PSYCHOLOGICAL DIFFERENTIATION AND DEFINITION OF THE SELF: A MULTIDIMENSIONAL SCALING APPROACH

by

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Ph.D. PSYCHOLOGY

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Abstract

Maximum likelihood multidimensional scaling was applied to similarity judgements of self and 17 significant others. Based on the argument that a person's level of differentiation would be reflected in the number of dimensions required to fit those judgements, three hypotheses were tested. The number of dimensions a person uses should be: 1. positively related to his stage of ego development; 2. negatively related to performance on the Embedded Figures Test; and 3. negatively related to reliance on external cues for self definition. Results supported all three hypotheses. The unbiased standard error estimate (corrected for dimensionality) was related to the number of dimensions used, stage of ego development and external orientation. Results were discussed in terms of their implications for social-personality and clinical research.

Ph.D. PSYCHOLOGIE

DIFFERENTIATION PSYCHOLOGIQUE ET DEFINITION DE SOI: UNE APPROCHE AVEC MULTIDIMENSIONAL SCALING

John David Christian

Résumé

"Maximum likelihood multidimensional scaling" a été appliqué à des jugements de similitude de soi et de 17 autres personnes significatives. Basées sur l'argument que le niveau de différentiation d'une personne sera reflété dans le nombre de dimensions requis pour accommoder ses jugements, trois hypothèses ont été examinées. Le nombre de dimensions utilisé par une personne devrait être: 1) en relation positive avec le stade développemental de l'égo; 2) en relation négative avec l'exécution du "Embedded Figures Test"; et 3) en relation négative avec la dépendance sur les indices externes pour une définition de soi. Les résultats ont confirmé ces trois hypothèses. L'estimation impartiale du "standard error" (corrigée pour la dimensionalité) était en relation négative avec le nombre de dimensions, avec le stade développemental de l'égo, et avec l'orientation externe. Ceci suggère que les gens qui se servent de peu de dimensions ne sont pas seulement à un stade plus bas dans le développement de l'égo, mais leurs jugements des personnes qui lui sont

significatives sont généralement plus inconsistants. La discussion des résultats est en termes de leurs implications pour la recherche clinique, celle de la psychologie de la personne.

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Introduction

The goal of this thesis is to empirically demonstrate that cognitive differentiation is fundamentally related to the important processes of self definition, ego development and perceptual style. In order to do so it will be necessary to trace the links among these concepts and to develop a new methodology suitable for the systematic investigation of differentiation.

Central to cognitive developmental theories is the construct of cognitive differentiation. While the meaning of differentiation will be discussed in some detail later, it generally refers to the number of cognitive categories with which an individual perceives and gives meaning to his world (Wiggins, Renner, Clore and Rose, 1971). In fact, while cognitively oriented ego theories differ in detail, their communality lies in the proposition that differentiation is a prime indicator of ego development. The principle is based on a biological metaphor which assumes a psychological parallel to the differentiation and integration of cells that occur during biological development (Mehrabian, 1968). Simply, the proposal is that increasing levels of ego development are highly associated with, if not dependent on, increasing degrees of cognitive differentiation. In Werner's terms

development ". . . proceeds from a state of relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration (Werner, 1957, p. 126)."

The first process which is theoretically related to differentiation is that of self definition. The present concern is not so much with the answer to the question "Who am I?" as it is with the means by which that answer is arrived at. While not exclusive to them, most ego theorists share the view that self definition progresses from a primary utilization of external cues at the earliest levels of development towards a greater and greater reliance on internal cues at later levels. That is to say that the emphasis shifts from "I am what their experience (of me) says I am" to "I am what my experience says I am." This progression will become more evident later when Loevinger and Wessler's (1970) conceptualization of ego development is outlined.

Considering differentiation and self definition together we arrive at the postulate that low levels of differentiation (and hence early levels of general psychological development) are associated with an emphasis on external cues for self definitional purposes and higher levels of differentiation are related to increasing degrees of reliance on

internal information. While these abstractions form the basis of a normal developmental sequence, that sequence also serves as a continuum on which to view individual differences at any given age level (e.g., Kohlberg, 1964; Loevinger & Wessler, 1970; Piaget, 1932).

The second concept related to differentiation is that of ego development. The concept of ego has had a lengthy history and therefore it is necessary to clarify its meaning as it will be used in this discussion. The concept of ego is not new and did not originate with Freud. As Loevinger and Wessler (1970) have made explicit "The truth is that Freud, on purpose, did not use the term 'ego'. He avoided terms of Latin origin in favour of words chosen from common speech, a preference that has been ignored by his translators (Loevinger & Wessler, 1970, p. 1)." While various writers appear to use terms such as self, the I, the me, to refer to essentially the same concept, the term 'ego' and 'ego development' formed an essential part of Dewey and Tuft's "Ethics" published in 1908. Whether intended or not, psychoanalytic use of terms like 'ego', 'superego' and 'id' came to be ascribed varying degrees of mythical meaning of 'the man in the mind' sort and it was partly in response to this that several later theorists shifted towards terms like 'self'.

Adler (Ansbacher & Ansbacher, 1956) has used the term 'style of life' in conjunction with self or ego to refer to the manner in which a person confronts problems, evaluates himself and others, and derives meaning from life in general. In a sense he was arguing that this 'style' is not the result of something the ego does but what the ego or self is.

Piaget (1932) uses the term ego in relation to the person's general cognitive mode of functioning, the manner or 'style' in which the person organizes and derives meaning from information available about himself and his environment. Sullivan's (1953) Interpersonal Theory of Psychiatry refers to the 'self system' which provides a frame of reference, again with which to meaningfully select and organize information about one's self and environment. Anxiety, from Sullivan's point of view represents precisely the failure to integrate information into that frame of reference or self system.

These writers are using the terms self and ego such as to infer a holistic view of personality. This view acknowledges the existence of processes which may be distinguished at least theoretically, but emphasizes their interrelatedness particularly in terms of the person's attempts to establish meaning in the information available to him.

More generally, the extent to which information about self and the environment is fully integrated is taken by many theorists as the main sign of psychological 'growth' (e.g., fully functioning (Rogers, 1961), self actualization (Maslow, 1954), interpersonal integration (Sullivan, Grant & Grant, 1957), integrated (Loevinger & Wessler, 1970)).

The terms self and ego will be used in this thesis in the sense they are used by the above authors. Self and ego will be taken as abstractions referring to the person's characteristic style of functioning, of experiencing himself and others, and more specifically to the manner or style in which he organizes available information about himself and his environment. It is assumed that the style of organization and integration of information is such as to maximize its meaning for the individual. In particular, the term ego will not be used in the sense it is in certain psychoanalytic writings as a derivation of instinctual energies.

Loevinger and Wessler's (1970) conceptualization of ego development is consistent with the present use of the term ego. Their system for scoring sentence completions follows from the theoretical position that ". . . the search for coherent meanings in experience is the essence of the ego or ego functioning, rather than just one among many

equally important ego functions (Loevinger & Wessler, 1970, p. 8)." This position stands in contrast to that of some psychoanalytic researchers such as Bellak, Hurvich and Gediman (1973) who view synthesis and integration of information as only one of many ego functions. Bellak et al. have studied ego functioning primarily with the use of interview techniques. Their interview questions were transformed into statements suitable for questionnaire format in the present work and are reported in the Procedure section. They will serve as a useful point of comparison with the results obtained by Loevinger & Wessler's (1970) system.

Insofar as the sentence completion procedure is concerned, the manner or style in which meaning is derived as well as the content of that meaning serves as the basis for assigning a given sentence completion to one of six possible ego stages and three transitional (between stages) levels. This system encompasses, in large part, developmental sequences referred to in terms of moral development (Kohlberg, 1964), character development (Peck & Havighurst, 1960), interpersonal integration (Sullivan, Grant & Grant, 1957) and relatability (Isaacs & Haggard, 1956). Like these and other cognitive-developmental theorists, Loevinger and Wessler's model is hierarchical and development is seen to progress sequentially. Inherent in such a scheme is the argument that no stage can

be bypassed or "skipped" and more importantly, each successive stage is not simply an addition to earlier stages but represents a rather fundamental transformation and reorganization of earlier levels. A brief description of each stage follows (from Loevinger & Wessler, 1970).

While the first stage is primarily preverbal and therefore not likely to be reflected in sentence completions it requires inclusion here for completeness. At this, the 'autistic' stage, the infant begins to distinguish between objects in the world and in doing so separates out himself as an object in that world, globally differentiating between the 'me' and the 'not me'. The next is the 'impulsive' stage and is so called because the primary preoccupation is with the consequence of impulse expression. Developing sense of self is reflected particularly by the word 'No'; while impulses are evaluated in terms of immediate positive and negative rewards. Punishment itself is typically construed as retaliatory which, if excessive can lead to strong feelings of vulnerability. Interpersonal style is simple where others are seen as a source of supply; good persons give to me, bad ones don't. Good (nice) and bad are frequently associated with clean and dirty.

The 'self protective' stage is reflected in the concern with impulse control; delay is possible particularly

when it is to one's own advantage. While the concept of blame is understood, it is typically externalized to others or to some part of one's self for which no responsibility is felt. Thus, if a person gets into trouble it is because he was with the wrong people. It is understood that there are rules, however, the primary rule for persons at this level is not to get caught. Rules are flexible but only when to one's own advantage. There is an intense concern with who is controlling whom, with the consequent preoccupation with domination and competition; the life philosophy is of a zero-sum sort in that what you win, I lose.

The next, or 'conformist' stage, represents the majority or at least largest minority of most social groups (Loevinger & Wessler, 1970). Identification is with authority, parents initially, followed by other adults and peers. Cognitive simplicity is apparent, there being a right way and a wrong way for all people at all times. This feature is particularly evident in terms of sex roles. It is perhaps because of a preoccupation with social acceptance, appearance and belonging that rules are accepted on the basis of perceived consensus alone. In contrast to primarily bodily feelings at earlier levels (e.g., upset, sick), inner states are expressed here in more emotional, although banal, terms

(e.g., angry, sad, Happy). There is little distinction between what is and what could be, or ought to be. Behaviour is validated in terms of its social meaning with only minimal awareness of psychological causality; self is defined in terms of social and role classifications.

What is characteristically absent at the 'conformist' and earlier levels is characteristically present at the 'conscientious' and later levels. Thus, feelings and individual differences are perceived in highly differentiated terms. What is and what ought to be are not necessarily equivalent. Psychological causation rather than rules per se is the basis for evaluating both self and others' behaviour. There is a considerable emphasis on psychological growth rather than rationalization of one's past. Self criticism (in contrast to self rejection) is typical, as is the awareness of personal choice as opposed to seeing one's self as a pawn of fate. Guilt is experienced when internal standards have not been met rather than because one has been caught. Moralizing (i.e., social notions of right and wrong) at earlier levels begins to be replaced by internal ethical standards which govern one's behaviour. While concern about achievement is not unique to this level, it is measured more with respect to internal standards rather than whether one has 'won' or

received social approval. In another sense evaluation shifts from quantity to quality.

The 'autonomous' stage refers not only to the realization of other people's need for autonomy but also to a certain detachment from socially determined striving and sense of responsibility. Dichotomous moral judgements are replaced by a realization of the complexity of human behaviour and human situations. Respect for other people is reflected particularly in terms of acknowledging their need to discover what is best for them and hence to make their own mistakes. What is best for me is not necessarily what is best for you. Expression of needs for achievement are replaced by concerns for self-fulfillment. Along with greater realization of complexities of one's self and others is a greater awareness of internal conflict. This is in contrast to earlier levels where conflict, if perceived, is more typically explained in terms of external situations.

The last or 'integrated' level includes probably no more than one percent of most social groups (Loevinger & Wessler, 1970). While it characterizes persons who have managed to reconcile polarities in particular, it is well described by Maslow's (1954, 1962) exposition of self-actualizing persons.

While this outline of Loevinger and Wessler's (1970) system is admittedly brief, two trends are nevertheless apparent. The first is that there is a progression from the global, at early stages, to the increasingly differentiated feelings and perceptions of self and others at later stages. Secondly, there is a parallel progression from a reliance on external sources for evaluation of self or self definition at early levels to more internal evaluation at later levels. Thus, not only are persons at later levels characterized by the greater use of internal cues for self definition, but that definition of self is more differentiated than at earlier levels. Therefore it should be expected that ego development as outlined by Loevinger and Wessler (1970) will be related to both differentiation and self definition.

These proposed relationships raise the intriguing question as to whether the relative emphasis on, or salience of, internal or external cues is related to more general perceptual functioning. Witkin, Dyk, Faterson, Goodenough and Karp (1962) have presented evidence that such a relationship exists. They found that persons who have difficulty performing on perceptual disembedding tasks (field dependent) tend to rely on external sources for definition of attitudes and evaluation of themselves. Field independent persons, on the

other hand, have often developed internal frames of reference which serve as guides for self definition.

It is this question of perceptual functioning which motivated the use of the Embedded Figures Test (Witkin, 1950) where performance requires that the person find a simple geometric form such as a triangle, represented internally (i.e., in memory), in a complex external array in which that simple form is perceptually embedded. In view of the preceding discussion, it would seem to follow that persons who place considerably more emphasis on external cues rather than those arising internally would therefore have difficulty utilizing an internal cue (the geometric form) to solve a problem involving complex external stimuli. In other words, an orientation towards the primary use of external cues should interfere with the demands of the task. Too great an external orientation should compete with, if not preclude, the perception and utilization of internal information, with the consequent decrement in performance.

Finally, the reliance on external information for self evaluation / self definition characteristic of earlier levels of development can be considered in a different light. If one depends primarily on information from others for self definitional purposes then the stability of that self defin-

ition is largely dependent on the stability of information deriving from those others. However, cues we receive from others are typically not always consistent; we are not always with the same people nor are the people we are with necessarily constant in their mood or in their feelings towards us. To the extent that cues from others are not always consistent, then it should be expected that there will be more lability or instability in the self definition and emotion of persons functioning at earlier levels of development than persons operating at later levels. On the basis of this reasoning a questionnaire was designed which, in summary, simply asked how much the respondent thought his notion of who he was and the feelings he had about himself, varied as a function of differing situations.

It was proposed earlier that differentiation is a concept common to most ego theories. However its use has ranged from a primary emphasis on its emotional developmental features (Mahler, Pine & Bergman, 1975) to an emphasis on perceptual factors typical of Witkin's work on field dependence-independence (Witkin, Dyk, Faterson, Goodenough & Karp, 1962). Its use here follows from the preceding discussion of self and ego. When it is proposed that a person's style of organizing and integrating information is such as to give that informa-

tion personal meaning it is possible, in fact probable, that individuals will vary not only in the content of the meaning they ascribe to similar information but they will vary in the number of different meanings (independent of content) they ascribe to the same or similar information. It is in this latter sense that the term differentiation is used here.

Methodological Considerations

The concept of differentiation proposed here emphasizes the manner in which an individual organizes information about himself and the enyironment in which he operates. Some serious difficulties lie in the development of a suitable methodology for empirically assessing differentiation. One problem concerns specifying the boundaries of one's environment and what it subsumes in content. However, it is reasonable to propose that [redacted] of the information people use for self definition is derived from interpersonal experiences (Sullivan, 1953), and therefore a decision was made to restrict this work to a consideration of the interpersonal environment, specifically self and significant others. It should be noted that the methodology to be discussed here is a general one and can be applied equally well to most other aspects of the person's environment.

There are a number of potential ways to study the manner in which a person experiences and organizes his interpersonal environment, the most common being questionnaire techniques. However, the main limitation of such techniques is the frequent assumption that concepts or constructs appearing in the questionnaire are those the subject spontaneously uses outside the test situation. While such constructs may be relevant to the investigator there is often no a priori reason for assuming their relevance to the subject. Kelly (1955) has argued that many 'objective' personality tests in fact force the subject to use and make decisions about constructs which he may use on no other occasion. Brigham (1971) has put forward a similar criticism of one of the most commonly used techniques in stereotype research: the adjective check list procedure (Katz & Braly, 1933). Brigham's (1971) main point is that here again the subject may be asked to think in terms of generalizations and categories he may not normally use. He cites a study by Ehrlich and Rinehart (1965) who compared results from an adjective check list to those from an open ended procedure. When subjects were allowed to spontaneously generate responses (open ended) they listed about five traits for each ethnic group but in responding to the check list eight to nineteen traits per

group were checked off.

While the attraction of questionnaires lies in the relative ease of quantification, they are not suitable for work in which the central interest is with the person's own frame of reference, his self. This requires that people be allowed to organize information they have about themselves and others in any way they wish. While this presents a potential problem for the data analyst in that some persons may insist on organizing that information idiosyncratically, that same freedom to organize and integrate information is necessary if the person is to reveal his characteristic style of integrating information.

A procedure which would appear to meet the present requirements is multidimensional scaling. Multidimensional scaling procedures are particularly appropriate because they permit a person to freely organize information while at the same time providing a rigorous quantitative model with which to fit the data. The person need not be aware of, nor articulate reasons for, making his particular judgements, judgements which are therefore relatively unconfounded by verbal ability. In these procedures persons are presented with a list of stimuli and are asked to make a judgement about how similar or how different these stimuli are, taken two at a time, and

in all combinations. They are not asked to make those judgements according to an experimenter imposed criterion, but in any way they wish. Their judgement for each pair of stimuli is indicated on a distance scale, a 9 point scale in the present research, which proceeds from 1 (very similar) to 9 (very different).

The purpose of multidimensional scaling algorithms is to represent each of the stimulus objects as a point in a k dimensional (Euclidean) space. It is assumed that relationships holding among these points correspond to perceived relationships among the objects. Traditionally, the purpose of displaying these relationships has been to reduce the variation in numerical magnitudes (or distances) arising from a myriad of similarity judgements to an essential pattern, the content of which lends itself to parsimonious interpretation. The number of dimensions required to display this pattern has been usually arrived at through a trade-off between interpretability and parsimony on the one hand and minimizing 'badness of fit' on the other. While this trade-off produces some serious statistical problems, the number of dimensions per se (i.e., independent of content) required to properly fit the data has rarely been a matter of psychological interest. That is to say, the concern has tradition-

ally been with the interpretability of the content of the spatial representation and not with the potential psychological significance of the dimensionality of that space quite apart from its content.

The prime goal of the present work is the demonstration of the psychological significance of the dimensionality of that space, independent of its content.

Consider again the notion of differentiation in the context of multidimensional scaling. Differentiation, as it will be recalled, is being taken to refer to the number of different meanings a person ascribes to a given set of information; which is to propose that the more a person consistently organizes information in terms of multiple meanings it may have for him, the higher will be the dimensionality of the spatial structure necessary to properly fit and describe the data. On the other hand, should another person construe that information as having only one or relatively few meanings for him the spatial structure necessary to properly fit the data will be correspondingly less differentiated and of lower dimensionality.

For purposes of elaboration, consider a person whose primary concern is the avoidance of rejection and the seeking of acceptance. While he may be quite capable of perceiving

many differences amongst people the meaning he ascribes to those perceptions and the way in which he organizes them will likely be in terms of what that perceptual information tells him about whether those people are accepting or rejecting. Were one to take a set of judgements this person made amongst all possible pairs of persons significant to him, it should be possible to rank order those persons along one line in a way such that persons towards one pole are judged as similar to each other (small distances between them) and dissimilar to those at the other end. The ordering of persons on this line should then reflect the degree to which they are construed as accepting or rejecting. To the extent that this person organized the information he had about these people only in terms of acceptance-rejection and made his judgements accordingly, the spatial structure required to fit the data would lack complexity being, in fact, one dimensional. This, in non-technical terms is essentially what most nonmetric multidimensional scaling models do. They attempt to fit the interpoint distances in a k dimensional space such that the ordering of those interpoint distances fits as closely as possible the corresponding similarity judgements.

To recapitulate, it is argued in this thesis that persons differ in the level of differentiation at which they

characteristically operate and therefore the degree to which persons organize information in terms of multiple meanings should be reflected in the number of dimensions required to best fit their data.

This raises the question as to what is the most appropriate model for the explication of individual differences. Carroll and Chang's (1970) individual difference algorithm (INDSCAL) is designed to reveal dimensions people have in common while providing indicators of inter-individual variation in the salience of those dimensions. While this is certainly an advance over group solutions which treat each subject's data simply as an unweighted replication, it nevertheless generates a solution which tends to represent the 'ideal' or 'representative' subject; and the allowance of individual differences is with respect to that ideal solution. Since the essence of the present work is to permit persons to reveal their potentially unique frame of reference, a priori assumptions about communalities between subjects would be defeating the purpose. For this reason, separate individual analyses are essential.

It has been proposed that differentiation is reflected in the number of different meanings that stimuli may have for a person. It is crucial then that a rigorous criterion be

developed in order to determine the number of dimensions which best fit each individual's data, since the number of dimensions should reflect the degree of differentiation.

This problem has been alluded to earlier as a trade-off between maximizing interpretability and minimizing 'badness of fit'. It is a trade-off because 'badness of fit' (or 'stress' in the case of MDSCAL; Kruskal, 1964a, 1964b) continues to decline with an increase in the number of dimensions extracted and reaches its minimum with n-1 dimensions where the solution fits perfectly but is highly unstable and little more interpretable than the raw data. Therefore, a consideration of the reduction of 'stress' alone does not permit any clear cut stopping rules. The analyst can not determine, for instance, when a reduction in 'stress' from k to k+1 dimensions reflects that the k+1 dimensional configuration is accommodating real and meaningful variation in the data or simple error variance. Resort to 'scallops' (that point at which 'stress' has been declining rapidly with increasing dimensions and only slowly thereafter) in the declining 'stress' function is only a partial solution because the majority of well over one hundred declining 'stress' functions analyzed by the author had the discouraging habit of being scallop free.

Ramsay (1976) has developed a procedure for maximum likelihood estimation of the location of the points. This type of estimation tends to use the data more efficiently than other present multidimensional scaling techniques. As well, it permits the statistical testing of a number of useful hypotheses. Among these is the hypothesis that a set of dissimilarity judgements can be satisfactorily approximated in a k-1 dimensional space rather than one of k dimensions. Thus, a useful decision rule for setting the dimensionality of the space is made possible. This, in addition to the efficiency of the estimates, made Ramsay's (1976) procedure the most appropriate tool for the analysis of the data for each subject in the study. Some modifications of the large sample dimensionality testing procedure were necessary in order to analyze single subject's data. These modifications will be described in the Method section.

Summary

The central proposal of this thesis is that the number of dimensions required to best fit a person's similarity judgements of significant others reflects that person's degree of differentiation. There were three means by which this proposal was tested:

a. Loevinger and Wessler's (1970) system for measuring ego

development;

b. Embedded Figures Test (Witkin, Oltman, Raskin & Karp, 1971; and

c. a questionnaire measuring perceived lability of emotion and self definition.

The hypothesized relationship between these variables can be formalized as follows:

1. If the degree of differentiation is associated with the level of ego development, and if differentiation is reflected in the number of dimensions required to best fit the person's data, then there should be a positive relationship between the number of dimensions used and the person's level of ego development.

2. If low levels of differentiation (few dimensions) are associated with the use of primarily external cues for self definition and self orientation then persons who use few dimensions should have more difficulty performing on the Embedded Figures Test where success is at least partly dependent on the ability to find a simple cue represented internally (i.e., in memory) in a complex external array. The reverse should hold for persons using many dimensions.

3. If low levels of differentiation are associated with a relative dependence on external cues for self definition and self evaluation, then persons using few dimensions should experience more lability of emotion and self definition as a function of differing social situations.

Method

Subjects

Thirty-nine persons participated in the present work on a voluntary basis with no monetary reward. Of this total, 21 were female, and 18 were male. Thirty-one were attending university full time, while 8 had previously graduated with a bachelors level degree. Their ages ranged from 19 to 33 years with a median age of 21.5 years.

Procedure

The measurement tools associated with each of the three main hypotheses will be described here in the following order: similarity judgements of self and significant others, sentence completion test, and questionnaire. Following these descriptions the method of analysis for data derived from each technique will be outlined.

1. Self and Significant Others (Multidimensional Scaling)

The list of persons to be judged always involved self and 17 other significant persons known to the respondent. However, it was important to allow respondents freedom to choose persons known to them personally, while at the same time ensuring that in generating their individual lists they all considered an equally broad range of persons. In order to achieve this, subjects were asked to select from amongst

people they knew those who best fit descriptions of 17 different persons, descriptions which were adapted and modified from Kelly (1955). The instructions to subjects and 17 descriptions were as follows:

Please refer to the descriptions of 18 different persons listed below, and select from among people you know the person who best fits each description. Then write the person's name in the space below each description. Please do not repeat any names. If a person has already been listed, just make a second choice.

1. Your mother (or stepmother)
2. Your father (or stepfather)
3. Your brother (or a boy nearest your own age who was most like a brother to you)
4. Your sister (or a girl nearest your own age who was most like a sister to you)
5. Your wife (or husband) or your girlfriend (or boyfriend). If this does not apply, a person you might like to be your girlfriend (or boyfriend)
6. Your closest friend of the same sex as yourself
7. Your closest friend of the opposite sex to yourself
8. A person of the same sex as yourself who, at the moment, is not a particularly close friend but who you would like to be closer with
9. A person of the opposite sex who, at the moment, is not a particularly close friend but who you would like to be closer with
10. A person of the same sex as yourself who you once thought was a good friend but who strongly disappointed you later
11. A person of the opposite sex to yourself who you once thought was a good friend but who strongly disappointed you later.
12. A person known to you personally with whom you would be most willing to talk over your personal feelings
13. A person you know who for some reason appears to dislike you
14. A person who you would most like to help or for whom you feel sympathy
15. A person with whom you feel very uncomfortable

16. The warmest person you know
17. A person you trust the most
18. Yourself

Once the list was completed in this fashion subjects were instructed as follows:

"These descriptions have been provided for no other reason than to ensure that every participant in this study considered an equally broad range of persons in generating their own list of persons. I am now going to present you with a whole series of persons taken two at a time from your list. For each of these pairs your task is to decide how similar or how different those two people are and then to indicate your decision using the nine-point scale in front of you. For instance, if you decided that these two people had nothing in common then you would indicate this by using a 9 from the scale (or Very Different). If, on the other hand, you felt these two people were very much alike then use a 1 from the scale (or Very Similar). The scale is provided to allow you to indicate the degree of similarity-dissimilarity you feel exists between two persons, so please try to use the full range of the scale in making your judgements. So, if you felt that two persons had as many similarities as differences then use a 5; if they are different but not too different, use a 6 or 7; if they are similar but not very similar then use a 4 or 3. Remember, there are no right or wrong answers; what matters is that you indicate what you feel, for whatever reason, is the degree of similarity between each pair of persons. Do you have any questions?"

After any points of confusion were clarified subjects were presented with 2 stimulus persons at a time and for each pair asked to indicate on the 9 point scale (ranging from Very Similar (1) to Very Different (9)) the degree to which they felt those two persons were similar or different. This process continued until all 153 (i.e. $\frac{n(n-1)}{2}$) combinations of 2 persons, in haphazard order had been assigned a similarity rating.

2. Sentence Completion (Ego Development)

The sentence completion test was administered two to three weeks after subjects had made their similarity judgements of self and significant others. The author had had previous experience with two sentence completion tests: that of Aronoff (1971) and Loevinger and Wessler (1970). On the basis of this experience stems were chosen from each test which had previously generated a wide range of responses. The present test then was composed of 49 stems, 26 of which were taken from Aronoff (1971) and 23 from Loevinger and Wessler (1970). Instructions to respondents, and stems were as follows. Those stems from Aronoff (1971) are marked * and those from Loevinger and Wessler (1970) by **.

> Below are several incomplete sentences. Please read and complete each one. If the suggested word occurs in the middle of the line place it wherever you wish.

* 1. I should like to . . .

** 2. Raising a family . . .

** 3. a. (complete only if you are a woman)
When I am with a man . . .

b. (complete only if you are a man)
When I am with a woman . . .

* 4. If I could only . . .

** 5. When they avoided me . . .

* 6. Most important . . .

** 7. If my mother . . .

* 8. To me, people . . .

** 9. The thing I like about myself is . . .

*10. The main driving force in my life is . . .

**11. What gets me into trouble is . . .

*12. Other people are . . .

**13. My mother and I . . .

**14. Education . . .

*15. For sure . . .

**16. Women are lucky because . .

*17. If I could change anything I . . .

**18. When I am nervous . . .

**19. a. (complete only if you are a man)
A man feels good when . . .

b. (complete only if you are a woman)
A woman feels good when . . .

**20. When someone won't join in group activities . . .

*21. As a child I . . .

**22. When people are helpless . . .

*23. What bothers me most . . .

*24. The people I like best . . .

**25. Men are lucky because . . .

**26. I feel sorry . . .

**27. If I can't get what I want . . .

**28. My father . . .

*29. The more involved one gets . . .

*30. Being . . .

*31. If I am put under pressure . . .

*32. A friend . . .

**33. My main problem is . . .

**34. I am . . .

*35. I am happy when . . .

*36. A stranger . . .

*37. I want . . .

**38. If my father . . .

**39. When they talked about sex I . . .

**40. a. (complete only if ydu are a woman)
The worst thing about being a woman . . .
b. (complete only if you are a man)
The worst thing about being a man . . .

**41. My conscience bothers me if . . .

*42. The future . . .

*43. If I were in charge . . .

*44. . . . care

*45. When an animal is wild . . .

*46. People think I am . . .

*47. It's fun to daydream about . . .

*48. My appearance . . .

*49. Tests like this . . .

3. Embedded Figures Test

The Embedded Figures Test (EFT) was administered in accordance with instructions given by Witkin, Oltman, Raskin and Karp (1971).

The materials used were as follows:

a. Cards. There were three sets of cards: one set of 12 cards (Form A) with a complex figure on each; one set of 8 cards with a simple figure on each; and a practice set consisting of one complex figure card and one simple figure card.

b. Stylus. Provided to permit the subject to trace the outline of the simple form in each complex figure.

c. Stopwatch. For timing subject's performance. Equipped with sweep second hand which could be started and stopped without necessarily resetting the hand to zero.

The subject was given the following instructions (from Witkin et al., 1971):

> "I am going to show you a series of coloured designs. Each time I show you one, I want you to describe it in any way you wish. I will then show you a single form which is contained in the larger design. You will then be given that larger design again, and your job will be to locate the simple form in it. Let us go through a practice trial to show you how it is done."

The subject was shown the practice complex figure for 15 seconds. The simple figure was then placed on top of the complex figure such that the complex figure could not be seen.

After 10 seconds the subject was instructed further:

> "I will now show you the coloured design again and you are to find the simple form in it. As soon as you have found the simple form let me know, and start tracing the simple form with this stylus. When you are tracing, please do not let the stylus touch the surface of the card."

The complex figure was exposed again by removing and turning over the simple figure. Considerable care was taken to be sure that the subject had no opportunity to see the complex and simple figures simultaneously. Finally, after any difficulties arising from the practice trial had been clarified, subjects were given these instructions:

> "This is how we will proceed on all trials. In every case the simple form will be present in the larger design. It will always be in the upright position, so don't turn the card around. There may be several of the simple forms in the same design, but you are to find and trace only one. Work as quickly as you possibly can, since I will be timing you, but be sure that the form you find is exactly the same as the original simple form in shape, size and proportions. As soon as you have found the form tell me at once and then start to trace it. If you ever forget what the simple form looks like, you may ask to see it again and you may do so as often as you like. Are there any questions?"

All 12 test items of Form A were presented in this manner. The timing procedure was as follows:

a. The stopwatch was started from zero the moment the simple form was turned over and the subject asked to locate it in the complex figure.

b. As soon as the subject located and traced out the simple form correctly the watch was stopped and time recorded.

c. If the subject's tracing was inaccurate or incomplete he was told, "No, that's not it" and asked to continue searching. The watch was left running.

d. If, after 3 minutes, the subject had not been able to find the simple form he was told "Let's try another one" and was started on the next item. Time was recorded as 3 minutes.

e. The subject could see the simple form again if he forgot it. In this case the watch was stopped for 10 seconds during which time the simple figure could be examined (again, without the complex figure being visible). When the 10 second period was up the simple form was removed and the watch restarted. Subjects were shown the simple form as often as requested.

4. Questionnaire

The questionnaire was designed to measure 12 aspects of a person's psychological functioning. All items can be found in Appendix II where they are grouped according to the psychological process they were intended to measure. Subjects were presented the statements in random order and were asked to indicate their degree of agreement-disagreement with each

statement on a 9 point scale proceeding from Strongly Agree (1) to Strongly Disagree (9).

The first set of 14 items in Appendix II were designed to measure the degree to which the person thought his feelings about himself, his attitudes and his behaviour were influenced by external sources(for example, "I act quite differently with different people"; "When I think about it, my attitudes and feelings are very easily influenced by others"). These 14 statements are subsumed under the heading: External Orientation. Strong agreement (indicated by a low score) with these statements then would suggest that the person relies heavily on external cues for self orientation / self evaluation with the implied de-emphasis on internal cues for this purpose.

All of the statements in the next 11 groups were taken and modified from Bellak, Hurvich and Gediman (1973). Ten of these groups are related to various aspects of ego functioning from a psychoanalytic point of view and the eleventh group is concerned with superego functioning. While Bellak et al. (1973) relied primarily on interview techniques their interview questions were transformed in the present work to statements suitable for a questionnaire format. Subjects were asked, as before, to indicate their degree of agreement-disagreement with these statements on a 9 point scale.

The first group of items related to psychoanalytic notions of ego functioning concerned Reality Testing. Six statements referred to the person's general ability to test the accuracy of his perceptions and in distinguishing inner from outer reality (for example, "I often wonder whether something really happened or whether it was just in my mind."). Five statements were intended to measure the extent to which the person felt his Judgement was adequate, particularly his ability to anticipate other people's reactions to his own behaviour (for example, "I seem to offend people without intending to.").

There were 8 statements designed to measure the subjects experiences of himself in the world, the extent to which he feels or has felt trance-like states and states of alienation from the world (for example, "I've had the experience of just not feeling real.", and "I often feel as though there were a glass wall between me and the rest of the world."). These 8 statements are included under the heading Sense of Reality.

Bellak et al.'s (1973) notion of Drive Regulation (6 statements) refers to a dimension anchored at one end by poor delay of reward, low tolerance for frustration and poor control of emotions, and at the other end by inhibition and overcontrol (for example, "I am easily frustrated." and "I

find it hard to 'let go'.").

The 7 statements included under Object Relations were directed primarily at the person's ease of relating to others; the extent to which he perceives himself able to cope with emotional attachment or intimacies (for example, "I have often run away from a relationship for fear of being hurt."). There were 4 statements concerned with Thought processes. In this context the concern was particularly with the person's ability to maintain an attentional set, that is, to be able to follow a line of thought without distraction. At one extreme is the inability to maintain an attentional set while the other extreme is reflected in an inability to modify or change an attentional set as would be the case in obsessional thinking(for example, "I have trouble keeping my mind on what I'm doing because of distraction from noises, etc." and "I'm often troubled by thoughts that stick in my mind so that I can't get rid of them.").

Six statements were directed at the person's level of Defensive Functioning. This term, as it is used here, refers not to the specific defensive styles (denial, projection, etc.) a person may display but to the adequacy (or its lack) of the person's defensive system regardless of style (for example, "I am a very anxious person." or "I have had the feeling that I am going to fall apart."). The next group of

statements concerned a person's ability to modulate or dampen incoming sensory stimuli. This aspect of ego functioning is referred to in terms of Stimulus Barrier and includes 4 items such as "I am overly sensitive to light, sound, touch, etc."

The notion of ego autonomy is somewhat unclear having different meanings for different psychoanalytic writers. Bellak et al.'s (1973) use of the term refers to the ability of the person for Autonomous Functioning (4 statements); that is, to maintain a course of action independent of fluctuating motivational and stimulation levels. This conception is reflected in statements such as "I've often felt so lacking in energy that I couldn't carry through with things that I ordinarily do." Synthetic-Integrative Functioning was measured by 4 statements. This term refers to the person's capacity to integrate new information into ongoing activity and to adjust one's behaviour to changing environmental demands. An example of items in this group is, "I don't adapt very easily to sudden changes in my routine."

Finally, the questionnaire included 5 statements intended to assess Superego Functioning. These statements concerned themselves with feelings of guilt, low esteem, and high expectations of oneself (for example, "I often have feelings of unworthiness." or "I expect too much of myself.").

Methods of Analysis

Similarity Judgements. The 153 similarity judgements of self and significant others were analyzed for each subject by multidimensional scaling techniques of Kruskal (1964a, 1964b) and Ramsay (1976). All individual similarity matrices were analyzed first by MDSCAL (Version 5MS in Fortran IV, Kruskal & Carmone, 1971). The resulting configuration was then used as the starting configuration for Ramsay's implicit equation algorithm for multidimensional scaling by maximum likelihood. The program was written by J. O. Ramsay in Fortran IV and was executed on an IBM 360/75 computer in double precision. Iterations were stopped in this latter procedure when the largest relative change in any coordinate value was 10^{-3}. In the majority of cases 200 iterations were sufficient for the criterion to be reached although a few did require several hundred iterations.

Testing Dimensionality (Goodness of Fit). The critical decision was whether a k+1 dimensional configuration provides a significantly better fit to the data than a k dimensional configuration. With respect to this decision, Ramsay (1976) has shown that $\chi^2 = -2 (\log L_{k-1} - \log L_k)$ has an asymptotic chi-square distribution if the population dimensionality is k-1, where $\log L_k$ is the log likelihood obtained by fitting

in k dimensions and where the degrees of freedom is given by the difference between the number of parameters fit in each case, which works out to be n-k. The chi-square test of dimensionality has an asymptotic distribution which appears to hold where there are several replicates. However, in the case of a single replication the actual distribution has a much longer tail than the chi-square distribution (Ramsay, 1976). This should not be taken as a complete loss of information because the χ^2 test of dimensionality in the single replication case still provides an upper bound as to the most likely number of dimensions. In other words, the χ^2 statistic provides a safe test that there are no more than k dimensions, although the most likely number, in fact, may be less than k.

Ramsay's (1976) Monte Carlo results which were based on 28 matrices of distances generated from independent random two dimensional configurations of 15 points show that the retention of too many dimensions would have occurred in 7 of 28 cases if $-2(\log L_{k-1} - \log L_k)$ were used as a chi-square variate. While this is based on a χ^2 criterion of 24 for 12 degrees of freedom, a more conservative criterion of 48 achieved by simply doubling the χ^2 criterion would lead to the retention of too many dimensions in only 1 of 28 cases

(or 3.6%). While there are presently no Monte Carlo studies with 18 points, these observations of Ramsay's data suggest that the approximate doubling of the chi-square criterion provides a reasonable basis for a stopping rule of dimensionality in the case of 18 points.

Because the critical values of χ^2 for 16, 15 and 14 degrees of freedom at the .05 level were rather similar (26.30 for 16 df., 25.00 for 15 df. and 23.68 for 14 df.) and because there was a lack of more specific criteria which could be based on Monte Carlo studies with 18 points, a stopping rule was used which required that $-2 (\log L_{k-1} - \log L_k) > 70$ in order for the k+1 dimensional solution to be retained. However, to be reasonably sure that the predicted relationships between dimensionality and other variables were robust and not strictly dependent on this one stopping rule based on the approximate doubling of the χ^2 criterion, a further range of stopping rules was used in establishing the number of dimensions for each subject. The full range of stopping rules was:

1. $-2(\log L_{k-1} - \log L_k) > 50$
2. $-2(\log L_{k-1} - \log L_k) > 60$
3. $-2(\log L_{k-1} - \log L_k) > 70$
4. $-2(\log L_{k-1} - \log L_k) > 80$

Relationships between dimensionality derived from each of these stopping rules and other variables in the study will be reported in the Results Section.

Sentence Completions. Each sentence completion was scored in accordance with Loevinger and Wessler's (1970) system for the measurement of ego development. Previously, both raters (a final year honours student and the author) had thoroughly worked through the self-training procedure provided by Loevinger and Wessler (1970). Final scores for each subject were based on a two-stage scoring procedure whereby in the first stage, the raters worked independently of each other and scored each completion with no knowledge of subject (i.e., no knowledge of results of the other tests) except where gender was revealed in the completions. All completions to a given stem were scored across subjects before proceeding to completions for the next stem. This procedure impressed on the raters the full range of possible responses to a particular stem, while scoring out of context (without regard to other completions from the same subject's protocol) minimized the possible biasing effects of knowledge of previous responses by a given subject. The inter-rater reliability at this stage was .78.

The second stage was concerned with those ambiguous completions assigned discrepant scores by the two raters. Here, the completion in question was re-analyzed by both raters together and if no agreement could be reached the

completion was, as a last resort, considered in the light of other completions by the subject (i.e., in context). In only a very few cases could no agreement be reached, however, some completions did remain ambiguous even in context and they were consequently assigned an average rating (i.e., conformist). Final scores were then assigned to each subject and are reported in the results section based on this two stage procedure.

Embedded Figures Test. The subject's time on each of 12 cards was converted to its common logarithm and the log mean time was the subject's score for the test. These transformed scores were assumed to correspond to the linear model (Hays, 1963) while the untransformed scores are lognormally distributed with standard deviation being proportional to the mean.

Questionnaire. Recall that subjects indicated their degree of agreement-disagreement on a 9 point scale ranging from Strongly Agree (1) to Strongly Disagree (9). Their score on each of the 12 aspects of psychological functioning was based on the total score arrived at by simply adding their responses to each statement in the group. Thus, the higher a person's total score for a given group of statements the more that person has indicated disagreement with those statements while a low total score indicates essential agreement. Be-

cause statements relating to psychoanalytic notions of ego functioning were problem oriented, a low score on Reality Testing, for instance, would indicate the person had difficulty in this area of his psychological functioning.

Once these 12 total scores had been computed, each statement was correlated (Pearson *r*) with the total score of the group to which it belonged. These item-total correlations can therefore be used as a guide in evaluating the validity of every statement in the group.

Results

Reporting of results will proceed in the order established earlier in the thesis: multidimensional scaling results, sentence completion results, embedded figures results, questionnaire results and finally the interrelationships amongst these variables.

Multidimensional scaling of similarity judgements

Initial analyses of 39 subjects showed that 5 of these subjects had not used a reasonable variety of responses of the 9 point distance scale. Because the effect of limiting the range (or categories) of similarity judgements can be to spuriously increase the number of dimensions required to best fit the data, these subjects were not considered for further analyses. This left 34 subjects (19 females and 15 males) for complete analyses on which all subsequent statistics are based.

Complete statistics relating to multidimensional scaling results are described subject by subject in Appendix I. Applying the stopping rules set out earlier to maximum likelihood multidimensional scaling results showed that, as proposed, there was variation between subjects in terms of the number of dimensions required to best fit their similarity

judgements of self and significant others. Table I shows the number of subjects using two, three and four dimensions as determined by each of the four stopping rules. This table can also be referred to for summary statistics concerning the mean unbiased standard error (the badness of fit measure corrected for dimensionality)and mean iterations to convergence.

Table II presents a summary version of Appendix III and can be referred to for most of the relationships discussed in this section.

Before proceeding it should be pointed out that regardless of the stopping rule applied there were no overall significant differences between males and females in the number of dimensions used. A consideration of the matrix presented in Appendix III shows that the correlations between the number of dimensions arrived at with the use of the four different stopping rules range from .80 to .91. While Appendix III can be referred to for relationships between dimensionality calculated according to these four rules and all other variables, all subsequent discussion of results involving multidimensional scaling will be based on stopping rule number three ($-2(\log L_{k-1} - \log L_k) > 70$). As can be seen in Appendix III this rule led to relationships between dimensionality and other variables which are rather typical of those relation-

Table I

Number of dimensions retained where $-2(\log L_{k-1} - \log L_k) > 50$

	1	2	3	4	5
Number of subjects		4	15	14	1
M unbiased standard error		.369	.281	.199	.143
M number of iterations to convergence		73.0	179.5	150.9	125

Number of dimensions retained where $-2(\log L_{k-1} - \log L_k) > 60$

	1	2	3	4	5
Number of subjects		5	16	13	
M unbiased standard error		.360	.274	.188	
M number of iterations to convergence		98.8	186.7	134.1	

Number of dimensions retained where $-2(\log L_{k-1} - \log L_k) > 70$

	1	2	3	4	5
Number of subjects		9	14	11	
M unbiased standard error		.340	.260	.185	
M number of iterations to convergence		96.7	167.4	141.2	

Number of dimensions retained where $-2(\log L_{k-1} - \log L_k) > 80$

	1	2	3	4	5
Number of subjects		13	12	9	
M unbiased standard error		.354	.244	181.3	
M number of iterations to convergence		112.2	138.6	142.3	

Table II

Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 N Dimenions $-2(\log L_{k-1} - \log L_k) > 70$																	
2 U. Standard Error	-92																
3 M ego development	66	-63															
4 M log EFT	-42	-38	43														
5 External	72	-66	44	-32													
6 Reality Testing	57	-58	51	-39	70												
7 Judgement	38	-51	38	-19	39	73											
8 Sense of Reality	14	-05	03	-06	32	53	39										
9 Drive Regulation	52	-47	28	-21	67	68	51	50									
10 Object Relations	41	-41	49	-36	39	54	57	27	49								
11 Thought	55	-53	30	-16	70	81	60	57	77	51							
12 Defensive Functioning	64	-61	56	-45	69	77	57	41	61	53	67						
13 Stimulus Barrier	51	-50	24	-44	33	53	54	50	51	55	57	50					
14 Autonomous Functioning	40	-44	42	-25	45	63	49	43	45	54	58	63	55				
15 Synthetic-Integrative	49	-49	53	-54	59	55	27	22	40	40	48	60	37	52			
16 Total (6-15)	58	-57	45	-34	68	90	75	69	79	70	86	82	73	74	59		
17 Superego	53	-38	29	-23	64	57	27	65	60	45	57	62	53	41	49	70	

ships based on the other three stopping rules.

The unbiased standard error estimate was very strongly related to the number of dimensions used ($r = -.86$, $p < .001$). This is an interesting finding because this particular error estimate is corrected for dimensionality. That is to say, it does not behave as does 'stress' in its relationship to dimensionality. As the number of dimensions is increased 'stress' decreases whereas the unbiased standard error estimate typically decreases with increasing dimensionality until the k+1 dimensional solution is no longer significant, at which time the error estimate begins to increase with further increases in dimensionality.

This result could be interpreted as saying that not only do persons using two dimensions have a relatively simple self-other 'space', but their judgements about that space lacks the precision and consistency of persons using four dimensions.

Measurement of Ego Development (sentence completion test)

Mean scores were calculated for each subject after assigning a 1 to the first level (Impulsive), and a 2 to the second level (Self Protective), and so on with a 9 assigned to the last, or Integrated level. Loevinger and Wessler (1970) have described a more complex scheme for assigning a single score to indicate a subject's probable level of ego

development but because their method did not lead to any stronger relationships with other variables in this study than did the simpler mean score, it will not be discussed further at this time. Subjects' mean scores ranged from a low of 2.69 to a high of 7.00 with a grand mean of 4.52. This represents a range from just slightly above the Self Protective stage to the transitional level between Conscientious and Autonomous stages with the mean falling just above the Conformist stage.

Embedded Figures Test

Subjects' mean times performing on the Embedded Figures Test ranged from a low of 16.1 seconds to a high of 141.0 seconds with a grand mean of 51.6 seconds and a standard deviation of 30.8 seconds. However, for all analyses between variables, subjects' scores in seconds were converted to their common logarithms (range = 1.11 to 2.12; mean = 1.44; standard deviation = 0.26).

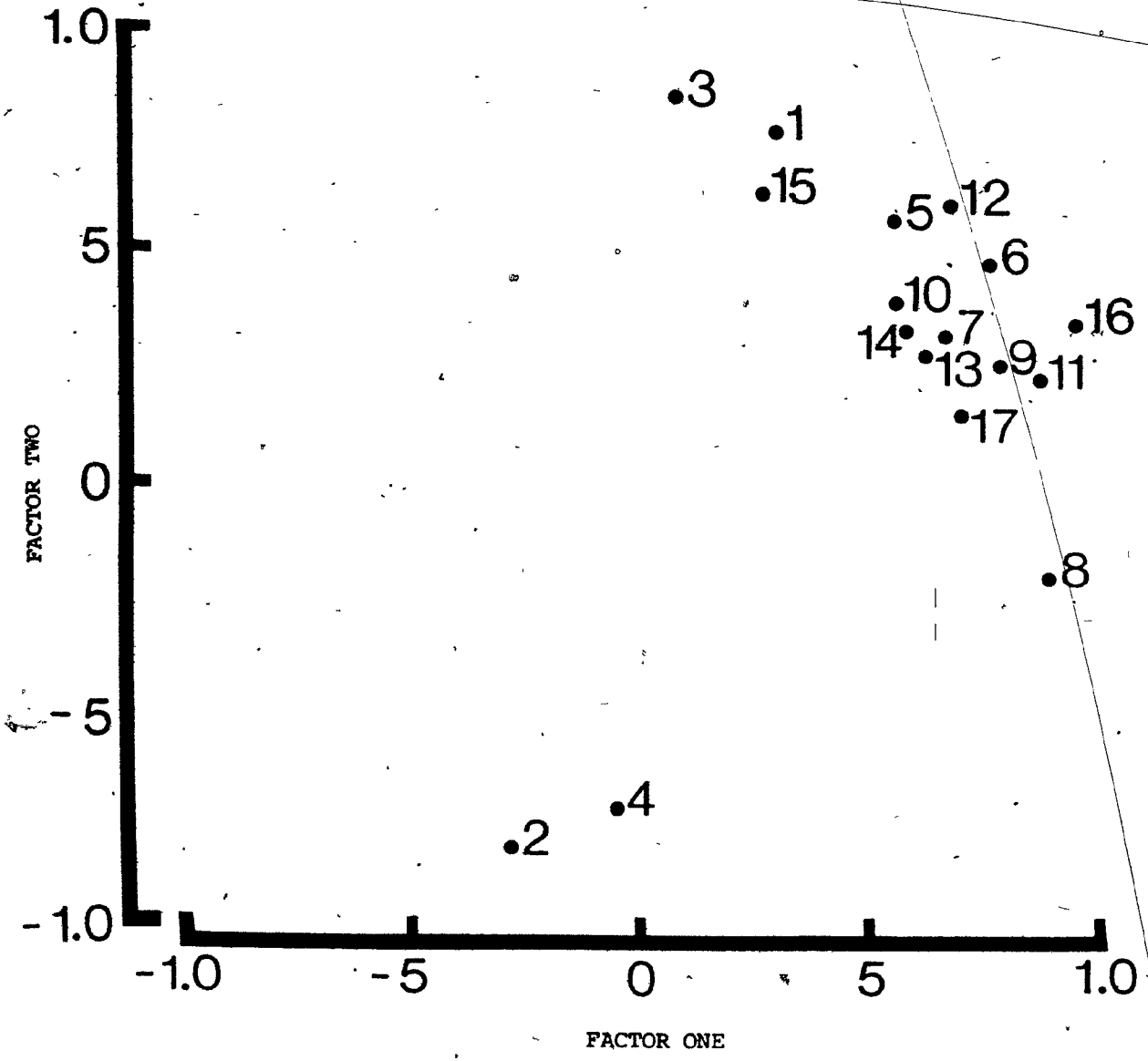
Questionnaire

The statements themselves are listed in Appendix II. Each statement is followed in the first column by the correlation between that statement and the total score for the group to which it belonged. These item-total correlations

are followed in column 2 by the mean score for that statement and in column 3 by its standard deviation.

The correlations between the various groups (i.e., External Orientation, 10 groups measuring various ego functions and Superego functioning) are contained in the matrix presented in Table II and Appendix III. Consider first those correlations between the various groups of statements intended to measure different aspects of ego functioning as construed by Bellak et al. (1973). What is impressive in this group of relationships is the overall strength of the correlations (average correlation in this set is .53). They are sufficiently high to raise doubts as to the utility of conceiving the ego to be a 'collection' or repository of <u>different</u> psychological functions. In fact, the average correlation between each group (Reality Testing, Judgement and so on) and the Total score, obtained by simply summing over all 10 ego function groups, was .76 ($p < .001$).

A principal component (type PA-1) factor analysis of the correlations in Table II provides another means of studying these relationships. The size of eigenvalues (Figure II) indicated that a two factor solution provided an adequate representation of the data. The varimax rotated two factor solution presented in Figure I shows a clear clustering of



LEGEND

1. Number of dimensions
2. Unbiased standard error
3. M ego development
4. M Log EFT
5. External Orientation
6. Reality Testing
7. Judgement
8. Sense of Reality
9. Drive Regulation
10. Object Relations
11. Thought
12. Defensive Functioning
13. Stimulus Barrier
14. Autonomous Functioning
15. Synthetic-Integrative
16. Total (6-15)
17. Superego

Figure I: Varimax rotated two factor solution (Principal components, Type PA-1)

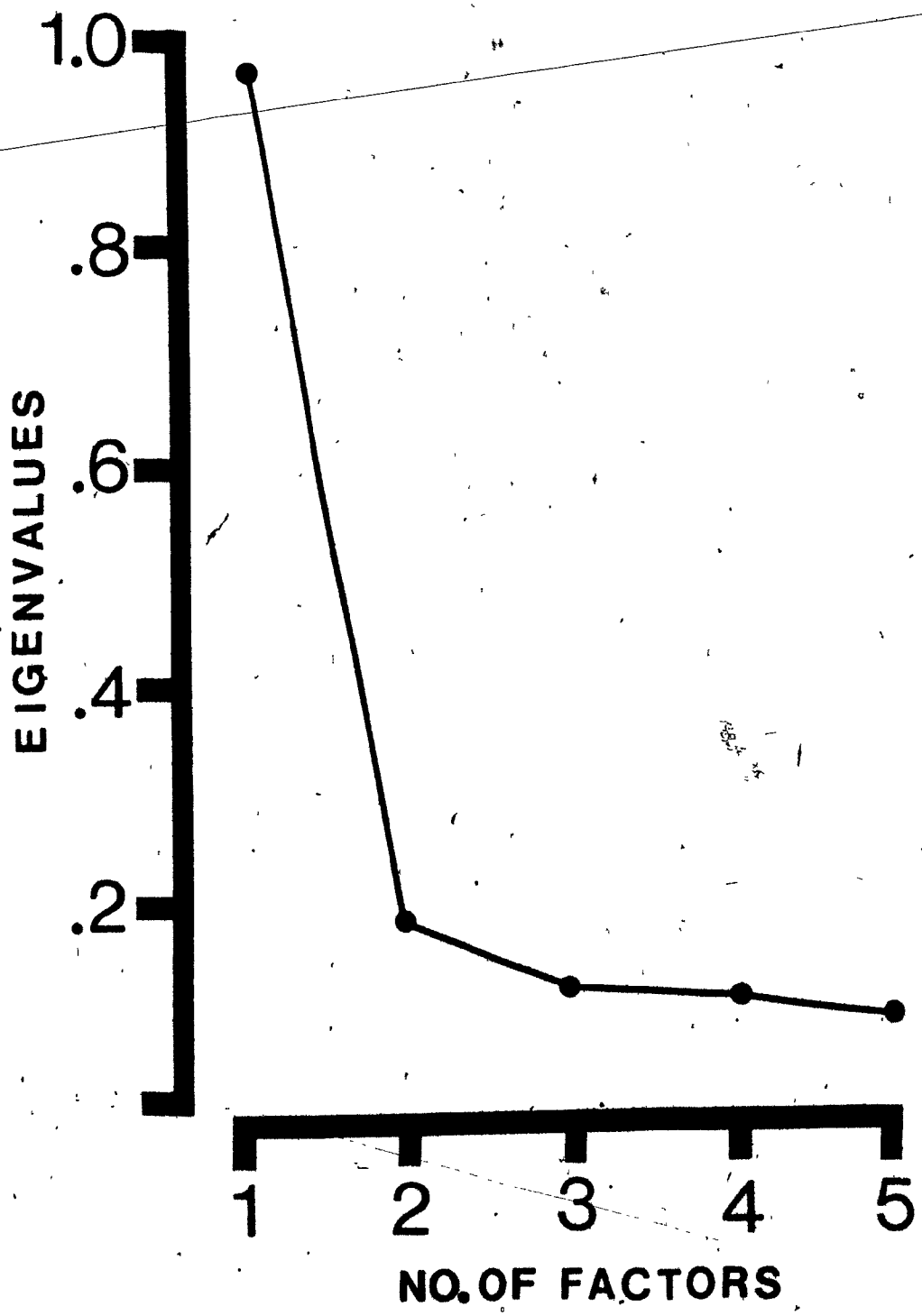


Figure II: Plot of eigenvalues for principal components (PA-1) factor analysis of 17 variables

points representing the various ego functions. This finding would seem to lend support to Loevinger's (1976) argument that the ego is best viewed holistically rather than as a collection of functions which, at least with this questionnaire, cannot be satisfactorily distinguished empirically from each other. In line with questionnaire items intended to measure various different ego functions, External Orientation statements also correlated substantially with both the Total score of ego function statements (r = .68, $p < .001$) and individual ego functions. The same can be said of statements intended to measure Superego functioning. These as well were strongly correlated with ego functioning statements.

The essence of questionnaire results appears to be that they reflect a respondent's general style rather than explicating theoretical distinctions in terms of ego functions. In other words, persons who reported having difficulty in the realm of Reality Testing reported having difficulty in most areas of ego functioning. Most certainly respondents showed little evidence of experiencing difficulty in one aspect of ego functioning and no difficulty in other areas.

Relationships between Variables

Relations between variables will be considered in this section and in the order of the three main hypotheses set out earlier in the Introduction.

Relationship between the number of dimensions used and the person's probable stage of ego development. The results of this analysis strongly support the first hypothesis of the thesis, namely that the number of dimensions used should be positively related to the person's stage of ego development. The relationship between these two variables is shown in bar graph form in Figure III. Each bar in the graph represents the mean percent of responses at a given stage of ego development for subjects using 2 (diagonal lined bars), 3 (solid white bars) and 4 (solid black bars) dimensions. Such a calculation shows, for example, that the average percent of responses at the Impulsive level for persons using 2 dimensions is 17. Another 16.5% of responses of persons using 2 dimensions are at the Self Protective level, 25% at the Conformist level and so on. Loevinger and Wessler's (1970) system indicates a transitional level between the Self Protective and Conformist stages. However, so few responses were actually scored at this transitional level that they were included in the Self Protective Stage and are reported accordingly.

When focusing on the overall distribution of responses it is clear that responses of persons using 2 dimensions are very much skewed towards the lower stages of ego development

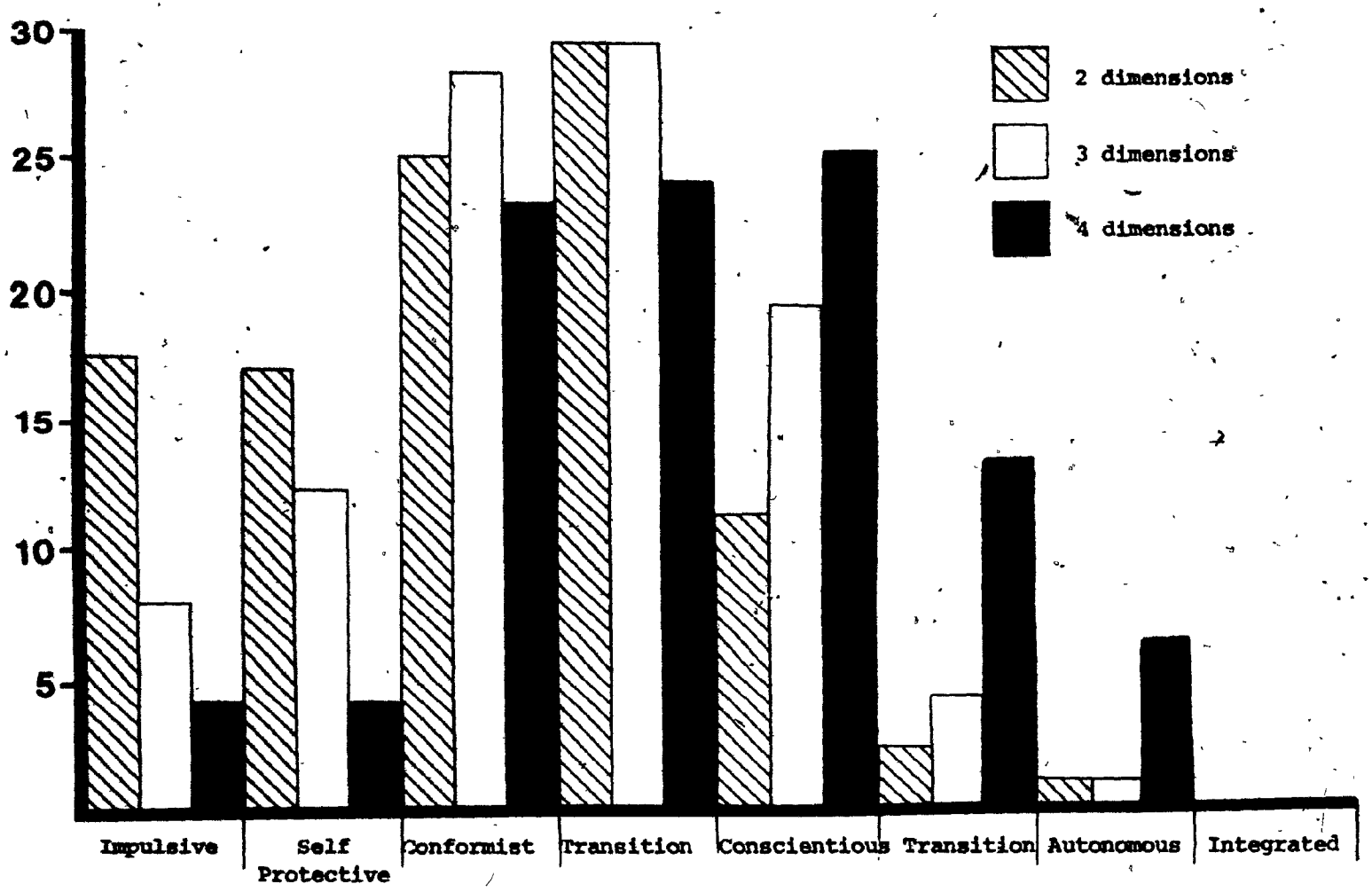


Figure III: Mean percent of Sentence Completions at each Ego Development level for persons using 2, 3, and 4 dimensions.

whereas the reverse pattern is apparent for persons using 4 dimensions. That is, the responses of persons using 4 dimensions are strongly skewed towards the higher ego developmental stages such that what represents a relatively low level response (i.e., Conformist) for a 4 dimensional person represents the highest level of responding for a person using 2 dimensions. The responses of persons using 3 dimensions fall primarily between the distributions for 2 and 4 dimensional subjects. A consideration of the relationship between the number of dimensions persons used and their mean ego stage reflects these three distributions. The correlation between dimensionality and subjects' mean ego stage was strong with $r = .66$ ($p < .001$), and 95% confidence limits of .41 and .82.

Another statistic extracted from the maximum likelihood multidmensional scaling was negatively related to the subject's mean ego stage. This was the unbiased standard error estimate. The correlation between it and mean ego stage was $-.63$ ($p < .001$) suggesting that persons operating at the lower stages of ego development not only used fewer dimensions in making their self-other judgements but do so in a much less precise way than persons at higher ego stages.

Relationship between the number of dimensions used and performance on the Embedded Figures Test. The second hypo-

thesis also received substantial support although not of the strength of the first hypothesis. The second hypothesis stated that number of dimensions should be inversely related to performance on the Embedded Figures Test; in other words, that persons using few dimensions should take longer than persons using several dimensions. The Pearson correlation between these two variables was -.42 ($p < .01$). A similar relationship existed between mean ego stage and performance on the Embedded Figures Test ($r = -.43$, $p < .01$). Thus, the higher the person's level of ego development the faster his performance in disembedding the simple figure from the complex figure.

Relationship between the number of dimensions used and questionnaire scales. The third hypothesis predicted that persons using few dimensions should experience more lability of emotion and self definition (External Orientation) as a function of differing situations than persons using several dimensions. This proposal as well was strongly supported, the correlation between the two variables being .72 ($p < .001$). To avoid confusion, it should again be pointed out that a low score on questionnaire scales reflects essential agreement while high scores reflect disagreement. Thus, this correlation of .72 suggests that persons using 2 dimensions

tend to agree with External Orientation statements while 4 dimensional persons essentially disagree.

There is a fairly strong suggestion that this proposed lability is in fact a general style not only related to social situations. For instance, it might be expected that if some persons are generally labile they would be less consistent in making their self-other judgements.

To the extent that they are less consistent, then, there should be a relationship between responses to External Orientation statements and the unbiased standard error derived from the multidimensional scaling of those self-other judgements. This relationship is actually quite substantial, there being a correlation of -.66 ($p < .001$) between these two variables. In other words, few dimensional persons experience more lability of emotion and self definition in differing social situations, but this is likely part of a more general lability which is reflected in their relatively high standard error scores in making their self-other judgements.

Attention was drawn earlier to the overall strength of correlations between the various groups of statements intended to measure different aspects of psychoanalytic notions of ego functioning. With the exception of Sense of Reality, these scales were also all reasonably related to the

number of dimensions, again suggesting that responses to these statements reflects a general style. In other words persons using 2 dimensions experience difficulty generally in most areas of ego functioning, not just in some and not others. Four dimensional persons, on the other hand, experience few of these difficulties. The consistency of these relationships suggests that the Total ego function score can justifiably be used to reflect this apparent style. The correlation between this Total score and the number of dimensions was .58 ($p < .001$).

A series of multiple regression analyses summarizes these results. The first series involved the systematic deletion of variables while the second analysis was based on a forward (~~stepwise~~) inclusion. The number of dimensions was treated as the dependent variable while the independent variables were mean ego development stage, mean (log) time on the Embedded Figures Test, total score on the External Orientation subtest and the total ego function score (Total). The results of the analyses are presented in Table III and it was consistently the case that the best predictors of dimensionality were the subject's score on the External Orientation subtest followed by his mean ego development stage and Total ego function score. Performance on the Embedded Figures Test was substantially less powerful in predicting dimensionality.

Table III

Multiple Regression Analysis with Systematic Deletion

Model Variables in Equation	Predictor Beta Coefficient: M EFT 1	M Ego 2	External 3	Total 4	Multiple R	F (Multiple R)
1 2 3 4	-.08	.38**	.49**	.05	.82	14.55***
1 2 3	-.13	.39**	.51***		.83	21.71***
1 2 4	-.14	.44**		.38**	.77	14.44***
1 3 4	-.23		.52**	.19	.77	14.77***
2 3 4		.41**	.45**	.13	.82	21.27***
1 2	-.21	.58***			.69	14.38***
1 3	-.25*		.64***		.76	21.19***
1 4	-.27			.53**	.67	12.79***
2 3		.43**	.53***		.82	31.65***
2 4		.49**		.40**	.76	21.04***
3 4			.56**	.24	.74	19.10***

* $p < .05$
** $p < .01$
*** $p < .001$

Table III (con't.)

Multiple Regression Analysis with Forward (Stepwise) Inclusion

Step	Variables in Equation	Predictor Beta Coefficient				Multiple R	F (Multiple R)
		M EFT	M Ego	External	Total		
1.	External			.72***		.72	34.67***
2.	External M Ego		.43**	.53***		.82	31.65***
3.	External M Ego M Eft	-.13	.39**	.51***		.83	21.71***
4.	External M Ego M Eft Total	-.12	.37**	.44**	.11	.83	16.23***

Discussion

A major finding of this research lies in the significant relationship between the number of dimensions a person used and his stage of ego development as indicated by the sentence completion test. The first hypothesis, which this finding supports, was based on arguments that concepts such as self and ego are best taken as abstractions referring to a person's characteristic style of functioning, and specifically to the style in which he organizes available information about himself and his environment. This style of organizing and integrating information, then, is the very essence of ego functioning according to Loevinger (1969, 1976; Loevinger & Wessler, 1970) and not only one of many ego functions as proposed by some psychoanalytic researchers (e.g., Bellak et al., 1973). Given this definition of the ego, dimensionality can be seen as a statement about the degree of differentiation in the process of organizing and integrating that information about self and others.

While the number of dimensions a person used was strongly related to his probable level of ego development, so was the unbiased standard error estimate ($r = -.63, p < .001$). In other words, the fewer the number of dimensions a person used the greater was the error in fitting his data. Thus

persons using two dimensions were less precise, less consistent, in making their judgements than persons using three or four dimensions. The question this finding raises of course is whether it simply reflects "noisy" data, and that two dimensional persons were somewhat careless in making their judgement or whether, on the other hand, their thinking, in being less precise, is characteristic of their general style of cognitive functioning. This question could not be answered with the data of this study. However, there are some interesting theoretical leads.

For instance, Loevinger (Loevinger & Wessler, 1970; Loevinger, 1976) in her description of persons operating at the earlier stages of ego development (i.e., Impulsive and Self Protective) points to relatively undifferentiated feelings, stereotypy and conceptual confusion among others as being characteristic. Since persons who are using two dimensions are also operating at these earlier stages one might expect their implied conceptual confusion to be reflected statistically in a higher error estimate.

Viewed from another perspective the third hypothesis stated that persons using few dimensions should experience more lability or fluctuation of emotion and self definition as a function of differing environmental cues (External Orientation) because of their dependence on external cues for

self definition. While the correlation between these two variables supported the hypothesis, what is of note here is that there was also a substantial correlation between the unbiased standard error estimate and External Orientation ($\underline{r}$ = -.66, $\underline{p}$< .001). That is, persons whose standard error estimate was high also agreed with those items in the questionnaire referring to lability as a function of social cues.

So there is reason to suggest that the high standard error estimate is reflecting more than noise or random error in the data of subjects using few dimensions, and that it is perhaps reflecting conceptual confusion. Before this is accepted as an adequate explanation, however, it would be necessary to carry out repeated testings of particularly those persons using few dimensions in order to determine the reliability of the phenomenon.

An issue related to that of reliability is concerned with the criterion for dimensionality modified from Ramsay (1976) for purposes of this work. The justification for setting the criterion of $-2(\log L_{k-1} - \log L_k) > 70$ may have been too conservative; that is, there is the possibility that in some cases too few dimensions were retained. While this must remain a possibility to be entertained, the effect of this rather conservative test of dimensionality appears to have been primarily one of shifting the range of dimensions

retained downwards without upsetting the relative position of subjects with respect to each other. So the range of dimensions for all subjects using the χ^2 criterion was 3 to 6, whereas it was from 2 to 4 using the criterion of $-2(\log L_{k-1} - \log L_k) > 70$. Therefore, there was probably little effect on subsequent correlational analyses. This suggestion is supported by the results reported in Appendix III where three different stopping rules (two less conservative and one more conservative) led to quite similar relationships with other variables. The range 2 to 4 also has the probable advantage of representing more reliable solution since instability tends to increase with the number of dimensions retained.

The present research has shown that dimensionality is related to a person's general style of functioning. Does this general style include intellectual functioning? It is a difficult question which the author is not really in a position to answer on the basis of this thesis. Loevinger (1976) reports correlations of from .1 to .5 between ego development and IQ but causal inferences are hard to make. On the whole the argument seems to be that IQ may place an upper limit on the maximum possible level of ego development attainable. In other words intellectually retarded persons are unlikely to achieve Conscientious or higher levels of functioning. On the other hand a high IQ is no guarantee

that a high ego level will be attained although it is perhaps more probable. While the evidence is anecdotal there are many historical instances of persons of unusually high intelligence whose level of ego and moral functioning was limited at best. In this context it is worth noting again that persons participating in this study were either university students or graduates suggesting that they were representing a relatively limited range of IQ. It is therefore improbable that individual differences in dimensionality were strictly a function of variation in IQ. Nevertheless future research should include not only a larger sample of subjects but subjects from a broader IQ spectrum. Multidimensional scaling techniques with concomitant IQ measures would then allow direct statements to be made about the relationship between dimensionality and IQ.

The fact that this organizational style appears to be a prime index of ego development has interesting implications for social-personality and clinical research. Traditionally social psychological research has been concerned with the content of the n dimensional space with little psychological significance being attached to the dimensionality of that space independent of its content. Simply, the usual question has been what points (representing persons, ethnic groups, personality trait labels and so on) go together in that space,

what ones do not, and why? While this discovery of content obviously remains an important aspect of multidimensional scaling techniques, important information is lost if the independent question of dimensionality of the space necessary to describe the content is not confronted.

Most psychological therapies share the goal of facilitating change in the direction of both increased flexibility in a person's perceptions of the world and increased flexibility in reacting and behaving towards the world. In essence, that goal can be seen as one of facilitating ego development. The methodological scheme worked out in this thesis suggests interesting possibilities not only for initial assessment of clients but also for assessing change. In the former case, that of initial assessment, the multidimensional scaling paradigm applied here could permit statements not only about the clients probable current stage of functioning (based on number of dimensions used) with the implied concerns typical of that stage, but also about his interpersonal 'space' mapped from the coordinates of the multidimensional scaling solution. While the content of this space has not been the subject of discussion in this work subjects did in fact find it highly meaningful particularly in terms of interpersonal concerns. This would suggest

that the content of clients' multidimensional space would be useful in identifying both positive and problematical aspects of their interpersonal 'space'.

In terms of assessing change two possibilities exist. If the therapeutic efforts are successful then one would expect an increase in the dimensions used by particularly those subjects whose initial stage of functioning was low. Thus, persons who begin therapy using only two dimensions, say, would hopefully over time begin using three and perhaps four dimensions. These more differentiated self-other perceptions should be related to increases in the level of ego functioning on the basis of the present research. The second, not necessarily independent, possibility is the assessment of changes in the content of multidimensional space. That is, do stimulus persons in 'problematical' clusters shift over time? For example, do stimulus persons originally composing what might be called an 'overcontrolling' cluster shift apart as the client comes to deal with problems of feelings of external control? There are of course very considerable individual differences in the psychological meaning of each cluster of points. The point to be made here is whatever the meaning of particular clusters for a given client one would expect changes if in fact therapeutic efforts are facilitating perceptual and reactive flexibility.

Earlier comments about the unbiased standard error estimate have potential significance in the clinical context. Findings of the present work indicated that not only were some persons using relatively few dimensions they were also less precise or consistent in making their similarity judgements. This was coincident with Loevinger and Wessler's (1970) descriptions of earlier stages of ego development which included conceptual confusion. It seems quite possible that related concepts such as cognitive slippage or looseness of associations which are frequently used to describe aspects of more severe clinical disorders would reflect themselves in higher error estimates. In this respect one would expect thought disordered clients to have multidimensional scaling solutions characterized by very high error estimates. From the point of view of assessing change with such clients then a lowering error estimate may well be a sign of more organized thought patterns.

From the point of view of future research there are a few statistical considerations which require further study. Probably the most important is to carry out Monte Carlo studies in order to determine stopping rules more precisely for 18 points fitted to two, three, four and perhaps five dimensional solutions. Next, studies where subjects would

repeat complete sets of similarity judgements perhaps once a week for a month are necessary to determine the stability of dimensionality over time. Related to this of course is the question as to how stable is the standard error estimate with repeated testings? The relationship between the standard error and other measures such as the External Orientation subtest was a strong finding of this study and certainly deserves more investigation.

Conclusion

This research indicates that in making apparently simple similarity judgements of self and significant others, persons are organizing information relevant to those judgements in a way which is characteristic of a far more general style of functioning. In terms of methodological considerations, most applications of multidimensional scaling techniques have been concerned with the content of the multidimensional space without investigating the psychological significance of the dimensionality of that space per se. This research indicates that much more information can be extracted from a multidimensional scaling paradigm than has previously been recognized. In other words there is, in one multidimensional profile, information about the content of a person's perceptions of stimuli presented to him, but also dimensional information relating to quite far reaching statements about his general style of psychological functioning.

Summary

Maximum likelihood multidimensional scaling was applied to similarity judgements of self and 17 significant others. Based on the argument that a person's level of differentiation would be reflected in the number of dimensions required to fit those judgements, three hypotheses were tested. The number of dimensions a person uses should be: 1. positively related to his stage of ego development; 2. negatively related to performance on the Embedded Figures Test; and 3. negatively related to reliance on external cues for self definition. Results supported all three hypotheses. The unbiased standard error estimate (corrected for dimensionality) was related to the number of dimensions used, stage of ego development and external orientation. Results were discussed in terms of their implications for social-personality and clinical research.

REFERENCES

Ansbacher, H. L., & Ansbacher, R. R. (Eds.). The individual Psychology of Alfred Adler. New York: Basic Books, 1956.

Aronoff, J. A test and scoring manual for the measurement of safety, love and belongingness, and esteem needs. Manuscript, Michigan State University, Department of Psychology, 1971.

Bellak, L., Hurvich, M., & Gediman, H. K. Ego functions in schizophrenics, neurotics, and normals: A systematic study of conceptual, diagnostic, and therapeutic aspects. New York: Wiley, 1973.

Brigham, J. C. Ethnic Stereotypes. Psychological Bulletin, 1971, 76, 15-38.

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.

Dewey, J., & Tufts, J. H. Ethics. New York: Holt, Rinehart and Winston, 1908.

Ehrlich, H. J., & Rinehart, J. W. A brief report on the methodology of stereotype research. Social Forces, 1965, 43, 564-575.

Hays, W. L. Statistics for psychologists. New York: Holt, Rinehart and Winston, 1963.

Isaacs, K. S., & Haggard, E. A. Some methods used in the study of affect in psychotherapy. In L. A. Gottschalk & S. H. Auerbach (Eds.), Methods of research in psychotherapy. New York: Appleton-Century-Crofts, 1956.

Katz, D., & Braly, K. Racial stereotypes of one hundred college students. Journal of Abnormal and Social Psychology, 1933, 28, 280-290.

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

Kohlberg, L. Development of moral character and moral ideology. In M. L. Hoffman & L. W. Hoffman (Eds.), Review of child development research. Vol. 1. New York: Russell Sage Foundation, 1964.

Kruskal, J. B. Multidimensional scaling by optimizing goodness-of-fit to a nonmetric hypothesis. Psychometrika, 1964, 29, 1-28. (a)

Kruskal, J. B. Nonmetric scaling: A numerical method. Psychometrika, 1964, 29, 28-42. (b)

Kruskal, J. B., & Carmone, F. How to use M-D-SCAL (Version 5M) and other useful information. Manuscript, Bell Laboratories, Murray Hill, November, 1971.

Loevinger, J. Theories of ego development. In L. Breger (Ed.), Clinical-cognitive psychology: Models and integrations. Englewood Cliffs, N. J.: Prentice-Hall, 1969.

Loevinger, J. Ego development. San Francisco: Jossey-Bass, 1976.

Loevinger, J., & Wessler, R. Measuring ego development I: Construction and use of a sentence completion test. San Francisco: Jossey-Bass, 1970.

Mahler, M. S., Pine, F., & Bergman, A. The psychological birth of the human infant. Symbiosis and individuation. New York: Basic Books, 1975.

Maslow, A. H. Motivation and personality. New York: Harper and Row, 1954.

Maslow, A. H. Toward a psychology of being. New York: Van Nostrand, 1962.

Mehrabian, A. An analysis of personality theories. Englewood Cliffs, N. J.: Prentice-Hall, 1968.

Peck, R. F., & Havighurst, R. J. The psychology of character development. New York: Wiley, 1960.

Piaget, J. The moral judgement of the child. New York: Free Press, 1932.

Ramsay, J. O. Maximum likelihood estimation in multidimensional scaling. Psychometrika, In Press, 1976.

Rogers, C. R. On becoming a person. Boston: Houghton Mifflin, 1961.

Sullivan, H. S. The interpersonal theory of psychiatry. New York: Norton, 1953.

Sullivan, C., Grant, M. Q., & Grant, J. D. The development of interpersonal maturity: Applications to delinquency. Psychiatry, 1957, 20, 373-385.

Werner, H. The concept of development from a comparative and organismic point of view. In D. B. Harris (Ed.), The concept of development. Minneapolis: University of Minnesota Press, 1957, pp. 125-148.

Wiggins, J. S., Renner, K. E., Clore, G. L., & Rose, R. J. The psychology of personality. Reading, Mass.: Addison-Wesley, 1971.

Witkin, H. A. Individual differences in ease of perception of embedded figures. Journal of personality, 1950, 19, 1-15.

Witkin, H. A., Dyk, R., Faterson, H. F., Goodenough, D. R., & Karp, S. A. Psychological differentiation. New York: Wiley, 1962.

Witkin, H. A., Oltman, P. K., Raskin, E., & Karp, S. A. A manual for the embedded figures tests. Palo Alto, Calif.: Consulting Psychologists Press, 1971.

Appendix I

Results of multidimensional scaling by maximum likelihood for each subject

Subject		Number of Dimensions				
		1	2	3	4	5
1	No. of iterations to convergence		228	149	214	
	Unbiased standard error		.376	.329	.313	
	Log likelihood function		91.8	122.9	140.8	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			62.2	35.8	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 2					
	> 80 : 2					
2	No. of iterations to convergence			75	105	96
	Unbiased standard error			.232	.198	.196
	Log likelihood function			175.7	210.5	224.7
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$				69.6	28.4
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 4					
	> 70 : 3					
	> 80 : 3					
3	No. of iterations to convergence			96	39	300
	Unbiased standard error			.249	.196	.186
	Log likelihood function			167.9	212.5	232.6
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$				89.2	40.2
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 4					
	> 70 : 4					
	> 80 : 4					

		1	2	3	4	5
4	No. of iterations to convergence			110	403	177
	Unbiased standard error			.234	.185	.172
	Log likelihood function			174.7	221.6	244.4
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$				93.8	45.6
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 4					
	> 70 : 4					
	> 80 : 4					
5	No. of iterations to convergence	106	57	215		
	Unbiased standard error	.704	.316	.290		
	Log Likelihood function	-13.8	118.4	141.6		
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$		264.4	46.4		
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 2					
	> 60 : 2					
	> 70 : 2					
	> 80 : 2					
6	No. of iterations to convergence	77	127	165		
	Unbiased standard error	.947	.422	.396		
	Log likelihood function	-59.1	74.1	93.8		
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$		266.4	39.4		
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 2					
	> 60 : 2					
	> 70 : 2					
	> 80 : 2					
7	No. of iterations to convergence		56	214	62	
	Unbiased standard error		.360	.222	.197	
	Log likelihood function		98.0	182.1	211.5	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			168.2	58.8	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 3					
	> 70 : 3					
	> 80 : 3					

		1	2	3	4	5
8	No. of iterations to convergence			68	126	125
	Unbiased standard error			.213	.160	.143
	Log likelihood			188.9	244.5	272.6
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$				111.2	56.2
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 5					
	> 60 : 4					
	> 70 : 4					
	> 80 : 4					
9	No. of iterations to convergence			131	130	95
	Unbiased standard error			.251	.204	.190
	Log likelihood function			164	206.6	228.2
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$				85.2	43.2
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 4					
	> 70 : 4					
	> 80 : 4					
10	No. of iterations to convergence			116	80	64
	Unbiased standard error			.236	.179	.165
	Log likelihood function			173.5	226.1	250.1
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$				105.2	48.0
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 4					
	> 70 : 4					
	> 80 : 4					
11	No. of iterations to convergence	58	56	73		
	Unbiased standard error	.658	.362	.349		
	Log likelihood function	- 3.6	97.1	113.5		
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$		201.4	32.8		
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 2					
	> 60 : 2					
	> 70 : 2					
	> 80 : 2					

		1	2	3	4	5
12	No. of iterations to convergence		114	156	159	
	Unbiased standard error		.380	.267	.258	
	Log likelihood function		89.7	154.3	170.8	
	$-2(\log L_{k-1} - \text{Log } L_k)$			129.2	33.0	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 3					
	> 80 : 3					
13	No. of iterations to convergence		87	50	217	
	Unbiased standard error		.369	.258	.243	
	Log likelihood function		94.5	159.2	179.9	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			129.4	41.4	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 3					
	> 80 : 3					
14	No. of iterations to convergence			122	184	191
	Unbiased standard error			.248	.208	.200
	Log Likelihood function			166.2	203.7	221.4
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$				75.0	35.4
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 4					
	> 70 : 4					
	> 80 : 3					
15	No. of iterations to convergence			103	81	154
	Unbiased standard error			.207	.171	.160
	Log likelihood function			193.4	233.6	256.2
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$				80.4	45.2
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 4					
	> 70 : 4					
	> 80 : 4					

		1	2	3	4	5
16	No. of iterations to convergence	122	52	107		
	Unbiased standard error	.922	.375	.360		
	Log likelihood function	-55.0	92.4	108.7		
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$		294.8	32.6		
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 2					
	> 60 : 2					
	> 70 : 2					
	> 80 : 2					
17	No. of iterations to convergence		395	215	419	
	Unbiased standard error		.309	.254	.253	
	Log likelihood function		121.5	162.1	173.3	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			81.2	22.4	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 3					
	> 80 : 3					
18	No. of iterations to convergence	80	66	98	87	
	Unbiased standard error	.784	.356	.304	.314	
	Log likelihood function	-30.2	100.3	134.3	140.7	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$		261.0	68.0	12.8	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 2					
	> 80 : 2					
19	No. of iterations to convergence		178	537	372	
	Unbiased standard error		.309	.258	.249	
	Log likelihood function		121.6	159.2	175.9	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			75.2	33.4	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 3					
	> 80 : 2					

		1	2	3	4	5
20	No. of iterations to convergence			58	311	110
	Unbiased standard error			.178	.148	.138
	Log likelihood function			217.3	255.9	278.8
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$				77.2	45.8
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 4					
	> 70 : 4					
	> 80 : 4					
21	No. of iterations to convergence		214	158	105	
	Unbiased standard error		.341	.284	.279	
	Log likelihood function		106.9	145.3	159.0	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			76.8	27.4	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 3					
	> 80 : 2					
22	No. of iterations to convergence		123	186	271	
	Unbiased standard error		.358	.297	.292	
	Log likelihood function		99.1	138.2	151.5	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			78.2	26.6	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 3					
	> 80 : 2					
23	No. of iterations to convergence		132	85	89	
	Unbiased standard error		.332	.252	.235	
	Log likelihood function		110.9	162.8	185.4	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			103.8	45.2	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 3					
	> 80 : 3					

		1	2	3	4	5
24	No. of iterations to convergence			148	49	215
	Unbiased standard error			.239	.196	.197
	Log likelihood function			171.6	213.2	223.7
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$				83.2	21.0
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 4					
	> 70 : 4					
	> 80 : 4					
25	No. of iterations to convergence		92	88	160	
	Unbiased standard error		.299	.193	.166	
	Log likelihood function		126.8	203.7	235.0	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			153.8	62.6	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 4					
	> 70 : 4					
	> 80 : 3					
26	No. of iterations to convergence		44	202	57	
	Unbiased standard error		.367	.324	.301	
	Log likelihood function		95.5	124.7	147.2	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			58.4	45.0	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 2					
	> 70 : 2					
	> 80 : 2					
27	No. of iterations to convergence		197	282	142	
	Unbiased standard error		.388	.273	.250	
	Log likelihood function		86.8	150.9	175.4	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			128.2	49.0	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 3					
	> 70 : 3					
	> 80 : 3					

		1	2	3	4	5
28	No. of iterations to convergence			66	62	129
	Unbiased standard error			.237	.193	.199
	Log likelihood function			172.5	215.2	221.7
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$				85.4	13.0
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 4					
	> 70 : 4					
	> 80 : 4					
29	No. of iterations to convergence		66	63	86	
	Unbiased standard error		.297	.240	.241	
	Log likelihood function		128.0	170.9	180.5	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			85.8	19.2	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 3					
	> 80 : 3					
30	No. of iterations to convergence		171	412	112	
	Unbiased standard error		.327	.283	.272	
	Log likelihood function		112.7	145.6	162.2	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			65.8	33.2	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 2					
	> 80 : 2					
31	No. of iterations to convergence		47	136	84	
	Unbiased standard error		.356	.275	.259	
	Log likelihood function		100.1	149.6	170.0	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			99.0	40.8	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 3					
	> 80 : 3					

		1	2	3	4	5
32	No. of iterations to convergence		74	71	39	
	Unbiased standard error		.401	.342	.322	
	Log likelihood function		81.8	116.9	136.7	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			70.2	39.6	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 3					
	> 80 : 2					
33	No. of iterations to convergence		48	85	177	
	Unbiased standard error		.298	.216	.187	
	Log likelihood function		127.4	186.8	219.9	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			118.8	66.2	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 4					
	> 60 : 4					
	> 70 : 3					
	> 80 : 3					
34	No. of iterations to convergence		69	175	239	
	Unbiased standard error		.288	.246	.237	
	Log likelihood function		132.5	166.8	183.3	
	$-2(\text{Log } L_{k-1} - \text{Log } L_k)$			68.6	33.0	
	No. of dimensions retained where $-2(\text{Log } L_{k-1} - \text{Log } L_k)$					
	> 50 : 3					
	> 60 : 3					
	> 70 : 2					
	> 80 : 2					

Appendix II

Questionnaire

External Orientation	r	M	s
1. My moods seem to shift a lot (i.e. quite variable) depending on who I am with. In other words I can feel very 'high' with some people and very 'low' with others.	.56	3.94	2.35
2. I act quite differently with different people.	.76	3.91	2.26
3. When I think about it, I quite often do things because of external pressures (parents, friends, etc.).	.74	5.09	2.44
4. I quite often get the feeling I'm not really the 'same person' from one situation to another or from one time to another.	.68	5.71	2.33
5. When I think about it, my attitudes and feelings are very easily influenced by others.	.73	5.03	2.05
6. I often get a troubled feeling from wondering if my parents and/or friends might disapprove of what I'm doing.	.60	5.47	2.29
7. I am very easily distracted.	.60	4.35	2.36
8. I would feel guilty if my parents and/or friends told me I was letting them down in any way.	.58	3.79	2.31
9. I sometimes feel I'm a quite different person when I'm with some people than when I'm with others.	.75	4.47	2.27
10. I enjoy being with people who are respected because I feel better myself when I am with them.	.57	5.56	2.40
11. I really value social recognition (respect from others).	.50	3.85	1.71
12. It's very important that other people like me because it makes me feel good about myself.	.70	4.53	2.03
13. I feel very uncomfortable when I don't know how I stand in the eyes of people around me.	.74	4.76	2.13
14. I often have dreams and/or fantasies about being someone quite different from who I think I really am.	.51	6.00	2.65
External Total Score		71.10	22.00

Reality Testing			
1. I've often been surprised to find that what I thought was going on really was not.	.71	4.82	2.19
2. I often wonder whether something really happened or whether it was just in my mind.	.77	6.09	2.61
3. I often think that I see what I want to see rather than what's really there - sort of like an ostrich burying it's head in the sand.	.79	5.18	2.33
4. It upsets me when I don't know what's going on.	.54	3.82	2.30
5. I get confused easily.	.88	5.68	2.43
6. People often misunderstand what I'm trying to tell them.	.78	5.18	2.33
Reality Testing Total Score		30.80	10.60
Judgement			
1. I've often done things which, when I thought about it afterwards, were done in poor judgement.	.58	4.47	2.09
2. I seem to offend people without intending to.	.77	6.12	1.95
3. I'm not very good at anticipating peoples' responses to me.	.73	6.24	2.09
4. I often seem to misjudge people.	.59	5.97	1.87
5. I am careless with myself, my health, etc.	.59	6.09	2.39
Judgement Total Score		34.40	7.87
Sense of Reality			
1. I quite often feel 'spaced' - not really in touch with myself.	.83	5.91	2.39
2. I often have the feeling that I'm out of touch.	.76	5.53	2.43
3. I often have deja vu experiences - that things are happening which have happened before, or that I've been to certain places before, or heard or thought or said something which has happened before.	.57	4.24	2.54
4. Things and people around me often feel unreal.	.89	6.24	2.13

5.	I often feel as though there were a glass wall between me and the rest of the world.	.80	5.62	2.65
6.	People and/or things have looked different from what I know them to be. For instance, they may have appeared closer or farther away, larger or smaller, etc.	.61	6.94	2.06
7.	I've often felt as though I was walking around in a trance.	.77	5.71	2.56
8.	I've had the experience of just not feeling real.	.79	5.29	2.48
	Sense of Reality Total Score		45.50	14.30

Drive Regulation

1.	I often have rapid changes in mood, like going from high to low rather quickly.	.74	4.79	2.69
2.	I spend a lot of time daydreaming about things.	.75	3.79	2.27
3.	Daydreaming is more pleasant and satisfying than reality	.75	6.09	2.43
4.	I tend to be an emotional and excitable person.	.41	4.32	2.50
5.	I am easily frustrated.	.69	4.82	2.32
6.	I find it hard to 'let go'.	.48	5.12	2.51
	Drive Regulation Total Score		28.90	9.35

Object Relations

1.	It seems that no matter how hard I try to avoid them the same difficulties crop up in most important relationships.	.63	5.00	2.19
2.	I seem to get involved with the same kind of people even when I thought he/she was going to be different.	.68	5.85	2.38
3.	In close relationships I often get to a point where things are getting too intimate so that I will want to break it up.	.62	5.88	2.53
4.	I have often run away from a relationship for fear of being hurt.	.57	6.47	2.34
5.	I generally keep distant with people.	.59	5.56	2.45

6. I prefer to be with people who talk about ideas and stay away from emotional topics.	.52	6.91	1.82
7. I often try to change the way people are and how they act so they'd be more the way I'd like them to be.	.52	6.67	1.85
Object Relations Total Score		42.40	9.25

Thought

1. I have trouble keeping my mind on what I'm doing because of distractions from noises,etc.	.63	4.94	2.44
2. I often find that I have so many thoughts racing through my head that I can't concentrate on any particular thing.	.83	4.88	2.67
3. I am often troubled by thoughts that stick in my mind so that I can't get rid of them.	.78	4.50	2.35
4. I often get carried away by my own ideas so that it's hard to come back to earth.	.54	5.29	2.29
Thought Total Score		19.60	6.47

Defensive Functioning

1. Things easily upset me.	.67	4.56	2.60
2. I am a very anxious person	.78	4.44	2.15
3. I have had the feeling that I am going to fall apart.	.68	4.56	2.69
4. I quite often have frightening nightmares.	.36	6.62	2.37
5. I have some special fears like claustrophobia, fear of travel, fear of crowds, etc.	.56	7.14	2.69
6. I am often concerned about what other people are saying about me.	.72	4.71	1.96
Defensive Functioning Total Score		32.03	9.00

Stimulus Barrier

1. I am overly sensitive to light, sound, touch etc.	.69	5.12	2.63
2. I often seek solitude when outside irritants get to be too much.	.73	3.38	2.12

3. I've often felt like jumping out of my skin when things got to be too much.	.60	5.59	2.54
4. Excitement 'rattles' me.	.59	6.59	2.16
Stimulus Barrier Total Score		20.68	6.15

Autonomous Functioning

1. I have difficulty with routine things (usual work routine, etc.).	.76	6.15	2.19
2. I often get lost in the middle of what I'm doing so that I have to stop and think about what the next step is.	.69	5.74	2.27
3. I've often felt so lacking in energy that I couldn't carry through with things that I ordinarily do.	.70	5.35	2.35
4. It's hard to get going on something I want to do.	.46	6.03	2.17
Autonomous Functioning Total Score		25.27	8.98

Synthetic-Integrative Functioning

1. I don't adapt very easily to sudden changes in my routine.	.58	6.06	2.36
2. When I'm busy doing one thing and something else comes up that needs to be done, I have difficulty getting back to what I was originally doing.	.69	5.88	2.01
3. I don't like to have bits and pieces lying around.	.63	4.65	2.23
4. It's important for me to be able to tie things together.	.51	3.38	1.74
Synthetic-Integrative Functioning Total Score		20.00	5.04

Superego Functioning

1. My conscience bothers me a lot.	.70	5.91	2.48
2. I am too strict with myself.	.76	5.53	2.64
3. I often feel guilty about things which I know are not my fault.	.71	5.21	2.46

4. I often have feelings of unworthiness.	.69	5.15	2.56
5. I expect too much of myself.	.65	5.26	2.37
Superego Functioning Total Score		7.06	8.81

Appendix III

Complete Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	N Dimensions $-2(\log L_{k-1}-\log L_k)>50$																							
2	U. Standard Error	-92																						
3	N Dimensions $-2(\log L_{k-1}-\log L_k)>60$	91	-90																					
4	U. Standard Error	-89	99	-93																				
5	N Dimensions $-2(\log L_{k-1}-\log L_k)>70$	84	-84	88	-85																			
6	U. Standard Error	-86	97	-88	97	-92																		
7	N Dimensions $-2(\log L_{k-1}-\log L_k)>80$	80	83	80	-82	87	-87																	
8	U. Standard Error	-84	96	-84	95	-85	97	-92																
9	M ego development	67	-63	69	-63	66	-63	68	-62															
10	M log EFT	-46	41	-45	41	-42	38	-37	34	-43														
11	External	63	-61	63	-61	72	-66	65	-62	44	-32													
12	Reality Testing	56	-55	51	-53	57	-58	48	-51	51	-39	70												
13	Judgement	36	-50	39	-52	38	-51	34	-47	38	-19	39	73											
14	Sense of Reality	-6	3	-3	2	14	-5	2	2	-3	6	32	53	39										
15	Drive Regulation	45	-41	40	-40	52	-47	51	-46	28	-21	67	68	51	50									
16	Object Relations	32	-37	34	-37	41	-41	49	-43	49	-36	39	54	57	27	49								
17	Thought	45	-45	40	-44	55	-53	50	-48	30	-16	-70	81	60	57	77	51							
18	Defensive Functioning	53	-54	54	-55	64	-61	55	-55	56	-45	69	77	57	41	61	53	67						
19	Stimulus Barrier	34	-41	33	-41	51	-50	39	-42	24	-44	33	53	54	50	51	55	57	50					
20	Autonomous Functioning	30	-38	29	-37	40	-44	37	-42	42	-25	45	63	49	43	45	54	58	63	55				
21	Synthetic-Integrative	48	-47	47	-47	49	-49	51	-49	53	-54	59	55	27	22	40	40	48	60	37	52			
22	Total (12 - 21)	45	-49	44	-49	58	-57	51	-51	45	-34	68	90	75	69	79	70	86	82	73	74	59		
23	Superego	34	-28	36	-29	53	-38	38	-30	29	-23	64	57	27	65	60	45	57	62	53	41	49	70	