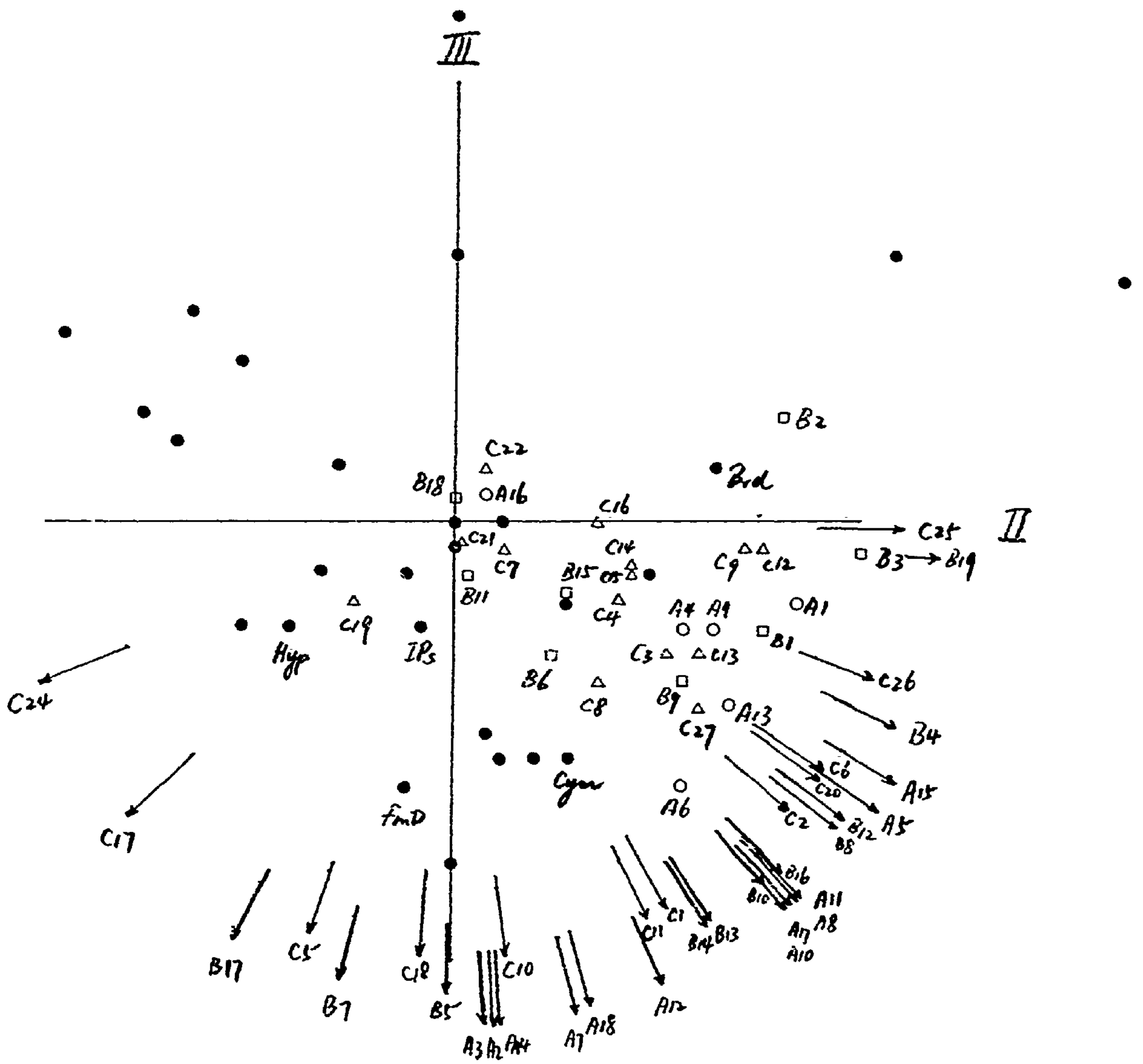

Figure 51. Plot of dimension 2 vs. dimension 3 of the common perceptual space with the judged target locations and vector directions for John Bradley JB (A, B, and C denote the sample; the numbers denote the subject number in each sample).

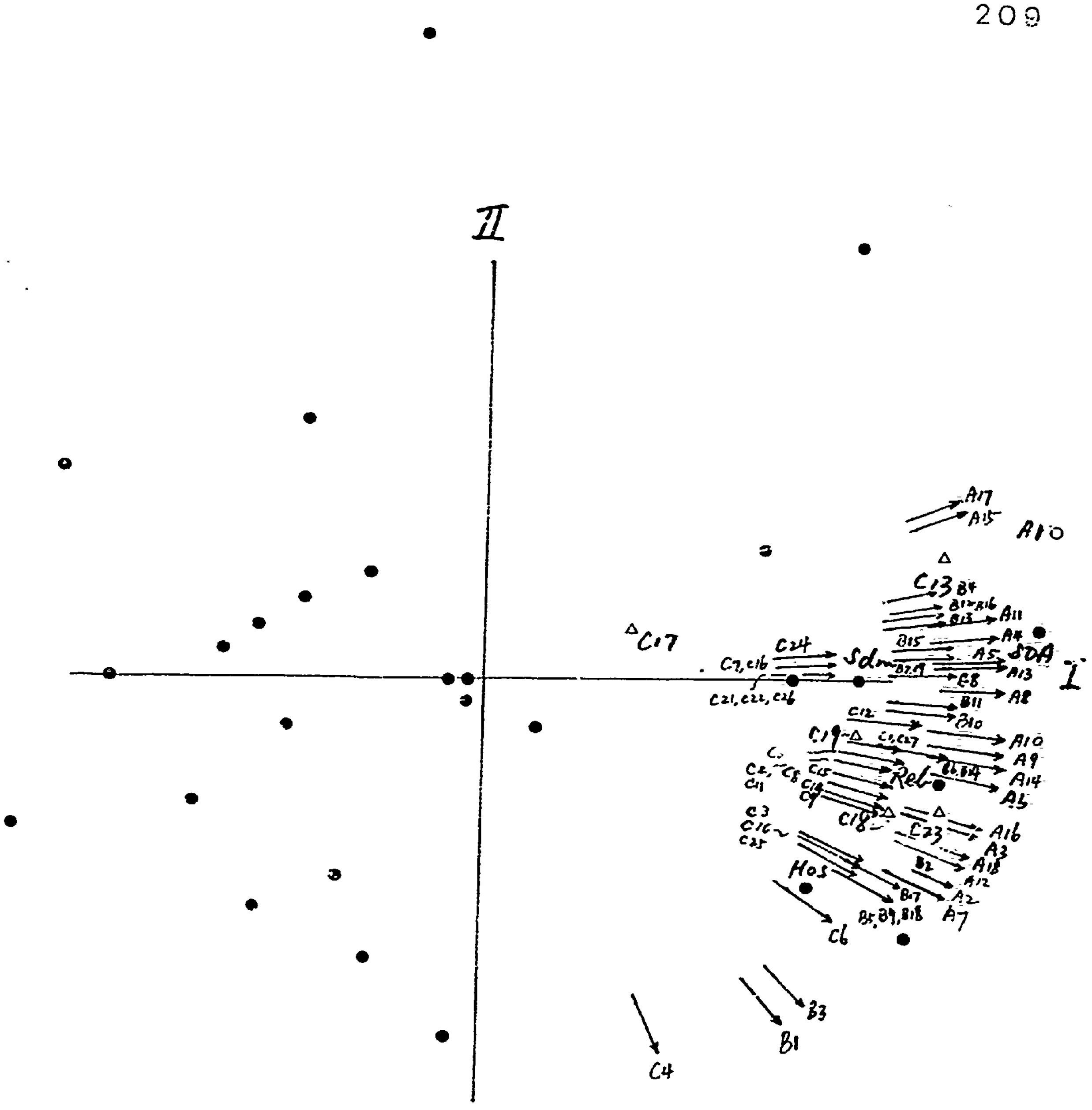

Figure 52. Plot of dimension 1 vs. dimension 2 of the common perceptual space with the judged target locations and vector directions for Jack Crawford JC. (A, B, and C denote the sample; the numbers denote the subject number in each sample).

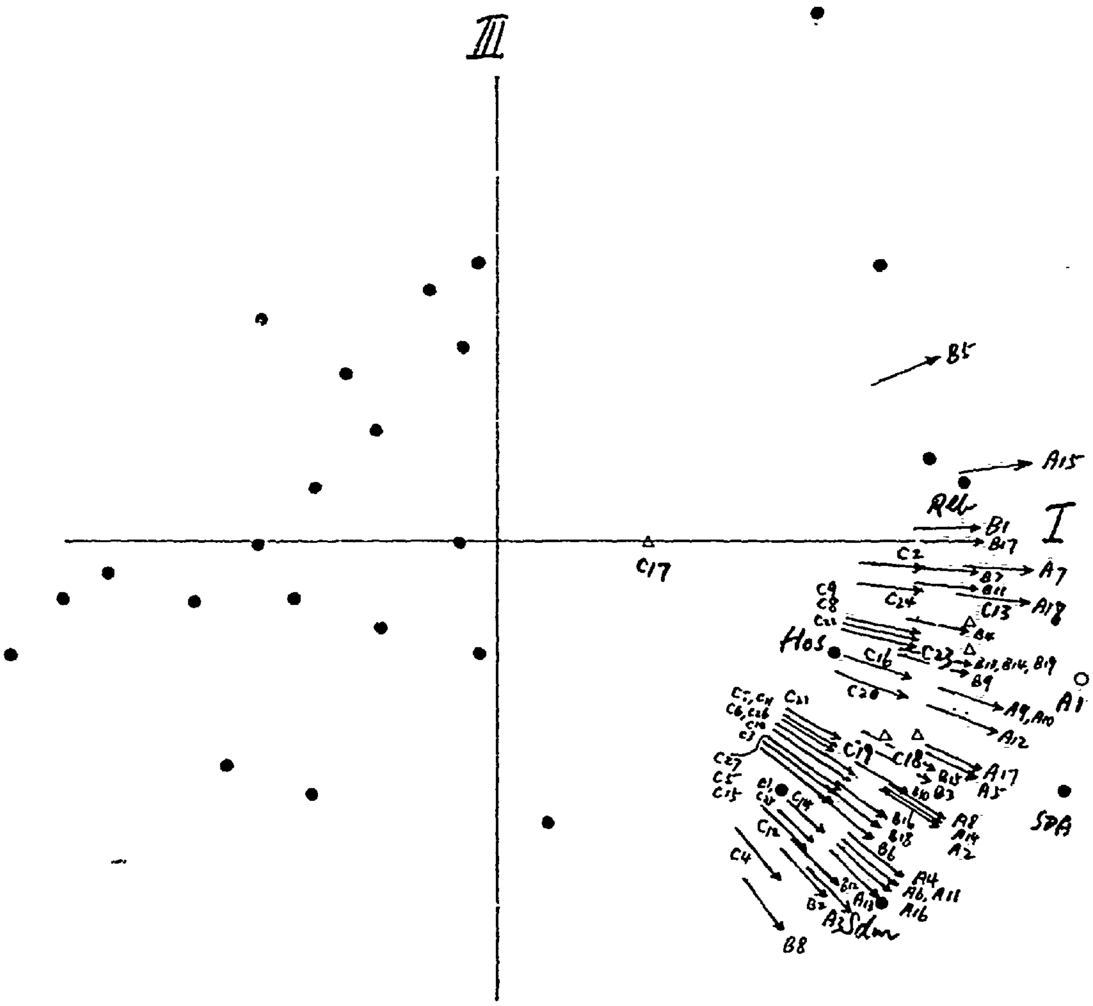

Figure 53. Plot of dimension 1 vs. dimension 3 of the common perceptual space with the judged target locations and vector directions for Jack Crawford JC (A, B, and C denote the sample; the numbers denote the subject number in each sample).

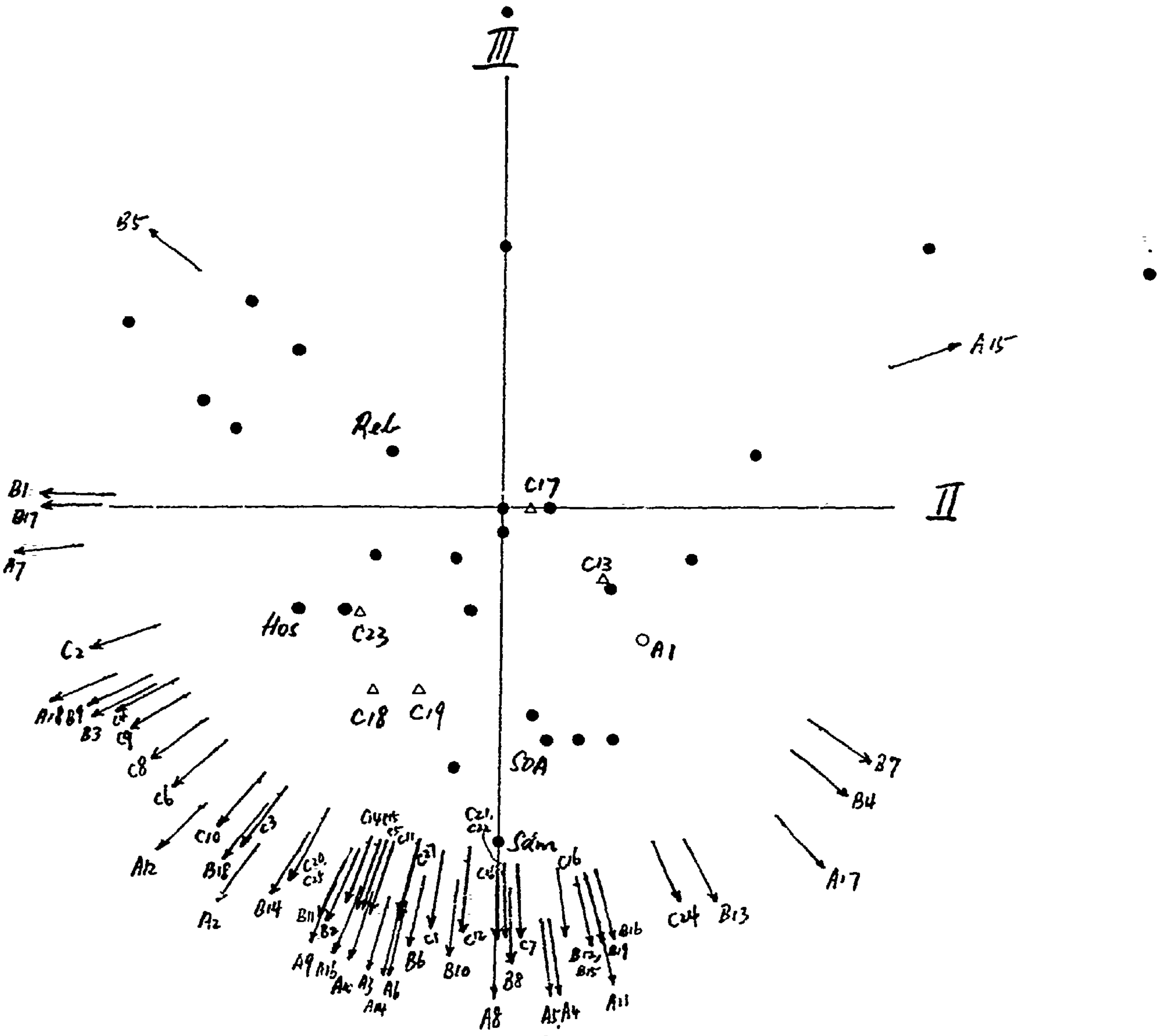

Figure 54. Plot of dimension 2 vs. dimension 3 of the common perceptual space with the judged target locations and vector directions for Jack Crawford JC (A, B, and C denote the sample; the numbers denote the subject number in each sample).

did not cluster in a dense region in the common perceptual space, there were greater inter-individual variations in the judged target locations and vector directions when compared to JA, indicating greater individual differences in making inferences or trait attribution with respect to JB. Some more obvious deviations from the group were the judgments of A14, A15, B2, C5, C17, C24. On the whole, the models did not fit the inferential judgments of these judges as well as other judges suggesting that the same possible reasons as described above could be applied. Again, no clear separation of judges from the three samples could be detected.

In Figures 52 to 54, the inferential judgments of only a small number of judges were represented as point locations. Very high consensus was evident in the inferential judgments with respect to JC as depicted by the dense clustering of vector directions in the region of the salient traits for the target (Rebelliousness, Socially Deviant Attitudes, Hostility, Sadism). The notable deviations from the group were the judgments of B5, C4, and C17. Their goodness of fit indices across the four phases were also relatively low suggesting that the same reasons could be applied to explain such deviations. In general, no clear separation of the judges from the three samples could be detected.

Individual Perceptual Spaces Analysis

Since individual differences in the perception of psychopathology might be more complicated than the simple weighting of the dimensions of the common perceptual space, and complexity in judgment should be defined in the "subjective metric" of each individual judge, a similar analysis using individual spaces was performed. Specifically, the dissimilarity judgments of the first 27 stimuli of each individual in each of the three samples were used as input to MLMDS1 to construct 64 different perceptual spaces, one for each judge. The separate scaling results are presented in Appendices 14 to 16. The resulting 64 configurations, rotated to a varimax criterion, were regarded as the individual perceptual spaces for the judges. Then, each judge's 27 inferential judgments with respect to each target were employed to locate those targets as points or vector directions in the judge's individual perceptual space using PREFMAP. The same four models were fitted.

More specifically, Phase 1 allowed idiosyncratic rotation and then differential axes weighting of the varimax rotated individual space separately for each target. Phase 2 allowed idiosyncratic differential axes weighting of the individual space obtained by reorientation using the mean judgments across the three targets. Phase 3 allowed equal axes weighting of the space in Phase 2. Finally Phase 4 implemented the vector model. The results of the analysis are shown in Tables 41 to 46.

## Table 41

## Fitting Individual Inferential Judgments to Individual Perceptual Spaces

## Goodness of Fit Indices (Sample A)

| | JA | | | | JB | | | | JC | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subject | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ |
| 1 | .83* | .82* | .82* | .54* | .78* | .76* | .73* | .31 | .77* | .74* | .71* | .62* |
| 2 | .71 | .64 | .52 | .24 | .81* | .76* | .75* | .64* | .89* | .85* | .80* | .79* |
| 3 | .88* | .87* | .83* | .77* | .83* | .82* | .80* | .53 | .80* | .79* | .71* | .58* |
| 4 | .85* | .82* | .81* | .51 | .75 | .67* | .65* | .32 | .90* | .85* | .84* | .83* |
| 5 | .83* | .79* | .75* | .49 | .67 | .66 | .66* | .60* | .74 | .69* | .66* | .65* |
| 6 | .69 | .66 | .59* | .53* | .79* | .74* | .70* | .69* | .87* | .83* | .76* | .74* |
| 7 | .88* | .86* | .86* | .79* | .84* | .78* | .78* | .68* | .89* | .88* | .88* | .86* |
| 8 | .67 | .47 | .42 | .37 | .74 | .67* | .67* | .58* | .85* | .79* | .77* | .77* |
| 9 | .92* | .91* | .90* | .83* | .77* | .75* | .72* | .67* | .95* | .93* | .92* | .92* |
| 10 | .82* | .79* | .79* | .73* | .62 | .62 | .61* | .54* | .73 | .72* | .70* | .65* |
| 11 | .86* | .82* | .80* | .60* | .75 | .74* | .74* | .65* | .90* | .89* | .88* | .87* |
| 12 | .81* | .80* | .73* | .69* | .72 | .70* | .65* | .59* | .85* | .82* | .82* | .81* |
| 13 | .79* | .78* | .76* | .58* | .74 | .74* | .72* | .65* | .41 | .40 | .24 | .22 |
| 14 | .81* | .79* | .70* | .60* | .75 | .70* | .64* | .59* | .83* | .80* | .67* | .67* |
| 15 | .65 | .60 | .55 | .18 | .68 | .67* | .63* | .39 | .84* | .83* | .69* | .68* |
| 16 | .68 | .68* | .61* | .40 | .72 | .66 | .64* | .32 | .71 | .67* | .58 | .55* |
| 17 | .71 | .68* | .67* | .51 | .89* | .87* | .83* | .75* | .93* | .91* | .89* | .89* |
| 18 | .82* | .69* | .67* | .45 | .81* | .80* | .80* | .27 | .87* | .78* | .75* | .74* |
| Root Mean Square | .79 | .76 | .72 | .57 | .76 | .73 | .71 | .56 | .83 | .80 | .75 | .73 |

*$p < .05$

## Table 42

## Fitting Individual Inferential Judgments to Individual Perceptual Spaces

## Between-Phase F-Ratios (Sample A)

| | JA | | | JB | | | JC | | |
|---|---|---|---|---|---|---|---|---|---|
| Subject | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ |
| 1 | .42 | .21 | 24.79* | .52 | 1.11 | 20.34* | .59 | .92 | 5.51* |
| 2 | 1.13 | 2.31 | 6.52* | 1.45 | .29 | 7.60* | 1.57 | 3.60* | .11 |
| 3 | .53 | 2.52 | 7.14* | .28 | 1.27 | 21.20* | .23 | 3.14 | 7.31* |
| 4 | 1.18 | .51 | 25.25* | 1.38 | .39 | 12.55* | 3.09 | .37 | 1.24 |
| 5 | 1.43 | 1.37 | 16.51* | .08 | .06 | 3.11 | .84 | .75 | .55 |
| 6 | .42 | 1.43 | 2.19 | 1.25 | 1.10 | .86 | 1.38 | 3.58* | 2.13 |
| 7 | .75 | .17 | 8.72* | 1.83 | .10 | 7.94* | .31 | .01 | 4.53* |
| 8 | 2.33 | .55 | .99 | 1.21 | .10 | 4.66* | 2.17 | .61 | .25 |
| 9 | .89 | .84 | 15.10* | .40 | 1.03 | 3.46 | 1.61 | 2.13 | .06 |
| 10 | .75 | .27 | 4.59* | .06 | .09 | 2.87 | .28 | .43 | 3.04 |
| 11 | 1.79 | 1.00 | 16.57* | .18 | .07 | 6.58* | .55 | .55 | 1.89 |
| 12 | .22 | 2.89 | 2.64 | .37 | 1.44 | 2.55 | .78 | .24 | 1.14 |
| 13 | .23 | .86 | 13.01* | .10 | .65 | 4.14 | .08 | 1.19 | .22 |
| 14 | .68 | 3.42 | 5.97* | .88 | 1.43 | 2.37 | 1.07 | 4.95* | .04 |
| 15 | .50 | 1.04 | 8.33* | .16 | .85 | 9.03* | .38 | 6.65* | .65 |
| 16 | .07 | 1.59 | 7.18* | 1.08 | .50 | 11.06* | .59 | 2.26 | .85 |
| 17 | .46 | .26 | 7.10* | .65 | 2.61 | 10.06* | 1.64 | 1.16 | .17 |
| 18 | 3.22* | .54 | 9.83* | .09 | .19 | 34.13* | 3.68* | 1.03 | .91 |

_Note_. Degrees of freedom for F-ratios are $F_{12}(3, 17)$, $F_{23}(2, 20)$, and $F_{34}(1, 22)$.

*$p < .05$

## Table 43

## Fitting Individual Inferential Judgments
## to Individual Perceptual Spaces
## Goodness of Fit Indices (Sample B)

| | JA | | | | JB | | | | JC | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subject | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ |
| 1 | .79* | .75* | .74* | .39 | .74 | .70* | .70* | .52 | .61 | .26 | .21 | .20 |
| 2 | .85* | .82* | .77* | .63* | .62 | .55 | .47 | .46 | .90* | .88* | .86* | .84* |
| 3 | .81* | .72* | .69* | .59* | .61 | .48 | .46 | .41 | .69 | .49 | .47 | .33 |
| 4 | .63 | .60 | .57 | .57* | .70 | .66* | .66* | .51 | .68 | .67* | .66* | .52 |
| 5 | .73 | .72* | .70* | .29 | .65 | .63 | .62* | .44 | .52 | .45 | .41 | .31 |
| 6 | .90* | .80* | .79* | .73* | .79* | .76* | .74* | .67* | .71 | .69* | .64* | .52 |
| 7 | .78* | .75* | .67* | .62* | .82* | .76* | .73* | .69* | .72 | .61 | .59* | .56* |
| 8 | .81* | .80* | .79* | .68* | .76* | .63 | .62* | .54* | .78* | .73* | .73* | .72* |
| 9 | .69 | .67* | .66* | .33 | .81* | .79* | .76* | .64* | .77* | .74* | .72* | .71* |
| 10 | .78* | .74* | .74* | .55* | .68 | .56 | .51 | .30 | .70 | .69* | .68* | .66* |
| 11 | .91* | .90* | .88* | .66* | .85* | .84* | .83* | .56* | .87* | .87* | .81* | .74* |
| 12 | .82* | .82* | .77* | .75* | .71 | .70* | .66* | .50 | .71 | .70* | .63* | .60* |
| 13 | .85* | .83* | .81* | .78* | .86* | .84* | .84* | .72* | .86* | .80* | .80* | .80* |
| 14 | .80* | .75* | .62* | .49 | .80* | .77* | .68* | .39 | .77* | .75* | .41 | .38 |
| 15 | .81* | .80* | .79* | .67* | .75 | .70* | .69* | .33 | .79* | .76* | .74* | .74* |
| 16 | .88* | .83* | .82* | .77* | .84* | .81* | .79* | .72* | .86* | .81* | .81* | .78* |
| 17 | .72 | .72* | .56 | .45 | .64 | .63 | .55 | .31 | .77* | .77* | .62* | .61* |
| 18 | .93* | .90* | .88* | .73* | .88* | .86* | .84* | .53 | .89* | .77* | .65* | .56* |
| 19 | .78* | .77* | .48 | .46 | .75 | .72* | .66* | .53 | .76* | .74* | .56 | .47 |
| Root Mean Square | .81 | .78 | .73 | .60 | .75 | .71 | .68 | .53 | .76 | .71 | .65 | .61 |

*$p < .05$

## Table 44

## Fitting Individual Inferential Judgments to Individual Perceptual Spaces

## Between-Phase F-Ratios (Sample B)

| | | JA | | | JB | | | JC | |
|---|---|---|---|---|---|---|---|---|---|
| Subject | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ |
| 1 | .79 | .28 | 19.73* | .66 | .15 | 9.21* | 2.77 | .24 | .02 |
| 2 | .83 | 2.51 | 11.16* | .73 | 1.17 | .26 | .87 | 1.45 | 2.10 |
| 3 | 2.33 | .71 | 5.84* | 1.36 | .20 | 1.22 | 2.53 | .19 | 3.24 |
| 4 | .27 | .62 | .15 | .62 | .22 | 6.66* | .12 | .08 | 6.78* |
| 5 | .21 | .49 | 17.31* | .22 | .23 | 7.04* | .47 | .50 | 1.86 |
| 6 | 4.64* | .50 | 5.31* | .68 | .79 | 4.22 | .38 | 1.41 | 4.76* |
| 7 | .70 | 2.59 | 2.48 | 1.62 | 1.04 | 2.49 | 1.71 | .37 | .99 |
| 8 | .27 | .45 | 8.75* | 2.30 | .22 | 3.34 | 1.08 | .04 | .65 |
| 9 | .32 | .19 | 12.92* | .36 | 1.24 | 8.84* | .64 | .53 | .95 |
| 10 | .93 | .07 | 11.90* | 1.55 | .71 | 5.23* | .23 | .24 | .85 |
| 11 | .22 | 1.62 | 35.35* | .23 | 1.08 | 25.52* | .20 | 3.63* | 7.09* |
| 12 | .01 | 2.26 | 2.12 | .25 | .84 | 7.43* | .13 | 1.88 | 1.33 |
| 13 | .90 | 1.09 | 2.43 | .71 | .34 | 13.41* | 1.85 | .23 | .31 |
| 14 | 1.03 | 4.12* | 5.51* | .58 | 3.37 | 12.92* | .34 | 9.13* | .78 |
| 15 | .20 | .66 | 10.36* | .90 | .34 | 14.94* | .69 | .79 | .07 |
| 16 | 2.15 | .41 | 4.72* | 1.04 | .66 | 6.19* | 1.81 | .28 | 2.81 |
| 17 | .04 | 4.02* | 3.58 | .11 | 1.61 | 6.55* | .10 | 4.97* | .42 |
| 18 | 2.26 | 2.18 | 23.43* | .88 | .96 | 32.32* | 5.58* | 4.21* | 4.13 |
| 19 | .23 | 8.63* | .51 | .42 | 2.01 | 5.88* | .48 | 5.20* | 2.69 |

Note. Degrees of freedom for F-ratios are $F_{12}(3, 17)$, $F_{23}(2, 20)$, and $F_{34}(1, 22)$.

*$p < .05$

## Table 45

## Fitting Individual Inferential Judgments

## to Individual Perceptual Spaces

## Goodness of Fit Indices (Sample C)

| | JA | | | | JB | | | | JC | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subject | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ |
| 1 | .80* | .76* | .75* | .68* | .68 | .61 | .60* | .39 | .77* | .68* | .66* | .55* |
| 2 | .85* | .85* | .83* | .81* | .69 | .67* | .64* | .61* | .92* | .91* | .89* | .89* |
| 3 | .90* | .86* | .83* | .75* | .85* | .79* | .78* | .53 | .81* | .76* | .74* | .73* |
| 4 | .81* | .80* | .80* | .42 | .81* | .77* | .73* | .53 | .66 | .65 | .64* | .47 |
| 5 | .75 | .66* | .40 | .40 | .76* | .69* | .68* | .49 | .59 | .58 | .46 | .39 |
| 6 | .81* | .78* | .78* | .57* | .90* | .90* | .88* | .83* | .70 | .69* | .67* | .66* |
| 7 | .70 | .62 | .61* | .50 | .88* | .85* | .83* | .45 | .85* | .80* | .80* | .78* |
| 8 | .59 | .54 | .52 | .45 | .76* | .74* | .72* | .70* | .75 | .65 | .57 | .51 |
| 9 | .86* | .85* | .84* | .83* | .90* | .90* | .88* | .88* | .90* | .89* | .87* | .79* |
| 10 | .82* | .80* | .77* | .59* | .63 | .60 | .50 | .24 | .86* | .82* | .74* | .74* |
| 11 | .95* | .90* | .89* | .86* | .60 | .58 | .55 | .46 | .85* | .82* | .81* | .80* |
| 12 | .70 | .68* | .62* | .32 | .72 | .69* | .62* | .42 | .74 | .73* | .62* | .59* |
| 13 | .82* | .72* | .71* | .61* | .64 | .56 | .54 | .48 | .75 | .70* | .67* | .63* |
| 14 | .69 | .66 | .64* | .41 | .72 | .69* | .56 | .49 | .75 | .69* | .56 | .52 |
| 15 | .80* | .78* | .63* | .31 | .79* | .70* | .67* | .10 | .83* | .75* | .50 | .37 |
| 16 | .80* | .79* | .75* | .35 | .79* | .78* | .78* | .45 | .75 | .71* | .65* | .64* |
| 17 | .86* | .83* | .75* | .54* | .69 | .61 | .60* | .51 | .80* | .79* | .72* | .47 |
| 18 | .82* | .72* | .69* | .65* | .76* | .72* | .60* | .48 | .82* | .77* | .68* | .59* |
| 19 | .79* | .78* | .77* | .75* | .88* | .87* | .87* | .60* | .47 | .43 | .41 | .17 |
| 20 | .89* | .86* | .84* | .76* | .73 | .67* | .62* | .57* | .76* | .75* | .61* | .61* |
| 21 | .85* | .85* | .79* | .77* | .87* | .84* | .82* | .68* | .83* | .81* | .73* | .71* |
| 22 | .82* | .79* | .76* | .62* | .73 | .69* | .68* | .53 | .86* | .85* | .84* | .84* |
| 23 | .81* | .77* | .76* | .65* | .85* | .79* | .79* | .71* | .71 | .49 | .48 | .47 |
| 24 | .64 | .59 | .59* | .31 | .63 | .62 | .50 | .42 | .66 | .64 | .59* | .49 |
| 25 | .76* | .68* | .64* | .34 | .69 | .54 | .51 | .24 | .89* | .80* | .73* | .73* |
| 26 | .76* | .73* | .71* | .58* | .62 | .62 | .59* | .31 | .79* | .76* | .74* | .73* |
| 27 | .83* | .78* | .69* | .61* | .77* | .73* | .69* | .34 | .84* | .81* | .77* | .76* |
| Root Mean Square | .80 | .76 | .72 | .60 | .76 | .72 | .69 | .53 | .78 | .74 | .68 | .64 |

*$p < .05$

# Table 46

## Fitting Individual Inferential Judgments to Individual Perceptual Spaces

## Between-Phase F-Ratios (Sample C)

| | | JA | | | JB | | | JC | |
|---|---|---|---|---|---|---|---|---|---|
| Subject | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ |
| 1 | 1.22 | .30 | 4.52* | .95 | .18 | 7.16* | 1.86 | .39 | 5.04* |
| 2 | .19 | .89 | 3.21 | .25 | .90 | 1.29 | .71 | 1.73 | .15 |
| 3 | 1.85 | 2.05 | 8.58* | 2.02 | .14 | 19.18* | 1.22 | .62 | .90 |
| 4 | .21 | .02 | 28.10* | .89 | 1.48 | 12.50* | .15 | .24 | 7.22* |
| 5 | 1.56 | 4.99* | .02 | 1.23 | .34 | 9.26* | .14 | 1.83 | 1.80 |
| 6 | .71 | .14 | 15.46* | .36 | 1.09 | 8.86* | .14 | .71 | .03 |
| 7 | 1.10 | .22 | 4.31* | 1.39 | .82 | 35.12* | 1.59 | .03 | 2.48 |
| 8 | .48 | .30 | 2.23 | .39 | .77 | 1.64 | 1.92 | 1.58 | 1.95 |
| 9 | .67 | .44 | .65 | .12 | 1.54 | .86 | .54 | 1.81 | 11.91* |
| 10 | .61 | .87 | 14.08* | .26 | 1.73 | 5.87* | 1.51 | 3.62* | .36 |
| 11 | 4.76* | .49 | 6.40* | .16 | .61 | 2.73 | .98 | .51 | .08 |
| 12 | .35 | 1.43 | 9.84* | .49 | 1.75 | 7.27* | .17 | 3.30 | .93 |
| 13 | 2.82 | .24 | 6.21* | .91 | .34 | 1.96 | 1.02 | .66 | 2.32 |
| 14 | .49 | .32 | 9.22* | .38 | 3.20 | 2.40 | 1.18 | 3.02 | 1.23 |
| 15 | .51 | 5.48* | 11.01* | 1.88 | .96 | 17.39* | 2.41 | 7.21* | 3.27 |
| 16 | .46 | 1.37 | 22.59* | .07 | .16 | 22.74* | .78 | 1.58 | .58 |
| 17 | 1.29 | 3.78* | 14.17* | 1.12 | .16 | 3.42 | .37 | 2.55 | 13.95* |
| 18 | 2.57 | .79 | 2.36 | .82 | 3.30 | 4.57* | 1.46 | 2.92 | 4.73* |
| 19 | .31 | .49 | 1.42 | .53 | .03 | 35.52* | .28 | .13 | 3.75 |
| 20 | 1.01 | 1.25 | 10.45* | .96 | 1.18 | 1.88 | .31 | 3.99* | .04 |
| 21 | .02 | 3.38 | 2.00 | 1.02 | .89 | 14.74* | .43 | 3.56* | 1.79 |
| 22 | .98 | .89 | 10.76* | .68 | .06 | 7.82* | .48 | .47 | .00 |
| 23 | 1.10 | .37 | 7.43* | 1.76 | .01 | 7.32* | 3.03 | .17 | .25 |
| 24 | .54 | .08 | 8.51* | .11 | 2.12 | 2.31 | .28 | 1.10 | 3.43 |
| 25 | 1.46 | 1.00 | 10.98* | 1.98 | .47 | 5.86* | 4.01* | 2.76 | .02 |
| 26 | .69 | .54 | 7.52* | .01 | .47 | 8.63* | .50 | 1.01 | .62 |
| 27 | 1.21 | 3.46 | 4.51* | .87 | 1.40 | 15.02* | .80 | 2.09 | .73 |

Note. Degrees of freedom for F-ratios are $F_{12}(3, 17)$, $F_{23}(2, 20)$, and $F_{34}(1, 22)$.

*$p < .05$

At the group level, by comparing the root mean squares of each sample across the four phases for each of the three targets when the common perceptual space was employed and when the individual spaces were employed, there was no observable increase in the goodness of fit indices by representing judged targets in individual perceptual spaces.

At the individual level, by employing the individual spaces, the goodness of fit indices for some judges improved a little (e.g., B4, C24 for JA, A14, B17, C5, C24, C25 for JB, and B5, C4 for JC), whereas the goodness of fit indices for other judges yielded poorer fit (e.g. C8 for JA, A13, B1, B14 for JC). In general, those individuals enumerated in the previous section as deviates in their judgments from the group did not show improvements in the goodness of fit indices when they were assumed to employ their own individual perceptual spaces instead of the common perceptual space.

Using similar criteria as before, it was found that the inferential judgments of most judges could be represented by either the simple unfolding model or the vector model when they were assumed to employ their individual perceptual spaces in making their judgments. Only a few judges required reorientation of axes and idiosyncratic stretching and contracting of axes in making inferential judgments with respect to JA and JC. No judges required more than the weighted unfolding model in their inferential judgments with respect to JB.

With respect to JA, these judges were A18, B6, and C11. With respect to JC, these judges were A18, B18, and C25. A reclassification of the judges by their inferential judgments when they were assumed to employ their individual perceptual spaces are shown in Table 47.

## Judge Type and Personality Correlates

To examine whether an individual's complexity in judgments as defined in the previous section was related to personality correlates, judges were arbitrarily divided into a number of types. To simplify, distinctions among different targets were not made and the three set of judgments were regarded as three replications. The 64 judges were then assigned to one of the four types:

Type 1 (N = 4): Vector direction representations were adequate for all three targets.

Type 2 (N = 17): Two targets could be represented adequately by vector directions and one by point location.

Type 3 (N = 27): One target could be represented by vector direction and two by point locations.

Type 4 (N = 16): Point representations were more adequate than vector direction representation for all three targets.

Thus, judges were divided into four types representing increasing level of complexity in making inferential judgments.

To examine the personality correlates of the four types of judges, a standard multiple profile analysis was performed using the JPI scores

## Table 47

### Classification of Judges by Inferential Judgments Using Individual Perceptual Spaces

| Target | Sample | General Unfolding Model | Weighted Unfolding Model | Simple Unfolding Model | Vector Model |
|---|---|---|---|---|---|
| JA | A | 1 | 0 | 14 | 3 |
| | B | 1 | 3 | 11 | 4 |
| | C | 1 | 3 | 17 | 6 |
| JB | A | 0 | 0 | 11 | 7 |
| | B | 0 | 0 | 14 | 5 |
| | C | 0 | 0 | 18 | 9 |
| JC | A | 1 | 4 | 3 | 10 |
| | B | 1 | 4 | 2 | 12 |
| | C | 1 | 4 | 5 | 17 |

of the judges. Since only Sample C judges completed the JPI, this analysis was confined to judges in Sample C with 2, 6, 14 and 5 judges in Type 1 to Type 4. Three specific hypotheses were tested. The parallelism hypothesis stated that the shapes of the four profile types were mutually identical, that is, the difference between each pair of adjacent scale scores was the same for all four types. This hypothesis was tested by conducting a one-way MANOVA on the slope scores, that is, the vector of differences between adjacent scores. The results of the analysis indicated that the parallelism hypothesis could not be rejected (Wilk's Lambda W = .081 and the associated Rao's F(42, 30.43) = .96; Lawley-Hotelling Trace T = 4.753, Roy's Largest Root R = .773, s = 3, m = 5, n = 4).

Assuming parallelism, the level hypothesis stated that the profiles for the four types were at the same mean level, that is, the mean sum of the scale scores was identical for the four types. The level hypothesis was tested by conducting a one-way ANOVA on the average of each subject's scale scores. The results indicated that the hypothesis could not be rejected ( F(2, 23) = .422).

Assuming parallelism, the flatness hypothesis stated that the "pooled" profile of the four types was flat, that is, the grand means on the 15 scales were identical. This hypothesis was tested by conducting a single sample Hotelling's $T^2$ on the vector of grand mean slope measures, that is, the vector of differences between adjacent grand means. The results indicated that the "pooled" profile was definitely not flat (The associated $F(14, 13) = 12.53$, $p < .0001$). Thus, the multiple JPI profile analysis did not show significant differences among the four different types of judges.

For exploratory purposes, a multiple discriminant analysis employing the 15 JPI scale scores of the Sample C judges was also performed. The results of the analysis showed that the four types could not be significantly distinguished using the JPI scores ( $\chi^2(45) = 49.78$ ). For further exploratory purposes, the resulting discriminant function was also used to classify with an equal prior probability criterion and a generalized distance measure the 27 judges of Sample C and the 18 judges of Sample D using their JPI scores. For Sample C, the original sample, 96.3% correct classification resulted. Only C5 was misclassified. For comparison, the inferential judgments of the 18 Sample D judges were used as input to the PREFMAP assuming that they too shared the common perceptual space of Samples A, B, and C. The results of the analysis are shown in Tables 48 and 49. As before, the 18 judges were then assigned to the four different types in a similar manner. Using the resulting judge types as the criterion, it was found that this classification only correctly identified five judges (D1, D3, D5, D11, and D14). In summary, the search for some personality correlates to the four judge types classified according to the level of complexity in judgment was unsuccessful.

## Table 48

## Fitting Individual Inferential Judgments to the Common Perceptual Space

## Goodness of Fit Indices (Sample D)

| | JA | | | | JB | | | | JC | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subject | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ |
| 1 | .90* | .88* | .87* | .80* | .88* | .85* | .84* | .73* | .83* | .83* | .81* | .81* |
| 2 | .74 | .70* | .70* | .51 | .65 | .56 | .54 | .47 | .83* | .77* | .74* | .74* |
| 3 | .71 | .62 | .54 | .32 | .81* | .74* | .70* | .59* | .50 | .42 | .41 | .35 |
| 4 | .78* | .42 | .40 | .07 | .80* | .79* | .75* | .68* | .64 | .60 | .57 | .49 |
| 5 | .88* | .69* | .62* | .58* | .70 | .51 | .47 | .46 | .78* | .78* | .75* | .73* |
| 6 | .89* | .80* | .70* | .68* | .85* | .83* | .65* | .62* | .80* | .78* | .60* | .58* |
| 7 | .87* | .77* | .72* | .65* | .82* | .79* | .71* | .69* | .87* | .85* | .84* | .80* |
| 8 | .90* | .82* | .79* | .66* | .92* | .85* | .84* | .72* | .87* | .85* | .84* | .84* |
| 9 | .95* | .89* | .85* | .82* | .94* | .93* | .90* | .85* | .96* | .95* | .95* | .93* |
| 10 | .76* | .72* | .72* | .71* | .80* | .77* | .75* | .72* | .82* | .79* | .74* | .71* |
| 11 | .82* | .78* | .72* | .71* | .78* | .66 | .65* | .65* | .79* | .76* | .72* | .72* |
| 12 | .73 | .65 | .61* | .40 | .85* | .80* | .72* | .40 | .84* | .73* | .68* | .59* |
| 13 | .87* | .79* | .78* | .59* | .83* | .75* | .73* | .67* | .84* | .84* | .83* | .82* |
| 14 | .63 | .57 | .47 | .41 | .67 | .64 | .55 | .46 | .78* | .75* | .71* | .61* |
| 15 | .89* | .74* | .71* | .68* | .78* | .78* | .76* | .74* | .78* | .75* | .69* | .68* |
| 16 | .87* | .78* | .77* | .53* | .68 | .64 | .64* | .59* | .83* | .80* | .79* | .76* |
| 17 | .83* | .81* | .72* | .61* | .58 | .56 | .42 | .37 | .81* | .79* | .76* | .70* |
| 18 | .81* | .80* | .78* | .64* | .73 | .64 | .64* | .62* | .80* | ,72* | .60* | .60* |
| Root Mean Square | .83 | .74 | .70 | .60 | .79 | .74 | .69 | .63 | .80 | .77 | .73 | .70 |

$^*p < .05$

## Table 49

## Fitting Individual Inferential Judgments to the Common Perceptual Space

## Between-Phase F-Ratios (Sample D)

| Subject | JA | | | JB | | | JC | | |
|---|---|---|---|---|---|---|---|---|---|
| | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ | $F_{12}$ | $F_{23}$ | $F_{34}$ |
| 1 | 1.00 | .75 | 9.69* | .97 | .72 | 13.09* | .08 | 1.00 | .62 |
| 2 | .75 | .02 | 10.30* | .97 | .38 | 2.08 | 1.56 | 1.13 | .16 |
| 3 | 1.35 | 1.60 | 5.74* | 1.65 | 1.25 | 6.42* | .53 | .15 | 1.14 |
| 4 | 6.16* | .26 | 4.02 | .24 | 1.41 | 4.84* | .50 | .44 | 2.72 |
| 5 | 7.51* | 1.79 | 1.84 | 2.62 | .44 | .43 | .06 | 1.11 | 1.35 |
| 6 | 4.01* | 3.92* | .94 | .56 | 8.53* | 1.46 | .46 | 6.25* | .78 |
| 7 | 3.87* | 2.05 | 4.11 | .92 | 3.22 | 1.15 | .55 | .86 | 4.54* |
| 8 | 4.04* | 1.81 | 10.24* | 4.60* | .44 | 15.04* | 1.16 | .30 | .76 |
| 9 | 6.64* | 3.56* | 4.71* | 1.41 | 3.53* | 10.83* | 1.17 | .39 | 9.51* |
| 10 | .77 | .16 | .11 | .85 | .65 | 2.30 | .92 | 1.82 | 2.39 |
| 11 | 1.29 | 1.94 | .68 | 2.66 | .16 | .00 | .68 | 1.49 | .04 |
| 12 | 1.40 | .89 | 7.20* | 1.44 | 3.36* | 16.53* | 3.04 | 1.71 | 4.35* |
| 13 | 3.08 | .08 | 15.27* | 2.22 | .37 | 4.11 | .25 | .53 | .84 |
| 14 | .63 | 1.51 | 1.57 | .30 | 1.83 | 2.86 | .50 | 1.37 | 6.41* |
| 15 | 6.90* | 1.02 | 2.24 | .15 | .75 | 1.22 | .51 | 2.08 | .99 |
| 16 | 3.33* | .75 | 16.12* | .47 | .10 | 2.32 | .85 | .77 | 2.38 |
| 17 | .75 | 3.90* | 6.58* | .22 | 2.04 | .89 | .52 | 1.04 | 5.14 |
| 18 | .36 | .76 | 11.41* | 1.39 | .04 | .95 | 2.08 | 3.19 | .17 |

*Note*. Degrees of freedom for F-ratios are $F_{12}(3, 17)$, $F_{23}(2, 20)$, and $F_{34}(1, 22)$.

$^{*}p < .05$

## Accuracy of Inferential Judgments

To assess judges' accuracy in inferring characteristics of the three targets, the Modal Profiles on which the target descriptions were based were used as the criteria. Pearson product-moment correlations between each judge's inferential judgments on the 25 stimuli (excluding Insomnia and Headache Proneness) and the 25 Modal Profile scale scores of the corresponding Modal Profile were computed as measures of accuracy and are shown in Table 50.

For exploratory purposes, three specific questions were asked concerning accuracy. The first one was whether there was differential accuracy comparing experienced and less experienced judges. The second one was whether there was differential accuracy among the four judge types classified on the basis of complexity of judgment in the previous section. The third one was whether judges who utilized the common perceptual space effectively made more accurate judgments.

To answer the first question, a Hotelling's $T^2$ was performed using the three accuracy scores of the 82 judges as a vector of dependent variables comparing the more experienced group (Sample A) with the less experienced group (Samples B, C, and D). The difference in accuracy between the two groups was significant (The associated $F(3, 78) = 5.57$, $p < .005$). Post hoc multiple comparisons were made by constructing the Roy-Bose simultaneous confidence intervals.

Table 50

Accuracy Index

| | A | | | B | | | C | | | D | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subject | JA | JB | JC | JA | JB | JC | JA | JB | JC | JA | JB | JC |
| 1 | .49 | .69 | .57 | .66 | .46 | .36 | .69 | .48 | .63 | .80 | .47 | .49 |
| 2 | .63 | .48 | .65 | .67 | .11+ | .54 | .73 | .62 | .78 | .48 | .51 | .67 |
| 3 | .32+ | .61 | .60 | .47 | .15+ | .38 | .68 | .62 | .61 | .34 | .28+ | .20+ |
| 4 | .55 | .36 | .54 | .50 | .40 | .53 | .43 | .68 | .02+ | .37 | .45 | .43 |
| 5 | .58 | .64 | .61 | .53 | .54 | .11+ | .48 | .36 | .45 | .63 | .27+ | .60 |
| 6 | .49 | .35 | .70 | .59 | .57 | .49 | .74 | .50 | .62 | .60 | .17+ | .24+ |
| 7 | .61 | .66 | .56 | .77 | .30+ | .61 | .76 | .36 | .56 | .46 | .56 | .54 |
| 8 | .59 | .77 | .69 | .58 | .77 | .57 | .69 | .59 | .69 | .51 | .60 | .78 |
| 9 | .84 | .74 | .80 | .56 | .57 | .59 | .66 | .46 | .73 | .78 | .46 | .72 |
| 10 | .50 | .66 | .70 | .67 | .53 | .47 | .64 | .64 | .54 | .61 | .49 | .58 |
| 11 | .49 | .58 | .68 | .75 | .50 | .77 | .72 | .67 | .63 | .50 | .41 | .44 |
| 12 | .71 | .80 | .64 | .63 | .76 | .59 | .47 | .74 | .56 | .57 | .38 | .36 |
| 13 | .61 | .56 | .57 | .73 | .62 | .80 | .79 | .48 | .56 | .61 | .51 | .62 |
| 14 | .73 | .63 | .65 | .61 | .60 | .75 | .64 | .28+ | .49 | .31+ | .43 | .59 |
| 15 | .48 | .47 | .65 | .71 | .61 | .78 | .75 | .18+ | .47 | .80 | .74 | .61 |
| 16 | .59 | .35 | .63 | .71 | .68 | .61 | .74 | .20+ | .61 | .63 | .43 | .38 |
| 17 | .57 | .62 | .57 | .56 | .40 | .47 | .66 | .21+ | .07+ | .55 | .42 | .52 |
| 18 | .54 | .68 | .56 | .75 | .27+ | .48 | .72 | .36 | .49 | .49 | .23+ | .34 |
| 19 | | | | .44 | .37 | .54 | .65 | .37 | .48 | | | |
| 20 | | | | | | | .72 | .52 | .69 | | | |
| 21 | | | | | | | .60 | .48 | .62 | | | |
| 22 | | | | | | | .33+ | .49 | .62 | | | |
| 23 | | | | | | | .55 | .49 | .54 | | | |
| 24 | | | | | | | .44 | .20+ | .24+ | | | |
| 25 | | | | | | | .63 | .16+ | .59 | | | |
| 26 | | | | | | | .67 | .37 | .54 | | | |
| 27 | | | | | | | .63 | .68 | .69 | | | |

*Note.* All are $p < .05$, one tailed, except denoted by + .

The 95% confidence intervals constructed to test all pairs of contrasts are shown in Table 51. The contrast for JB was significant.

To assess whether the four different types of judges were differentially accurate in making inferential judgments, a one-way MANOVA was performed using the accuracy vector as the dependent variables and the type of judges as the single factor. The resulting statistics were: Wilk's Lambda W = .876 and the associated Rao's F(9, 141.31) = .88 ; Lawley-Hotelling Trace T = .140, Roy's Largest Root R = .107 (s = 3, m = $-\frac{1}{2}$, n = 28). Thus the results provided no evidence that different types of judges as defined were differentially accurate.

To examine whether judges who utilized the common perceptual space effectively did make more accurate judgments, we first sought for an appropriate index for effective utilization of the common perceptual space. One convenient choice was the goodness of fit indices (multiple Rs) computed as a result of fitting the hierarchy of models to the inferential judgments of each judge to locate a judged target as a point or a vector direction in the common perceptual space. To be general, we chose the goodness of fit index for the general unfolding model for each target dividing judges arbitrarily into two groups on the basis of the F-ratio computed from the multiple R using $\underline{p}$ = .01 as the dividing line.

This way of classification resulted in three sets of effective and ineffective users of the common perceptual space in making

### Table 51

### Comparing Accuracy Measures of the More Experienced with the Less Experienced Groups

| Target | | More Experienced | Less Experienced | Roy-Bose 95% Confidence Intervals |
|---|---|---|---|---|
| A | mean | .573 | .611 | -.038 ± .094 |
| | s.d. | .115 | .123 | |
| B | mean | .592 | .455 | .137 ± .125 |
| | s.d. | .139 | .166 | |
| C | mean | .632 | .531 | .101 ± .118 |
| | s.d. | .066 | .167 | |
| | | N = 18 | N = 64 | |

inferential judgments with respect to JA, JB, and JC. The number of judges in each category is shown in Table 52. This classification indicated that most judges utilized the common perceptual space effectively in their inferential judgments with respect to JC, less effectively with respect to JA, and least with respect to JB. The experienced group (Sample A) did not in general make better use of the common perceptual space in judging the targets, especially in judging JA and JB. Thus it appeared that the experienced judges, defined in our limited sense, were not in general necessarily effective users of the common perceptual space. The means and standard deviations of the accuracy measures for effective and ineffective users with respect to the three targets are also shown in Table 52.

Separately for each target, comparison between effective and ineffective users was made by performing a $t$ test. With respect to JA, $t(80) = 3.43$ ($p < .001$, one-tailed); with respect to JB, $t(80) = 1.51$ ($p < .10$, one-tailed); with respect to JC, $t(80) = 5.92$ ($p < .001$, one-tailed). It appeared that judges who utilized the common perceptual space effectively did make more accurate judgments, at least, with respect to JA and JC.

## Table 52

### Comparing Accuracy Measures Between Effective and Ineffective Users of the Common Space

| Target | Sample | Effective User | | | | Ineffective User | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | A | B | C | D |
| JA | mean | .636 | | | | .546 | | | |
| | s.d. | .116 | | | | .111 | | | |
| | N | 9 | 13 | 19 | 11 | 9 | 6 | 8 | 7 |
| | | N = 52 | | | | N = 30 | | | |
| JB | mean | .520 | | | | .463 | | | |
| | s.d. | .156 | | | | .175 | | | |
| | N | 3 | 10 | 12 | 7 | 15 | 9 | 15 | 11 |
| | | N = 32 | | | | N = 50 | | | |
| JC | mean | .607 | | | | .416 | | | |
| | s.d. | .100 | | | | .191 | | | |
| | N | 17 | 12 | 21 | 9 | 1 | 7 | 6 | 9 |
| | | N = 59 | | | | N = 23 | | | |

## Discussion

In this study, we investigated some models for the process of inferential judgments of three specific targets JA, JB, and JC corresponding to the three clinical types representing clinical depression, preparanoid, and psychopathy in Study 1. Specifically, the hierarchy of linear-quadratic models was fitted to the inferential judgments with respect to each target. The significantly better fit of a more general model than a more restricted one was regarded as the requirement of more complex process to locate the target in the perceptual space.

Our analyses were conducted at two levels, assuming either the common perceptual space was shared by all judges, or each judge employed his own individual perceptual space in making inferential judgments. The results of fitting the models to the mean inferential judgments of Samples A, B, and C with respect to the three targets suggested that target complexity might lead to "complex" judgments. It appeared that JA was most complex, JB was less so, and JC was least complex. The results of using individual inferential judgments to locate targets in the same common perceptual space suggested that there were considerable individual differences in adopting complex strategies in inferential judgments.

To ensure that complexity in judgment was defined in each judge's "subjective metric" such that nonlinearity and configurality in the judgment process were meaningful, the models were also fitted to the judge's inferential judgments with respect to each target using the individual's own perceptual space instead of the common perceptual space. However, the common perceptual space appeared to be quite adequate in representing judges' perception of psychopathology, and in forming a basis for inferential judgments with respect to specific targets. In general, at both levels of analysis, the representation of the inferential judgments of judges by the simple unfolding model and the vector model appeared to be a good approximation if not the true state of affairs.

We also classified judges into four different types according to their level of complexity in making inferential judgments. The attempts to seek personality correlates to these judge types were by and large unsuccessful.

We also explored the relative "accuracy" of inferential judgments of judges with respect to the three targets. It is recognized that "accuracy" of inferential judgments, for our purposes, was defined with respect to each target and in a restricted sense as the degree of correspondence between the inferential judgments and the Modal Profile on which the target description was based. Specifically, three separate analyses were performed to assess whether there was differential accuracy when comparing experienced and less experienced judges, comparing four different judge types divided according to the level of complexity in judgment, and comparing judges utilizing effectively and judges utilizing ineffectively the shared implicit theory or common perceptual space. An overall significant difference was found when comparing the experienced with the less experienced judges in the accuracy measures. The fact that a significant contrast with respect to JB was found might be due to the rarity of JB as reported by Skinner (1975)(2.1% of the population he employed in his classification studies). There was no significant differential accuracy for different judge types. Judges who utilized the shared implicit theory more effectively did make more accurate judgments especially with respect to JA and JC.

# CHAPTER 7

# GENERAL DISCUSSION

We have demonstrated in previous chapters either in theoretical arguments or in empirical investigations that implicit personality theory is properly characterized as implicit. It can be made explicit by the structural representation of a representative set of constructs and hence resembles a theory. Contending that it is not confined to the domain of normal personality, we have extended it to the domain of psychopathology. Implicit in our arguments and investigations is a broadened notion of implicit personality theory. Attempts to broaden this notion can be summarized as two general and parallel processes, extension and intension. These terms were used by Kaplan (1964) to denote the development of a theory. In simple terms, "extension" refers to the generalization of implicit personality theory from the domain of normal personality to other domains. "Intension" refers to the refining of implicit theory through addition of new concepts or relations among concepts such that a better understanding of the phenomenon can be achieved.

## A Broadened Notion of Implicit Theory of Personality

"Extension". Schneider (1973), in his comprehensive review of the research on implicit personality theory, has argued for a broadened notion to include other "nontrait aspects" of implicit personality theory. Indeed, as he suggested, attitudes, facial features, emotional expressions, stereotypes, socioeconomic variables, etc. can all be fitted to this implicit personality theory paradigm. The underlying assumption is: people do have implicit notions of the relationships among these attributes of people. Thus people can be assumed to have implicit theories of personality, of psychopathology, of motivation, of vocational interests, of human values, of social relations, of self, etc. (See also Wegner & Vallacher, 1977).

Our study on the perception of psychopathology is one among many possible ones which serves to generalize and test the notion of implicit theory in the domain of psychopathology. Our findings indicated that there are considerable individual differences in the perception of psychopathology which are more complicated than the simple weighting of dimensions of the shared implicit theory of psychopathology. However, this shared implicit theory appears to approximate parsimoniously many implicit theories. In addition, this shared implicit theory representing the perceived relationships among psychopathological characteristics or behaviors corresponds closely to the self-reported data from normal and abnormal samples. Our dual parametrization of clinical types and psychopathological characteristics in a joint space also enhances our understanding of the perception of these clinical types, revealing that they are perceived more or less "accurately."

"Intention". We have suggested a distinction between implicit theory per se and inferential judgments with respect to specific target persons utilizing the implicit theory. Thus, distinguished from the structure of perceived trait relationships is the judgment of specific persons. The locations of these specific persons in the perceptual space or implicit theory give the likelihood of particular traits or behaviors being attributed to these persons.

In effect, we suggest that even though a person's perceived trait relationships or the general implicit theory may exist independently of a target person, inferential judgments with respect to a specific target person require certain flexibility of the implicit theory to take into account specific information about the target person. This interpretation is consistent with the results of Hanno and Jones (1974) who assessed implicit personality theory by changing reference persons as described previously.

A similar conclusion on the flexibility of the implicit theory has also been reached by Bierhoff and Bierhoff-Alfermann (1976), and Bierhoff (1976) who studied implicit personality theory along a slightly different line. They cited Laucken's (1974) conception of implicit personality theory in his analysis of "Naive Verhaltenstheorie" which emphasizes the explanation of the behaviors of specific target persons by a judge. Laucken (1974) distinguished two types of explanation of a person's behaviors by a judge: a "process theoretical" one which the judge employs in analyzing the actual events that have taken place, and a "disposition theoretical" one which the judge employs in attributing stable dispositions to the person. Thus Bierhoff and Bierhoff-Alfermann (1976) and Bierhoff (1976) focused on the "process theoretical" aspect and studied what competing psychological theories people employed as explanation of the behaviors of specific target persons.

The hierarchy of models for the process of inferential judgments thus represent a refinement of the implicit personality theory along this line. In our studies, we started with a perceptual space of characteristics or traits, the focus was then on the process of trait attribution. With a perceptual space of psychological theories, or other constructs of explanation, the notions of causal attribution can be easily accomodated in our paradigm.

Our findings in the process of inferential judgments also suggested that there are great individual differences in the judgment process. Some judges are undoubtedly more complex in their judgments than others, and some targets are admittedly perceived as more complex than others. In addition to modeling the complex process of inferential judgments, the hierarchy of models also provide a set of subject parameters for analyzing individual differences, a set of parameters similar to those of the model for "inferential accuracy."

## Jackson's Model for "Inferential Accuracy" Revisited

The recognition that implicit theory contributes a valid component in the judgments of others has motivated Jackson to reformulate the threshold model for the item responding process to a model for "inferential accuracy" in person perception (Jackson, 1972), and in clinical judgment of psychopathology (Reed & Jackson, 1975). In the model for "inferential accuracy," individual differences are expressed in terms of indices of sensitivity and threshold.

Sensitivity refers to an individual's awareness of the shared inferential network of traits, that is, the general implicit theory. Sensitivity is operationally defined as the correspondence between an individual's judgments of a specific target person and the group average judgments usually collectively referred to as the group consensus. Thus, we have a seemingly global index of sensitivity to the general inferential network, yet when operationally defined, we have different indices of sensitivity to different group consensus judgments with respect to different specific target persons.

Threshold refers to the readiness of an individual to attribute traits or behaviors to specific target persons based on the presumed relations among traits or behaviors, that is, the general implicit theory. Threshold is operationally defined as the mean judgment ratings of an individual with respect to a particular judged target. Thus, we have a seemingly global index of threshold in terms of the likelihood of trait or behavior attribution on the basis of the general implicit theory, yet when operationally defined, we have different indices of thresholds with respect to the individual's judgments of different specific target persons. Admittedly, global indices of sensitivity and threshold can be obtained in the form of averages by sampling adequately a number of specific target persons in the domain of interest.

In our conceptualization and research paradigm, we incorporate the ideas of the model for "inferential accuracy" and suggest a unified treatment relating inferential judgments with respect to specific target persons to implicit theory. In this treatment, we make an explicit distinction between implicit theory per se and inferential judgments with respect to specific target persons based on the implicit theory, thus allowing us to conceptualize individual differences in perception and judgment.

In perception, instead of having a completely global index of sensitivity to the general implicit theory, we have a number of indices of sensitivity to each of the dimensions of the implicit theory, the dimensions being "discovered" rather than "imposed" by multidimensional scaling. Operationally, each individual's indices of sensitivity to the dimensions of the general implicit theory can be estimated by his diagonal weight matrix in an individual differences model of multidimensional scaling, giving the relative importance he attaches to each dimension.

In judgment, with respect to a particular judgment, we have a corresponding index of sensitivity indicating the importance the judge attaches to a dimension, or the contribution of that dimension, in making that particular judgment with respect to a specific target. Operationally, the cosine of the angle between the target vector and the dimension provides an estimate of this index in the vector model. In the unfolding model, differential axes weighting provide an estimate of the relative importance or the contribution of the particular dimension in making the judgment.

The concept of threshold can be conceptualized in inferential judgments as the degree of likelihood or probability of trait or behavior attribution. It can be estimated by reproduced distances between target locations and traits or behaviors. In the vector model, the geometric representation is in terms of a family of parallel lines, planes, hyperplanes, perpendicular to the target vector direction representing equal probability of trait or behavior attribution. In the unfolding models, the geometric representation is in terms of concentric circles, spheres, hyperspheres, ellipses, ellipsoids, and hyperellipsoids centered at the target point location representing equal probability of trait or behavior attribution.

## Process, Accuracy, and Individual Differences

In our study of inferential judgments, we examined a hierarchy of linear-quadratic models to represent the process of inferential judgments with respect to three specific targets, relating inferential judgments to implicit theory. According to our models, we submit that each judge has a perceptual space or an implicit theory of psychopathology, and he uses it in various ways in making inferential judgments with respect to specific targets. Geometrically, the judgment process is modeled by rotating the axes of the perceptual space, differential weighting of the axes, and locating the target as a point or a vector direction in the space such that the likelihood of a target engaging in other behaviors or possessing other traits can be assessed. Mathematically, this is equivalent to fitting linear and quadratic equations to the data. Since we do not presume relevant dimensions or measurement scales for our judges, our modeling of the complex processing of judges as configural and nonlinear is in terms of the "subjective metric" of the judges, a point emphasized by Anderson (1972) in the study of clinical judgment. Thus our approach allows us to study the process of clinical judgment in a way different from the traditional clinical judgment process studies. However, as explicated in Chapter 2, our models may only approximate the true state of affairs, and many other competing models not considered and not intended to be ruled out in our study may fit the data as well.

Our study of inferential judgments also bears on the "accuracy" of judgment. Our findings on the relative "validity" of the implicit theory of psychopathology, and on the more or less "accurate" perception of clinical types lay the foundation for assessing the differential accuracy of judges who utilize the shared implicit theory effectively and ineffectively. Admittedly, perception and judgment can be confounded in this case. Along this line of speculation, relatively "accurate" inferential judgments with respect to a target may be a result of a reorientation of an individual's idiosyncratic implicit theory to the shared implicit theory or effective utilization of the specific information about the target or both. It is recognized that, for our purposes, "validity" is defined in a restricted sense as validation against self-reported data. Similarly, "accuracy" is also defined in a restricted sense as the degree of correspondence between the inferential judgments with respect to a target and the Modal Profile on which the target description is based.

We have adopted throughout an individual differences approach to both the perception and judgment of psychopathology. Admittedly, we have focused more on the group differences in the perception of psychopathology, and have viewed the shared implicit theory as a good approximation and parsimonious representation of many individual idiosyncratic implicit theories. In many applications, such as in clinical diagnosis, an individual's implicit theory is too important to be ignored. In our view, the individual's implicit theory to a large extent constitutes a person's personality and can be uncovered in the same manner as in our paradigm. For example, Kelly (1955) considered, in his theoretical work, the entire process of social learning as one of generating construct dimensions along which others are perceived, suggesting that the individual and his social world may be revealed in his implicit theory about himself and the significant others in his life. In this regard, according to our conceptualization, an individual's problems arising from his social interactions may stem from his idiosyncratic implicit theory. Further, problems arising from inaccurate judgments of specific persons may reflect difficulties in locating these specific persons in his implicit theory. Thus, accordingly, psychotherapy may be properly conceptualized as the altering or reorientation of the implicit theory of a patient.

# REFERENCES

Ajzen, I. Attribution of dispositions to an actor: Effects of perceived decision freedom and behavioral utilities. Journal of Personality and Social Psychology, 1971, 18, 144-156.

Ajzen, I., & Fishbein, M. A Bayesian analysis of attribution processes. Psychological Bulletin, 1975, 82, 261-277.

Alker, H. A., & Hermann, M. G. Are Bayesian decisions artificially intelligent? The effect of task and personality of conservatism in processing information. Journal of Personality and Social Psychology, 1971, 19, 31-41.

Anderson, N. H. A simple model for information integration. In R. P. Abelson, E. Aronson, W. J. McGuire, T. M. Newcomb, M. J. Rosenberg, & P. H. Tannenbaum (Eds.), Theories of cognitive consistency: A sourcebook. Chicago: Rand McNally, 1968.

Anderson, N. H. Integration theory and attitude change. Psychological Review, 1971, 78, 171-206.

Anderson, N. H. Looking for configurality in clinical judgment. Psychological Bulletin, 1972, 78, 93-102.

Anderson, N. H. Cognitive algebra: Integration theory applied to social attribution. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 7). New York: Academic Press, 1974. (a)

Anderson, N. H. Information integration theory: A brief survey. In D. H. Krantz, R. C. Atkinson, R. D. Luce, & P. Suppes (Eds.), Contemporary developments in mathematical psychology. San Francisco: Freeman, 1974. (b)

Asch, S. E. Forming impressions of personality. Journal of Abnormal and Social Psychology, 1946, 41, 258-290.

Beach, L., & Wertheimer, M. A free response approach to the study of person cognition. Journal of Abnormal and Social Psychology, 1961, 62, 367-374.

Beals, R., Krantz, D. H., & Tversky, A. Foundations of multidimensional scaling. Psychological Review, 1968, 75, 127-142.

Bennett, J. F., & Hays, W. L. Multidimensional unfolding: Determining the dimensionality of ranked preference data. Psychometrika, 1960, 25, 27-43.

Bierhoff, H. W. The use of psychological theories by 'naive' judges: A second look. European Journal of Social Psychology, 1976, 6, 369-374.

Bierhoff, H. W., & Bierhoff-Alfermann, D. The use of psychological theories by 'naive' judges: A study in implicit personality theory. European Journal of Social Psychology, 1976, 6, 429-445.

Boyd, J. E., & Jackson, D. N. The perceived structure of social attitudes and personality: A multidimensional scaling approach. Multivariate Behavioral Research, 1967, 2, 281-297.

Bruner, J. S., Shapiro, D., & Tagiuri, R. The meaning of traits in isolation and in combination. In R. Tagiuri, & L. Petrullo (Eds.), Person perception and interpersonal behavior. Stanford, California: Stanford University Press, 1958.

Bruner, J. S., & Tagiuri, R. The perception of people. In G. Lindzey (Ed.), Handbook of social psychology (Vol. 2). Cambridge, Mass.: Addison-Wesley, 1954.

Burron, B. F., & Jackson, D. N. Inferential accuracy and threshold in person perception. Research Bulletin No. 296, Department of Psychology, the University of Western Ontario, 1974.

Carroll, J. D. Individual differences and multidimensional scaling. In R. N. Shepard, A. K. Romney, & S. B. Nerlove (Eds.), Multidimensional scaling: Theory and applications in the behavioral sciences (Vol. 1). New York: Seminar Press, 1972.

Carroll, J. D., & Chang, J. J. Analysis of individual differences in multidimensional scaling via an N-way generalization of "Eckart-Young" decomposition. Psychometrika, 1970, 35, 283-319.

Chan, D. W., & Jackson, D. N. Implicit theory of psychopathology. Research Bulletin No. 400, Department of Psychology, the University of Western Ontario, 1976. Multivariate Behavioral Research, 1978, in press.

Chapman, L. J., & Chapman, J. P. Associatively based illusory correlation as a source of psychodiagnostic folklore. In L. D. Goodstein, & R. I. Lanyon (Eds.), Readings in personality assessment. New York: Wiley, 1971.

Cliff, N. Adjective checklist responses and individual differences in perceived meaning. Educational and Psychological Measurement, 1968, 28, 1063-1077. (a)

Cliff, N. The "idealized individual" interpretation of individual differences in multidimensional scaling. Psychometrika, 1968, 33, 225-232.

Cliff, N. Liking judgments and multidimensional scaling. Educational and Psychological Measurement, 1969, 29, 73-85.

Cliff, N., Bradley, P., & Girard, R. The investigation of cognitive models for inventory response. Multivariate Behavioral Research, 1973, 8, 407-425.

Cliff, N., & Young, F. W. On the relation between unidimensional judgments and multidimensional scaling. Organizational Behavior and Human Performance, 1968, 3, 269-285.

Coombs, C. H. Psychological scaling without a unit of measurement. Psychological Review, 1950, 57, 145-158.

Coombs, C. H. A note on the relation between the vector model and the unfolding model for preferences. Psychometrika, 1975, 40, 115-116.

Cooper, L. G. A new solution to the additive constant problem in metric multidimensional scaling. Psychometrika, 1972, 37, 311-322.

Cronbach, L. J. Processes affecting scores on "understanding of others" and "assumed similarity". Psychological Bulletin, 1955, 52, 177-193.

D'Andrade, R. B. Trait psychology and componential analysis. American Anthropologist, 1965, 67, 215-228.

David, H. A. The structure of cyclic paired-comparison designs. The Journal of the Australian Mathematical Society, 1963, 3, 117-127.

Dawes, R. M., & Corrigan, B. Linear models in decision making. Psychological Bulletin, 1974, 81, 95-106.

DeSwart, J. H. Opinion revision and the influence of corresponding and conflicting adjectives. Acta Psychologica, 1971, 35, 198-206.

Diederich, G. W., Messick, S. J., & Tucker, L. R. A general least squares solution for successive intervals. Psychometrika, 1957, 22, 159-173.

Dornbusch, S. M., Hastorf, A. H., Richardson, S. A., Muzzy, R. E., & Vreeland, R. S. The perceiver and the perceived: Their relative influence on categories of interpersonal perception. Journal of Personality and Social Psychology, 1965, 1, 434-440.

DuCharme, W. M. Response bias explanation of conservative human inference. Journal of Experimental Psychology, 1970, 85, 66-74.

Edwards, W. Conservatism in human information processing. In B. Kleinmuntz (Ed.), Formal representation of human judgment. New York: Wiley, 1968.

Einhorn, H. J. The use of nonlinear, noncompensatory models in decision making. Psychological Bulletin, 1970, 73, 221-230.

Goldberg, L. R. Simple models or simple processes? Some research on clinical judgments. American Psychologist, 1968, 23, 483-496.

Green, B. F., Jr. Descriptions and explanations: A comment on papers by Hoffman and Edwards. In B. Kleinmuntz (Ed.), Formal representation of human judgment. New York: Wiley, 1968.

Green, P. E., & Carmone, F. G. Multidimensional scaling and related techniques in marketing analysis. Boston: Allyn & Bacon, 1970.

Green, P. E., & Rao, V. R. Applied multidimensional scaling: A comparison of approaches and algorithms. New York: Holt, Rinehart & Winston, 1972. (a)

Green, P. E., & Rao, V. R. Configuration synthesis in multidimensional scaling. Journal of Marketing Research, 1972, 9, 65-68. (b)

Hanno, M. R., & Jones, L. E. Effects of a change in reference person on the multidimensional structure and evaluations of trait adjectives. Journal of Personality and Social Psychology, 1973, 28, 368-375.

Harshman, R. A. Foundations of the PARAFAC procedure: Models and conditions for an explanatory multi-modal factor analysis. Working Papers in Phonetics No. 16. Los Angeles: University of Californiz, 1970.

Harshman, R. A. PARAFAC2: Mathematical and technical notes. Working Papers in Phonetics No. 22. Los Angeles: University of California, 1972.

Hays, W. L. An approach to the study of trait implication and trait similarity. In R. Tagiuri, & L. Petrullo (Eds.), Person perception and interpersonal behavior. Stanford: Stanford University Press, 1958.

Himmelfarb, S. Integration and attribution theories in personality impression formation. Journal of Personality and Social Psychology, 1972, 23, 309-313.

Himmelfarb, S., & Anderson, N. H. Integration theory analysis of opinion attribution. Journal of Personality and Social Psychology, 1975, 31, 1064-1072.

Hodges, B. H. Adding and averaging models for information integration. Psychological Review, 1973, 80, 80-84.

Hoffman, P. J. The paramorphic representation of clinical judgment. Psychological Bulletin, 1960, 57, 116-131.

Hoffman, P. J. Cue-consistency and configurality in human judgment. In B. Kleinmuntz (Ed.), Formal representation of human judgment. New York: Wiley, 1968.

Hoffman, P. J., Slovic, P., & Rorer, L. G. An analysis-of-variance model for the assessment of configural cue utilization in clinical judgment. Psychological Bulletin, 1968, 69, 338-349.

Hoffmann, H., Jackson, D. N., & Skinner, H. A. Dimensions of psychopathology among alcoholic patients. Journal of Studies on Alcohol, 1975, 36, 825-837.

Jackson, D. N. A threshold model for stylistic responding. In C. Hanley (Chm.), Symposium on New Interpretations of Response Styles and Content. Presented at meetings of the American Psychological Association, San Francisco, 1968.

Jackson, D. N. The multidimensional nature of human social perception. Canadian Journal of Behavioral Science, 1969, 1, 227-262.

Jackson, D. N. A model for inferential accuracy. The Canadian Psychologist, 1972, 13, 185-194.

Jackson, D. N. Personality Research Form Manual (2nd ed.). Goshen, N. Y. : Research Psychologists Press, 1974.

Jackson, D. N. Jackson Personality Inventory Manual. Goshen, N. Y. : Research Psychologists Press, 1976.

Jackson, D. N., & Carlson, K. A. Convergent and discriminant validation of the Differential Personality Inventory. Journal of Clinical Psychology, 1973, 29, 214-219.

Jackson, D. N., Chan, D. W., & Stricker, L. J. Implicit personality theory: Illusory or accurate? Journal of Personality, 1978, in press.

Jackson, D. N., & Messick, S. Differential Personality Inventory. London, Ontario: Authors, 1971.

Jackson, D. N., Neill, J. A., & Bevan, A. R. An evaluation of forced-choice and true-false item formats in personality assessment. Journal of Research in Personality, 1973, 7, 21-30.

Johnson, S. C. Hierarchical clustering schemes. Psychometrika, 1967, 32, 241-254.

Jones, E. E., & Davis, K. E. From acts to dispositions: The attribution process in person perception. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 2). New York: Academic Press, 1965.

Kadushin, C. Why people go to psychiatrists. New York: Atherton Press, 1969.

Kahneman, D., & Tversky, H. On the psychology of prediction. Psychological Review, 1973, 80, 237-251.

Kaplan, A. The conduct of inquiry. San Francisco: Chandler, 1964.

Kelley, H. H. Attribution theory in social psychology. In D. Levine (Ed.), Nebraska Symposium on Motivation (Vol. 15). Lincoln: University of Nebraska Press, 1967.

Kelley, H. H. The processes of causal attribution. American Psychologist, 1973, 28, 107-128.

Kelly, G. A. A theory of personality: The psychology of personal constructs. New York: Norton, 1955.

Krane, W. R. Least squares estimation of individual differences in multidimensional scaling. Reports No. 43, Department of Psychology, York University, 1976.

Kruskal, J. B., & Carroll, J. D. Geometric models and badness-of-fit functions. In P. R. Krishnaiah (Ed.), Multivariate analysis II. New York: Academic Press, 1969.

Kruskal, J. B., & Wish, M. Multidimensional scaling. Sage Publications, 1978.

Kusyszn, I. A comparison of judgmental methods with endorsements in the assessment of personality traits. Journal of Applied Psychology, 1968, 52, 227-233.

Laucken, U. Naive Verhaltenstheorie. Stuggart: Klett, 1974.

Lay, C. H., Burron, B. F., & Jackson, D. N. Base rates and information value in impression formation. Journal of Personality and Social Psychology, 1973, 28, 390-395.

Lay, C. H., & Jackson, D. N. Analysis of the generality of trait-inferential relationships. Journal of Personality and Social Psychology, 1969, 12, 12-21.

Lingoes, J. C., & Schönemann, P. H. Alternative measures of fit for the Schönemann-Carroll matrix fitting algorithm. Psychometrika, 1974, 39, 423-427.

Lovie, A. D., & Davies, A. D. M. An application of Bayes' theorem to person perception. Acta Psychologica, 1970, 34, 322-327.

McNeel, S. P., & Messick, D. M. A Bayesian analysis of subjective probabilities of interpersonal relationships. Acta Psychologica, 1970, 34, 311-321.

Meehl, P. E. Clinical vs. statistical prediction. Minneapolis: University of Minnesota Press, 1954.

Messick, D. M. Logical aspects of social inference. Paper presented at the Third Research Conference on Subjective Probability, Utility, and Decision Making. Brunel University, Uxbridge, England, 1971.

Messick, S. J., & Abelson, R. P. The additive constant problem in multidimensional scaling. Psychometrika, 1956, 21, 1-15.

Miller, G. A. Mathematics and psychology. New York: Wiley, 1964.

Miller, J. E., Shepard, R. N., & Chang, J. J. An analytic approach to the interpretation of multidimensional scaling solutions. American Psychologist, 1964, 19, 579-580.

Mirels, H. L. Implicit personality theory and inferential illusions. Journal of Personality, 1976, 44, 467-487.

Mulaik, S. A. Are personality factors raters' conceptual factors? Journal of Consulting Psychology, 1964, 28, 506-511.

Norman, W. T. Toward an adequate taxonomy of personality attribute: Replicated factor structure in peer nomination personality ratings. Journal of Abnormal and Social Psychology, 1963, 66, 574-583.

Norman, W. T., & Goldberg, L. R. Raters, ratees, and randomness in personality structure. Journal of Personality and Social Psychology, 1966, 4, 681-691.

Osgood, C. E. Studies on the generality of the affective meaning systems. American Psychologist, 1962, 17, 10-28.

Passini, F. T., & Norman, W. T. A universal conception of personality structure? Journal of Personality and Social Psychology, 1966, 4, 44-49.

Philips, C. D., & Edwards, W. Conservatism in a simple probability inference task. Journal of Experiemental Psychology, 1966, 72, 346-354.

Ramsay, J. O. Solving implicit equations in psychometric data analysis. Psychometrika, 1975, 40, 337-360.

Ramsay, J. O. Maximum likelihood estimation in multidimensional scaling. Psychometrika, 1977, 42, 241-266.

Reed, P. L. Assessing inferential accuracy in clinical judgment and person perception. Unpublished doctoral dissertation, the University of Western Ontario, London, Canada, 1976.

Reed, P. L., & Jackson, D. N. Clinical judgment of psychopathology: A model for inferential accuracy. Journal of Abnormal Psychology, 1975, 84, 475-482.

Reed, P. L., & Jackson, D. N. Personality measurement and inferential accuracy. Research Bulletin No. 419, Department of Psychology, the University of Western Ontario, 1977.

Rogers, T. B. The process of responding to personality items: Some issues, a theory and some research. Multivariate Behavioral Research Monograph, 1971, 6(2).

Rosenberg, S., & Cohen, B. D. A method for the study of lay conceptions of psychopathology: A free-response approach. American Journal of Community Psychology, 1977, 5, 177-193.

Rosenberg, S., Nelson, C., & Vivekananthan, P. S. A multidimensional approach to the structure of personality impressions. Journal of Personality and Social Psychology, 1968, 9, 283-294.

Rosenberg, S., & Sedlak, A. Structural representations of implicit personality theory. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 6). New York: Academic Press, 1972. (a)

Rosenberg, S., & Sedlak, A. Structural representations of perceived personality trait relationships. In A. K. Romney, R. N. Shepard, & S. B. Nerlove (Eds.). Multidimensional scaling: Theory and applications in the behavioral sciences (Vol. 2). New York: Seminar Press, 1972. (b)

Ross, J., & Cliff, N. A generalization of the interpoint distance model. Psychometrika, 1964, 29, 167-176.

Schlosberg, H. Three dimensions of emotion. Psychological Review, 1954, 61, 81-88.

Schneider, D. J. Implicit personality theory: A review. Psychological Bulletin, 1973, 79, 294-305.

Schönemann, P., Cafferty, T., & Rotten, J. A note on additive functional measurement. Psychological Review, 1973, 80, 85-92.

Schönemann, P. H., & Carroll, R. M. Fitting one matrix to another under choice of a central dilation and a rigid motion. Psychometrika, 1970, 35, 245-255.

Sherman, R. Individual differences in perceived trait relationships as a function of dimensional salience. Multivariate Behavioral Research, 1972, 7, 109-129.

Shikiar, R. The perception of politicians and political issues: A multidimensional scaling approach. Multivariate Behavioral Research, 1974, 9, 461-477.

Shikiar, R., Wiggins, N. H., & Fishbein, M. The prediction of political evaluation and voting preference: A multidimensional analysis. Journal of Research in Personality, 1976, 10, 424-436.

Shweder, R. A. How relevant is an individual difference theory of personality? Journal of Personality, 1975, 43, 455-485.

Simon, H. A., & Newell, A. The uses and limitations of models. In L. D. White (Ed.), The state of social sciences. Chicago, Illinois: University of Chicago Press, 1956.

Skinner, H. A. Modal Profile analysis: A unified treatment of classification procedures. Unpublished doctoral dissertation, the University of Western Ontario, 1975.

Skinner, H. A. Modal Profile analysis: A unified treatment of classification procedures. Research Bulletin No. 349, Department of Psychology, the University of Western Ontario, 1976.

Slovic, P., & Lichtenstein, S. Comparison of Bayesian and regression approaches to the study of information processing in judgment. Organizational Behavior and Human Performance, 1971, 6, 649-744.

Spence, I. Multidimensional scaling. In P. Colgan (Ed.), Quantitative ethology. New York: Wiley-Interscience, 1977.

Spence, I., & Domoney, D. W. Single subject incomplete designs for nonmetric multidimensional scaling. Psychometrika, 1974, 39, 469-490.

Spence, I., & Graef, J. The determination of the underlying dimensionality of an empirically obtained matrix of proximities. Multivariate Behavioral Research, 1974, 9, 331-342.

Stricker, L. J., Jacobs, P. I., & Kogan, N. Trait interrelations in implicit personality theories and questionnaire data. Journal of Personality and Social Psychology, 1974, 30, 198-207.

Takane, Y., Young, F. W., & DeLeeuw, J. Nonmetric individual differences multidimensional scaling: An alternating least squares method with optimal scaling features. Psychometrika, 1977, 42, 7-67.

Torgerson, W. S. Theory and methods of scaling. New York: Wiley, 1958.

Trope, Y. Inferential processes in the forced compliance situation: A Bayesian analysis. Journal of Experiemental Social Psychology, 1974, 10, 1-16.

Trope, Y., Burnstein, E. Processing the information contained in another's behavior. Journal of Experimental Social Psychology, 1975, 11, 439-458.

Tucker, L. R. Intra-individual and inter-individual multidimensionality. In H. Gulliksen, & S. Messick (Eds.), Psychological scaling: Theory and applications. New York: Wiley, 1960.

Tucker, L. R., & Messick, S. An individual differences model for multidimensional scaling. Psychometrika, 1963, 28, 333-367.

Voyce, C. D., & Jackson, D. N. An evaluation of a threshold theory for personality assessment. Educational and Psychological Measurement, 1977, 37, 383-408.

Wainer, H. Estimating coefficients in linear models: It don't make no nevermind. Psychological Bulletin, 1976, 83, 213-235.

Walters, H. A., & Jackson, D. N. Group and individual regularities in trait inference: A multidimensional scaling analysis. Multivariate Behavioral Research, 1966, 1, 145-163.

Warr, P. B., & Smith, J. S. Combining information about people: comparisons between six models. Journal of Personality and Social Psychology, 1970, 16, 55-65.

Wegner, D. M., & Vallacher, R. R. Implicit psychology: An introduction to social cognition. New York: Oxford University Press, 1977.

Wiggins, J. S. Personality and prediction: Principles of personality assessment. Reading, Mass.: Addison-Wesley, 1973.

Wiggins, N. Individual differences in human judgments: A multivariate approach. In L. Rappoport, & D. A. Summers (Eds.), Human judgment and social interaction. New York: Holt, Rinehart & Winston, 1973.

Wiggins, N. H., & Blackburn, M. C. Implicit theories of personality: An individual differences approach. Multivariate Behavioral Research, 1976, 11, 267-285.

Wiggins, N., & Hoffman, P. J. Three models of clinical judgment. Journal of Abnormal Psychology, 1968, 73, 70-77.

Wish, M., Deutsch, M., & Biener, L. Differences in perceived similarity of nations. In A. K. Romney, R. N. Shepard, & S. B. Nerlove (Eds.), Multidimensional scaling: Theory and applications in behavioral sciences (Vol. 2). New York: Seminar Press, 1972.

Wish, M., Deutsch, M., & Kaplan, S. J. Perceived dimensions of interpersonal relations. Journal of Personality and Social Psychology, 1976, 33, 409-420.

Wold, H. Estimation of principal components and related models by iterative least squares. In R. R. Krishnaiah (Ed.), Multivariate analysis . New York: Academic Press, 1966.

Wyer, R. S. A quantitative comparison of three models of impression formation. Journal of Experimental Research in Personality, 1969, 4, 29-41.

Wyer, R. S. Information redundancy, inconsistency, and novelty, and their role in impression formation. Journal of Experimental Social Psychology, 1970, 6, 111-127. (a)

Wyer, R. S. Quantitative prediction of belief and opinion change: A further test of a subjective probability model. Journal of Personality and Social Psychology, 1970, 16, 559-570. (b)

Wyer, R. S., & Goldberg, L. A probabilistic analysis of the relationships among beliefs and attitudes. Psychological Review, 1970, 77, 100-120.

Yarrow, M. R., & Campbell, J. D. Person perception in children. Merrill-Palmer Quarterly, 1963, 9, 57-72.

Young, F. W. Nonmetric multidimensional scaling: Recovery of metric information. Psychometrika, 1970, 35, 455-474.

Young, F. W., & Cliff, N. Interactive scaling with individual subjects. Psychometrika, 1972, 37, 385-415.

Young, G., & Householder, A. S. Discussion of a set of points in terms of their mutual distances. Psychometrika, 1938, 3, 19-22.

# APPENDIX 1

## Items Assessing Experience with Psychopathology

1. I am a keen observer of the behavior of people.
2. I am personally acquainted with individuals showing abnormal behavior.
3. I have observed at close hand neurotic behavior in people I know.
4. I have had interactions with mentally ill people.

# APPENDIX 2

## Intrasubject Reliability

| Sample<br>Subject | A | B | C |
|---|---|---|---|
| 1 | 34 | 60 | 91 |
| 2 | 48 | 73 | 73 |
| 3 | 82 | 84 | 93 |
| 4 | 66 | 81 | 49 |
| 5 | 79 | 65 | 42 |
| 6 | 55 | 63 | 76 |
| 7 | 90 | 75 | 46 |
| 8 | 85 | 59 | 62 |
| 9 | 81 | 75 | 78 |
| 10 | 84 | 73 | 77 |
| 11 | 72 | 83 | 64 |
| 12 | 72 | 70 | 76 |
| 13 | 76 | 51 | 51 |
| 14 | 84 | 81 | 71 |
| 15 | 70 | 94 | 76 |
| 16 | 78 | 72 | 44 |
| 17 | 60 | 58 | 88 |
| 18 | 35 | 90 | 84 |
| 19 |  | 65 | 63 |
| 20 |  |  | 56 |
| 21 |  |  | 80 |
| 22 |  |  | 85 |
| 23 |  |  | 80 |
| 24 |  |  | 43 |
| 25 |  |  | 50 |
| 26 |  |  | 87 |
| 27 |  |  | 74 |

Note. The index is based on 20 repeated items. Decimals omitted.

## APPENDIX 3

### Exponent Estimates for Subjects

| Subject | A | B | C |
|---|---|---|---|
| 1 | .523 | .556 | .518 |
| 2 | .522 | .651 | .615 |
| 3 | .557 | .497 | .703 |
| 4 | .557 | .516 | .429 |
| 5 | .526 | .472 | .403 |
| 6 | .829 | .618 | .609 |
| 7 | .628 | .566 | .532 |
| 8 | .624 | .731 | .444 |
| 9 | .715 | .580 | .500 |
| 10 | .545 | .550 | .657 |
| 11 | .603 | .604 | .698 |
| 12 | .656 | .622 | .595 |
| 13 | .504 | .503 | .516 |
| 14 | .505 | .550 | .586 |
| 15 | .504 | .699 | .513 |
| 16 | .590 | .574 | .482 |
| 17 | .559 | .514 | .590 |
| 18 | .536 | .561 | .499 |
| 19 |  | .498 | .411 |
| 20 |  |  | .531 |
| 21 |  |  | .432 |
| 22 |  |  | .495 |
| 23 |  |  | .499 |
| 24 |  |  | .443 |
| 25 |  |  | .533 |
| 26 |  |  | .492 |
| 27 |  |  | .727 |
| Average | .582 | .572 | .535 |

Note. Exponents for the dissimilarities are the reciprocals of these numbers.

# APPENDIX 4

## Three-Dimensional Weighted Group Solution for Three Pseudoindividuals

| | |
|---|---|
| Number of iterations to converge | 140 |
| Unbiased standard error estimate | .177 |
| Number of parameters | 96 |
| Error degrees of freedom | 1209 |
| Log likelihood function | 1659.534 |

| Pseudoindividual | Within-subject Unbiased Standard Error | Exponent Estimate |
|---|---|---|
| 1 | .205 | .858 |
| 2 | .185 | .930 |
| 3 | .131 | .956 |

## APPENDIX 5

### Estimated Weight Matrix

### of Common Configuration

### Samples A and B

| | | Dimension | |
|---|---|---|---|
| Sample A Individual | I | II | III |
| 1 | .01616 | .00032 | .00163 |
| 2 | .01077 | .00246 | .00406 |
| 3 | .00654 | .00217 | .01685 |
| 4 | .01634 | .00351 | .02202 |
| 5 | .00963 | .00937 | .01178 |
| 6 | .01273 | .00634 | .01521 |
| 7 | .01300 | .00153 | .01970 |
| 8 | .01903 | .00845 | .01349 |
| 9 | .02165 | .00305 | .01234 |
| 10 | .01862 | .01339 | .01387 |
| 11 | .02038 | .01982 | .00530 |
| 12 | .01573 | .01201 | .00739 |
| 13 | .01004 | .00705 | .01011 |
| 14 | .00407 | .01347 | .01415 |
| 15 | .01332 | .00726 | .01544 |
| 16 | .00835 | .00642 | .01735 |
| 17 | .01229 | .01070 | .01063 |
| 18 | .01899 | .01573 | .00280 |

| | | Dimension | |
|---|---|---|---|
| Sample B Individual | I | II | III |
| 1 | .01107 | .00410 | .00606 |
| 2 | .01507 | .00175 | .00391 |
| 3 | .00707 | .00152 | .01336 |
| 4 | .01185 | .00383 | .02137 |
| 5 | .01020 | .00402 | .00930 |
| 6 | .00945 | .00651 | .01144 |
| 7 | .00468 | .00271 | .01036 |
| 8 | .00752 | .00092 | .02294 |
| 9 | .00935 | .00281 | .02705 |
| 10 | .00260 | .00244 | .02528 |
| 11 | .01105 | .01436 | .01265 |
| 12 | .01336 | .01062 | .00441 |
| 13 | .01505 | .01143 | .01059 |
| 14 | .01287 | .01151 | .01082 |
| 15 | .01362 | .02225 | .00860 |
| 16 | .02771 | .01005 | .02569 |
| 17 | .00482 | .00267 | .00311 |
| 18 | .01065 | .00306 | .00209 |
| 19 | .00537 | .01350 | .00948 |

# APPENDIX 6

## Estimated Weight Matrix
## of Common Configuration
## Sample C

| Sample C Individual | Dimension I | II | III |
|---|---|---|---|
| 1 | .01034 | .00368 | .00707 |
| 2 | .01594 | .00317 | .02051 |
| 3 | .00841 | .00267 | .02511 |
| 4 | .00082 | .00774 | .00733 |
| 5 | .00457 | .00522 | .00979 |
| 6 | .01439 | .00005 | .00499 |
| 7 | .01298 | .01666 | .00486 |
| 8 | .00611 | .01617 | .00066 |
| 9 | .00796 | .00032 | .01991 |
| 10 | .01203 | .00488 | .00522 |
| 11 | .01298 | .00054 | .01969 |
| 12 | .01141 | .00253 | .00461 |
| 13 | .01419 | .00397 | .00925 |
| 14 | .01609 | .00520 | .00672 |
| 15 | .01490 | .02053 | .00406 |
| 16 | .01320 | .01667 | .01374 |
| 17 | .01534 | .00393 | .01167 |
| 18 | .02367 | .00697 | .01435 |
| 19 | .00767 | .01077 | .00203 |
| 20 | .01645 | .00638 | .01872 |
| 21 | .01245 | .00768 | .00314 |
| 22 | .01217 | .01912 | .00221 |
| 23 | .00666 | .01422 | .01130 |
| 24 | .00706 | .01164 | .00631 |
| 25 | .02192 | .00238 | .01451 |
| 26 | .01940 | .00089 | .00894 |
| 27 | .02327 | .01176 | .01216 |

# APPENDIX 7

## Three Varimax Rotated Components

## (Alcoholic Sample)

| Variable | I | II | III |
|---|---|---|---|
| 1 | .497 | .208 | .037 |
| 2 | .428 | .138 | -.106 |
| 3 | .613 | .354 | -.313 |
| 4 | .451 | -.217 | -.575 |
| 5 | .497 | .364 | -.358 |
| 6 | .369 | .100 | -.362 |
| 7 | .766 | .117 | -.141 |
| 8 | .273 | .403 | -.409 |
| 9 | .693 | .203 | -.166 |
| 10 | .501 | -.252 | .288 |
| 11 | .062 | .310 | -.647 |
| 12 | .760 | -.053 | -.009 |
| 13 | .680 | .007 | -.277 |
| 14 | .223 | .369 | -.538 |
| 15 | .398 | .508 | -.236 |
| 16 | .509 | .612 | -.191 |
| 17 | .628 | .237 | -.273 |
| 18 | .636 | .510 | -.095 |
| 19 | .480 | -.116 | -.028 |
| 20 | .072 | .164 | -.646 |
| 21 | .037 | -.662 | .356 |
| 22 | .069 | -.002 | -.686 |
| 23 | .512 | .086 | -.386 |
| 24 | .037 | -.812 | -.158 |
| 25 | .029 | .223 | -.758 |
| 26 | .714 | .071 | -.013 |
| 27 | .018 | -.609 | .444 |

# APPENDIX 8

## Three Varimax Rotated Components

## (Prison Sample)

| Variable | I | II | III |
|---|---|---|---|
| 1 | .602 | .070 | .037 |
| 2 | .673 | .051 | -.011 |
| 3 | .711 | .365 | -.046 |
| 4 | .423 | .526 | -.244 |
| 5 | .651 | .303 | -.289 |
| 6 | .447 | .315 | -.425 |
| 7 | .758 | .201 | -.154 |
| 8 | .333 | .524 | -.076 |
| 9 | .749 | .262 | -.053 |
| 10 | .325 | -.263 | .273 |
| 11 | .145 | .758 | .002 |
| 12 | .723 | .000 | -.037 |
| 13 | .689 | .204 | -.050 |
| 14 | .316 | .653 | -.181 |
| 15 | .487 | .552 | .219 |
| 16 | .590 | .458 | .250 |
| 17 | .549 | .459 | -.027 |
| 18 | .755 | .246 | .118 |
| 19 | .463 | -.014 | .110 |
| 20 | .066 | .710 | -.163 |
| 21 | .036 | -.506 | -.432 |
| 22 | .157 | .521 | -.120 |
| 23 | .613 | .301 | -.355 |
| 24 | -.077 | -.061 | -.816 |
| 25 | -.013 | .786 | .035 |
| 26 | .732 | .049 | .057 |
| 27 | -.134 | -.683 | -.345 |

## APPENDIX 9

## Three Varimax Rotated Components

## (Psychiatric Sample)

| Variable | I | II | III |
|---|---|---|---|
| 1 | .357 | -.100 | -.406 |
| 2 | .368 | .050 | -.510 |
| 3 | .575 | .382 | -.418 |
| 4 | .195 | .502 | -.436 |
| 5 | .748 | .164 | -.202 |
| 6 | .571 | .080 | -.046 |
| 7 | .588 | .044 | -.566 |
| 8 | .600 | .331 | -.265 |
| 9 | .422 | .209 | -.595 |
| 10 | -.311 | -.162 | -.614 |
| 11 | .358 | .670 | -.243 |
| 12 | .279 | .171 | -.736 |
| 13 | .058 | .441 | -.652 |
| 14 | .349 | .589 | -.130 |
| 15 | .666 | .304 | -.245 |
| 16 | .684 | .244 | -.110 |
| 17 | .510 | .440 | -.248 |
| 18 | .757 | .010 | -.365 |
| 19 | -.075 | .454 | -.564 |
| 20 | .309 | .608 | .073 |
| 21 | -.330 | -.582 | -.126 |
| 22 | -.142 | .643 | -.310 |
| 23 | .626 | .158 | -.238 |
| 24 | -.454 | -.057 | -.135 |
| 25 | -.004 | .829 | -.095 |
| 26 | .325 | .124 | -.723 |
| 27 | -.552 | -.569 | -.154 |

# APPENDIX 10

## Three Varimax Rotated Components

## (College Sample)

| Variable | I | II | III |
|---|---|---|---|
| 1 | .563 | -.041 | .032 |
| 2 | .404 | .111 | .003 |
| 3 | .694 | .213 | -.185 |
| 4 | .573 | -.030 | -.300 |
| 5 | .637 | .022 | -.180 |
| 6 | .513 | -.147 | -.169 |
| 7 | .723 | .064 | -.092 |
| 8 | .311 | .420 | -.244 |
| 9 | .597 | .270 | -.317 |
| 10 | .469 | .038 | .089 |
| 11 | .135 | .177 | -.488 |
| 12 | .708 | .056 | .031 |
| 13 | .672 | .013 | -.191 |
| 14 | -.046 | .187 | -.634 |
| 15 | .456 | .309 | -.244 |
| 16 | .484 | .570 | -.163 |
| 17 | .216 | .285 | -.445 |
| 18 | .653 | .301 | .158 |
| 19 | .389 | .047 | -.136 |
| 20 | -.056 | .512 | -.282 |
| 21 | -.005 | -.663 | .059 |
| 22 | .190 | -.282 | -.632 |
| 23 | .577 | -.189 | -.158 |
| 24 | .125 | -.674 | -.304 |
| 25 | -.018 | .009 | -.756 |
| 26 | .645 | .176 | .083 |
| 27 | -.091 | -.570 | .326 |

# APPENDIX 11

## Three Varimax Rotated Components

## (Total Sample)

| Variable | I | II | III |
|---|---|---|---|
| 1 | .500 | -.091 | .166 |
| 2 | .626 | .047 | .051 |
| 3 | .712 | .208 | .231 |
| 4 | .473 | .607 | -.138 |
| 5 | .681 | .191 | .178 |
| 6 | .477 | .337 | -.021 |
| 7 | .796 | .150 | .036 |
| 8 | .405 | .309 | .293 |
| 9 | .726 | .206 | .075 |
| 10 | .336 | -.234 | -.214 |
| 11 | .187 | .679 | .218 |
| 12 | .757 | .021 | -.067 |
| 13 | .695 | .335 | -.075 |
| 14 | .290 | .572 | .254 |
| 15 | .467 | .284 | .524 |
| 16 | .543 | .215 | .532 |
| 17 | .506 | .302 | .270 |
| 18 | .736 | .023 | .374 |
| 19 | .468 | .102 | -.121 |
| 20 | .038 | .605 | .213 |
| 21 | .053 | -.416 | -.617 |
| 22 | .138 | .641 | -.121 |
| 23 | .653 | .218 | -.005 |
| 24 | .033 | .218 | -.779 |
| 25 | -.025 | .708 | .126 |
| 26 | .735 | -.059 | .089 |
| 27 | -.077 | -.453 | -.677 |

## APPENDIX 12

## Common Perceptual Space Scaling Results

| | |
|---|---|
| Number of iterations to converge | 147 |
| Unbiased standard error estimate | .177 |
| Number of parameters | 87 |
| Error degrees of freedom | 966 |
| Log likelihood function | 1342.472 |

| Pseudoindividual | Within-subject Unbiased Standard Error | Exponent Estimate |
|---|---|---|
| 1 | .198 | .829 |
| 2 | .192 | .899 |
| 3 | .133 | .920 |

# APPENDIX 13

## Locations and Directions of Average Judged Targets and Real Individuals in the Common Perceptual Space

| Average judged target | Coordinate |  |  | Weight of Axes |  |  |
|---|---|---|---|---|---|---|
|  | I | II | III | I | II | III |
| AJA | -13.01 | 3.05 | 3.85 | .00156 | .00156 | -.00156 |
| BJA | -21.91 | -2.23 | 6.37 | .00138 | .00138 | -.00138 |
| CJA | -13.48 | 1.28 | 1.86 | .00175 | .00175 | -.00175 |
| AJB | -5.59 | 22.49 | -20.48 | .00107 | .00107 | .00107 |
| BJB | -10.01 | 15.57 | -9.27 | .00148 | .00148 | .00148 |
| CJB | -6.33 | 14.68 | -8.55 | .00135 | .00135 | .00135 |
| Real person |  |  |  |  |  |  |
| JA1 | -6.30 | 6.51 | -1.55 | .00411 | .00411 | .00411 |
| JA3 | -3.15 | 5.92 | .70 | .00533 | .00533 | .00533 |
| JC1 | -16.08 | 14.01 | 4.65 | -.00290 | -.00290 | -.00290 |

| Average judged target | Direction Cosine |  |  |
|---|---|---|---|
| AJC | .88 | -.07 | -.46 |
| BJC | .90 | -.13 | -.41 |
| CJC | .84 | -.23 | -.49 |
| Real person |  |  |  |
| JA2 | -.98 | .06 | .17 |
| JB1 | -.63 | .70 | -.35 |
| JB2 | -.32 | .95 | -.03 |
| JB3 | -.43 | .89 | .15 |
| JC2 | .94 | .21 | -.26 |
| JC3 | .77 | .19 | -.61 |

## APPENDIX 14

### Three-Dimensional Individual Solutions

### Based on 27 Stimuli (Sample A)

| Subject | Unbiased Standard Error | Number of Parameters | Error df | Log Likelihood Function | Iterations to Convergence |
|---|---|---|---|---|---|
| 1 | .190 | 75 | 131 | 285.241 | 124 |
| 2 | .153 | 75 | 131 | 329.847 | 210 |
| 3 | .175 | 75 | 131 | 302.833 | 218 |
| 4 | .180 | 75 | 131 | 296.866 | 354 |
| 5 | .197 | 75 | 131 | 278.018 | 222 |
| 6 | .291 | 75 | 131 | 197.877 | 156 |
| 7 | .201 | 75 | 131 | 274.349 | 79 |
| 8 | .224 | 75 | 131 | 251.698 | 116 |
| 9 | .212 | 75 | 131 | 262.856 | 188 |
| 10 | .203 | 75 | 130 | 270.965 | 126 |
| 11 | .241 | 75 | 130 | 236.027 | 218 |
| 12 | .205 | 75 | 130 | 268.567 | 204 |
| 13 | .248 | 75 | 130 | 230.354 | 190 |
| 14 | .231 | 75 | 130 | 244.789 | 290 |
| 15 | .251 | 75 | 130 | 227.422 | 183 |
| 16 | .266 | 75 | 130 | 215.385 | 275 |
| 17 | .214 | 75 | 130 | 260.427 | 77 |
| 18 | .242 | 75 | 130 | 235.130 | 216 |

# APPENDIX 15

## Three-Dimensional Individual Solutions

## Based on 27 Stimuli (Sample B)

| Subject | Unbiased Standard Error | Number of Parameters | Error df | Log Likelihood Function | Iterations to Convergence |
|---|---|---|---|---|---|
| 1 | .212 | 75 | 131 | 262.738 | 229 |
| 2 | .298 | 75 | 131 | 193.067 | 176 |
| 3 | .203 | 75 | 131 | 272.164 | 147 |
| 4 | .235 | 75 | 131 | 242.169 | 95 |
| 5 | .266 | 75 | 131 | 216.188 | 162 |
| 6 | .235 | 75 | 131 | 241.521 | 188 |
| 7 | .264 | 75 | 131 | 218.323 | 174 |
| 8 | .245 | 75 | 131 | 233.738 | 206 |
| 9 | .250 | 75 | 131 | 228.991 | 97 |
| 10 | .235 | 75 | 131 | 241.661 | 245 |
| 11 | .273 | 75 | 130 | 210.077 | 234 |
| 12 | .235 | 75 | 130 | 240.959 | 148 |
| 13 | .223 | 75 | 130 | 252.014 | 261 |
| 14 | .224 | 75 | 130 | 251.264 | 210 |
| 15 | .329 | 75 | 130 | 172.039 | 132 |
| 16 | .218 | 75 | 130 | 256.228 | 124 |
| 17 | .289 | 75 | 130 | 198.670 | 124 |
| 18 | .236 | 75 | 130 | 240.593 | 260 |
| 19 | .293 | 75 | 130 | 196.098 | 114 |

# APPENDIX 16

## Three-Dimensional Individual Solutions

## Based on 27 Stimuli (Sample C)

| Subject | Unbiased Standard Error | Number of Parameters | Error df | Log Likelihood Function | Iterations to Convergence |
|---|---|---|---|---|---|
| 1 | .248 | 75 | 131 | 230.949 | 167 |
| 2 | .212 | 75 | 131 | 263.280 | 276 |
| 3 | .198 | 75 | 131 | 276.969 | 121 |
| 4 | .174 | 75 | 131 | 304.266 | 154 |
| 5 | .260 | 75 | 131 | 220.740 | 255 |
| 6 | .287 | 75 | 131 | 201.093 | 98 |
| 7 | .238 | 75 | 131 | 239.426 | 124 |
| 8 | .187 | 75 | 131 | 288.550 | 145 |
| 9 | .181 | 75 | 131 | 295.766 | 252 |
| 10 | .279 | 75 | 131 | 206.555 | 247 |
| 11 | .275 | 75 | 131 | 209.706 | 104 |
| 12 | .249 | 75 | 131 | 230.043 | 229 |
| 13 | .277 | 75 | 130 | 207.451 | 150 |
| 14 | .263 | 75 | 130 | 217.834 | 165 |
| 15 | .198 | 75 | 130 | 275.810 | 144 |
| 16 | .251 | 75 | 130 | 227.218 | 105 |
| 17 | .216 | 75 | 130 | 258.268 | 336 |
| 18 | .236 | 75 | 130 | 239.782 | 82 |
| 19 | .212 | 75 | 130 | 261.947 | 227 |
| 20 | .217 | 75 | 130 | 257.118 | 167 |
| 21 | .218 | 75 | 130 | 256.516 | 198 |
| 22 | .213 | 75 | 130 | 261.065 | 233 |
| 23 | .243 | 75 | 130 | 234.256 | 145 |
| 24 | .299 | 75 | 130 | 191.381 | 193 |
| 25 | .229 | 75 | 130 | 246.161 | 138 |
| 26 | .280 | 75 | 130 | 205.021 | 300 |
| 27 | .289 | 75 | 130 | 198.626 | 217 |