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Multidimensional Models of Social Perception, Cognition, and Behavior

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A common assumption of social psychological theories is that interpersonal behavior is mediated by structured cognitive representations of self and others, interaction episodes, interpersonal roles and relationships, group goals and tasks, as well as more general social environments and situations. A second basic theoretical assumption is that both individual adjustment and group effectiveness depend on some degree of consensus and stability in conceptions of these domains; thus, investigation of communalities and differences in perception and structuring of social stimuli is an important prerequisite for prediction of both individual differences and intraindividual consistency in social behavior.

The present paper reviews theoretical, empirical and methodological work that is relevant to these issues, with an emphasis on research that has employed multidimensional scaling, clustering techniques, and related multivariate methods to investigate problems in social cognition. Work in three major areas is reviewed: (1) interpersonal perception and attraction in intact groups; (2) perception of political and fictional figures; and (3) perception of social roles, relationships, and situations. For each area, one or more exemplary studies are discussed, related work is cited, and relevant theoretical and methodological issues are raised.

The inherent complexity of our social world suggests that an understanding of the processes whereby social stimuli are perceived, processed, represented, and acted upon will require theories and

methods of investigation that recognize this complexity. Although most general theories of social experience and behavior (Festinger, 1954; Heider, 1974; Kelly, 1955; Lewin, 1951; Triandis, 1972) recognize the interplay of developmental, normative, motivational, and affective factors in the determination of social behavior, much current research in social cognition seems to have lost sight of some of these essential features. Specifically, the results of many investigations applying information-processing paradigms to the study of perception and memory for social objects (e.g., persons, traits, interaction episodes, roles) are not directly relevant to the understanding of social behavior, although such research may well contribute to the understanding of general perceptual and memorial processes. Social psychologists' adoption of information-processing paradigms is attributable, in part, to dissatisfaction with more traditional paradigms and to a desire to understand cognitive processes mediating various types of social experience and behavior.

In his summary of the proceedings of a symposium on cognition and social behavior, Simon (1976) argued that traditional paradigms and analytic tools are incompatible with social psychologists' emerging interest in cognitive processes: "The variance analysis paradigm, designed to test whether particular stimulus variables do or do not have an effect upon response variables, is largely useless for discovering and testing process models to explain what goes on between appearance of stimulus

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and performance of response. These traditional methods are particularly inappropriate when both stimulus and response are complex . . ." (p. 261).

After attempting to establish that the processing of social information is essentially the same as processing of nonsocial information, Simon recommended the use of chronometric techniques, eye movement recording, recall measures, verbal protocol analysis, and other "methodological requisites for approaching cognitive social psychology from an information processing point of view" (p. 261).

It is difficult to disagree with Simon's arguments for the importance of understanding mediating processes underlying social behavior and his dismissal of the variance analysis paradigm. However, Simon's second piece of advice, that those interested in social cognition should adopt the information-processing paradigm, is not so compelling.

A basic assumption underlying several theories of social cognition and behavior is that people organize and summarize their knowledge about various relevant domains (e.g., persons, interpersonal behaviors, traits, and roles) into cognitive structures (cf. Kelly, 1955; Russell, 1980). In turn, these cognitive structures are assumed to shape the perception, encoding, and interpretation of future inputs from those domains. These conceptual frameworks or "implicit theories" are thought to be inferable from judgments about the domains (Kelly, 1955; Wenger & Vallacher, 1977).

The purpose of the present paper is to review recent research that has employed multidimensional scaling (MDS) and related techniques to investigate the structure of individuals' perceptions and conceptions about themselves and others, interpersonal relationships, social episodes, social situations, attributions, and various other domains of social stimuli.¹ A central concern in this review

will be to assess the extent to which the results of such investigations either provide a useful framework for further research or contribute directly to the understanding of the cognitive states and processes mediating interpersonal behavior in groups and organizations.

Much of the early research applying MDS methods to social phenomena was intended to demonstrate these methods and to provide descriptions of the domains under investigation. Therefore, in reviewing more recent research, attention was focused on the explanatory power of the research results and the extent to which MDS constituted an informative level of analysis of the process or phenomenon being investigated.

For each research area, at least one exemplary study will be discussed in detail and other recent work will be briefly noted. The advantages and disadvantages of the MDS approach relative to other methods commonly used to investigate the phenomena of interest will be discussed. Finally, suggestions about how MDS methods might profitably be applied to extant problems in some of these research areas will be made.

Interpersonal Perception and Attraction in Intact Groups

In previous papers (Davison & Jones, 1976; Jones, 1982; Jones & Young, 1972) a theoretical basis and a research paradigm for investigating problems in interpersonal perception were presented that relied heavily on MDS methods. In addition, methods of analysis and interpretation were described, and advantages and limitations of this paradigm relative to other methods commonly used to investigate social perception and behavior were discussed. A brief outline of the major features of this approach will be presented below, followed by a discussion of several studies that have employed the paradigm.

Theoretical Basis

The conception of interpersonal perception guiding the previous and recent work in this area distinguishes between *self* and *other(s)* as alternative

¹Because of space constraints, the extensive literature on applications of MDS to the study of personality perception and implicit theories of personality will not be reviewed here. Rosenberg and Sedlak (1972) and Wenger and Vallacher (1977) have conducted detailed and insightful reviews of work in these areas. Also, related research applying structural models to the study of social networks, perceptions of faces, perception of emotion, and attribution will not be covered by this review.

points of reference. At a given point in time, each individual in the social field is assumed to have an internal representation of significant others, with self positioned somewhere in the representation or schema. This is his or her own "social environment." The term *social structure* refers to the pattern of this environment (Jones & Young, 1972). Further, it is assumed that the representation is dimensional, with distances among self and others (and distances among others) reflecting important information about interpersonal relationships. Individual and temporal differences in the representations can be at the level of (1) the number and/or identities of the dimensions; (2) the relative saliences of the dimensions; or (3) the positioning of self and others along one or more of the dimensions. Interpersonal attraction, communication, and other types of behavior are assumed to be mediated by these representations. In turn, the structures of individuals' representations are assumed to change as a function of these behaviors and other experiences in the group. The degree of isomorphism among the schemata of individuals in a group is assumed to have important implications, not only for their interpersonal behavior, but also for their satisfaction and effectiveness. Finally, any individual's cognitive representation is assumed to be the basis for his or her judgments and inferences about both self and others.

General theories of interpersonal behavior (e.g., Jones & Thibaut, 1958; Sullivan, 1953) and symbolic interactionist theories (McCall, 1974; Mead, 1934) assume that social reality for an individual is a product of that individual's experiences in groups and organizations. In the course of social interaction, experiences of self, others, and interaction episodes are assumed to be encoded and represented in organized cognitive structures that in turn regulate future interactions. MDS methods are well suited for investigating and quantifying these structures.

In research where the primary focus is on the prediction and understanding of interpersonal behavior in groups and organizations, a research approach using persons per se as the units of analysis has numerous advantages over paradigms that rely exclusively on trait terms, situation labels or vi-

gnettes, role or behavior descriptions, and the like. This framework is compatible with several general theories of social perception and action (e.g., Festinger, 1954; Kelly, 1963; Sullivan, 1953) as well as more general cognitive theories (e.g., Scott, 1969).

The Structural Model

The desired representation of social structure and derivation of the dimensions underlying group members' construal of their social environment are accomplished by MDS analysis of general interpersonal similarity judgments about self and others. In making these judgments, the judge may consider the entire complex of demographic, behavioral, and personality cues that he or she deems relevant for judging pairs of individuals. For each pair judged, it is assumed that a social comparison process is evoked, essentially similar to the process typically evoked in actual social situations involving two or more group members. Thus, the observed set of interpersonal similarity relations generated by a particular judge contains a wealth of relevant information about that judge's construal of self and significant others, including implicit information about the "locations" of self, others, and the salient dimensions in which this cognitive structure is embedded.

Two-way MDS methods (e.g., KYST; Kruskal, Young & Seery, 1973) or three-way MDS methods (e.g., INDSCAL; Carroll & Chang, 1970) are then applied to recover those dimensions and the locations of self and others along them. The geometric structure derived by MDS represents self and others as points, with distances among points representing perceived differences among group members; this derived configuration will be referred to as the perceived or implicit social structure of the group. Application of individual difference MDS methods to data from numerous members of a group allows inferences about individual and subgroup differences in construal of a common social situation. These models, in principle, permit inferences about individual differences in the number, identities, saliences, and predictive validities of the underlying dimensions. An adequate account of inter-

personal behavior requires that these individual differences be taken into account.

In the paradigm used by Jones and Young (1972), independently measured sociometric, demographic, and personality variables are antecedents; dimensions of interpersonal perception and individual differences parameters derived via MDS procedures are intervening variables; and interpersonal behaviors, attributions, sociometric choices, and so forth, are the dependent variables. Coupled with an appropriate research design and appropriate sampling of judges and stimulus persons, results from investigations employing this paradigm lead to inferences about the relationship between self-perception and construal of others. A general hypothesis of this type predicts that individuals who see themselves as extreme on a relevant dimension will attach more importance to that dimension in judging others (Hirschberg & Jennings, 1980; Hirschberg, Jones, & Haggerty, 1978).

To date, most of the research employing MDS techniques to investigate issues in person perception has concentrated on basic questions, e.g., discovering the most salient dimensions underlying interpersonal perception in a group or searching for personality or other correlates of model-derived subject salience parameters. There have been relatively few studies investigating issues of more general theoretical interest, nor have there been many studies that use these methods to examine changes in the perceived structure of groups as a function of training, goals, changes in formal structure, and other types of experience or interventions. Examples of research that has gone beyond basic description and investigation of individual differences correlates are presented in the next section.

Interpersonal Perception in a Research Laboratory

The first application of an individual difference MDS model to investigation of interpersonal perceptions and behavior of a functioning organization was Jones and Young's (1972) longitudinal field study of a research laboratory. This investigation

was designed (1) to identify dimensions of interpersonal perception for group members; (2) to test hypotheses about individual and subgroup differences in the salience of those dimensions; (3) to investigate relationships between perceived group structure and interpersonal behavior; and (4) to examine changes in interpersonal perception over time.

The participants in the study were the faculty, staff, and students of a research laboratory. It was expected that role and status differences among members would be reflected in their perceptions of self and others, and that those differences in construal would moderate interpersonal attraction and behavior in important ways. The "stimulus persons" in this study were a subset of the group, but the entire group served as judges. Thus, those judges who were also stimulus persons made judgments about others, themselves, and the relationships between themselves and others. Three types of data were collected:

1. *Interpersonal similarities.* Judges were asked to make similarity judgments about all possible pairs of stimulus persons, taking into account "whatever characteristics of the individuals that are relevant."
2. *Unidimensional attribution scales.* Subjects were asked to rate each of the stimulus persons on scales indicating degree of interest in various professional activities, status, life-style, and political orientation. Those scales represented hypotheses about the identities of the dimensions of interpersonal perception.
3. *Sociometric choices.* Each subject was asked to choose the two sets of three individuals with whom they associated *least* and *most* frequently: (1) for research advice and (2) socially.

These tasks were intended to tap two important domains of interpersonal behavior, social and work-related. The resulting choice data served as dependent variables in analyses designed to interrelate interpersonal perception and behavior.

Data were collected on two occasions, one year apart, using overlapping groups of individuals as judges and stimulus persons. A generalization of the INDSCAL model involving parameters for stimuli, judges, and occasions was applied to in-

investigate change in interpersonal perceptions as a function of seniority and experience.

INDSCAL analyses of the interpersonal similarities data from both years revealed three interpretable dimensions underlying interpersonal perception. Listed in order of overall salience, these were:

1. *Status*. Individuals with the lowest scale values were first-year graduate students; individuals in the middle were advanced graduate students and assistant professors; and those with the highest scale values were associate and full professors. Correlations between stimulus persons' projections on the dimension and an objective measure of status was .94.
2. *Political persuasion*. Scale values of individuals on this dimension were highly correlated with perceived position along a left-right or liberal-conservative political spectrum and a measure of orthodoxy of life-style.
3. *Professional interests*. Individuals' locations on this dimension were predictable from the patterns of their interests in substantive problem areas and methodology. For example, perceived degree of interest in statistical problems correlated $-.91$ with projections along this dimension.

Multiple regression analyses relating the INDSCAL-derived dimensions to the various unidimensional scales revealed that three subsets of construct vectors closely coincided with the unrotated dimensions. These results supported the expectations that the orientation of the dimensions as derived would be meaningful and that the group perceived itself according to the status, professional interests, and political persuasion of its members.

The subject space resulting from the INDSCAL analysis was analyzed to determine if there were consistent points of view in interpersonal construal associated with four role-defined subject groups: New Graduate Students, Graduate Students, Faculty, and Clerical-Secretarial Personnel. Multiple discriminant analysis using the salience weights as predictor variables and the four groups as "criterion" variables revealed overall significant differences among the centroids of the groups. Salience

of professional interests was the most important variable differentiating the groups, with Graduate Students exhibiting the highest weights and Clerical Workers the lowest weights. Faculty were more status conscious than the other groups; New Graduate Students and Clerical Personnel paid more attention to political persuasion.

A generalization of the INDSCAL model, with data from both years combined, was developed to explore changes in the saliences of the dimensions over time. The subject space resulting from this model contains two points for each subject, representing the relative saliences of the stimulus space dimensions at Time 1 and Time 2. Thus, changes in interpersonal perception over time are reflected in differences of the directions and magnitudes of salience weights.

It was predicted that temporal stability in interpersonal perception would be a function of duration of group membership. The results of the longitudinal analysis demonstrated that Faculty and Advanced Graduate Students exhibited very small changes in dimension salience, whereas New Graduate Students exhibited relatively larger changes, confirming the prediction. Over the 1-year period, Political Persuasion became more salient for the new students, and Professional Interests became less salient.

Another objective of the research was to predict interpersonal choice and behavior using what had been learned about the dimensions of interpersonal construal and individual differences in the saliences of these dimensions. A simple model, which capitalizes on the fact that a subgroup of judges were also stimulus persons with locations in the group stimulus space, was devised to generate these predictions. Distances between each judge and the remaining stimulus persons were computed in a relevant subspace. Then, the three stimulus persons closest to the judge and the three farthest from the judge were identified. Finally, these two sets of predicted choices were compared to each judge's actual choices, and the percentage of correctly predicted choices was determined. The accuracy of these predictions ranged from 46% to 62% when the group space (or a relevant subspace) was used as the basis for prediction. Using each judge's own

stimulus space as the basis for prediction increased accuracy by approximately 10%.

Interpersonal Perception and Attraction in a ROTC unit

A field study by Davison and Jones (1976) investigated the relationship between interpersonal perception and interpersonal attraction for members of a ROTC unit. One purpose of the research was to test the "similarity-attraction" hypothesis (Byrne, 1971) via a two-stage model that analyzes the relationship between MDS-derived dimensions of interpersonal perception and measures of attraction based on sociometric choice data.

An INDSCAL (Carroll & Chang, 1970) analysis of interpersonal similarity judgments revealed that group members were perceived to vary in status, subgroup affiliation, and interest in exercising authority. These dimensions were comparable in interesting ways to those derived in the Jones and Young (1972) study of the research laboratory. For example, in the ROTC unit the highly salient subgroup affiliation dimension represented a perceived contrast between members of a social fraternity versus members of a "special forces" group; those two subgroups were engaged in a friendly rivalry for members and for leadership positions within the corps. In the Jones and Young (1972) study, the professional interests dimension was essentially a contrast between laboratory staff interested in methodology and statistical models versus those more interested in empirical research and substantive theory.

Davison and Jones (1976) employed modified sociometric and preferential choice procedures to measure interpersonal attraction. Each respondent was asked to judge the likelihood that he would choose each of the stimulus persons to engage in or participate with him in various activities or situations, e.g., work squads at a summer camp. An attraction measure based on a set of items of this type contains more information about the pattern and intensity of subjects' interpersonal preferences than traditional sociometric nomination data.

Davison and Jones's (1976) two-stage model of the similarity-attraction relationship assumes that

an individual's attraction responses toward others in a group are based on his or her assessments of others' positions along more basic dimensions of interpersonal perception. In their paradigm, these dimensions and group members' positions along them are measured via an MDS analysis of interpersonal similarity judgments. Each individual's degree of attraction toward other members is measured (as described above) and a generalized multidimensional unfolding analysis (Carroll, 1972) is used to interrelate perceived similarity and attraction. It is noteworthy that this model attempts to account for each group member's attraction responses toward *all* other group members who are included as stimulus persons. The entire network of attraction relations can be summarized and represented by a parsimonious geometric model, with stimulus persons represented as points in a r -dimensional space and judges either represented by their "ideal points" (Coombs, 1964) or as vectors through the space, depending on the particular version of the model that is adopted.

The ideal point model assumes that strength of attraction toward each group member is an additive function of the similarity between the subject and that individual. Specifically, if p_{ij} is the attraction of subject i toward person j , w_{it} is the weight of dimension t for subject i , x_{it} is subject i 's scale value along dimension t , and x_{jt} is the scale value for stimulus person j on dimension t , then the similarity-attraction hypothesis suggests that attraction is a linear function of the squared difference between the positions of subject i and person j along each of the r dimensions:

$$P_{ij} = \sum_{t=1}^r w_{it}(x_{it} - x_{jt})^2 + c_i \quad [1]$$

where c_i denotes a constant unique to person i .

Under this model, strength of attraction is not necessarily monotonically related to the extremity of a stimulus person's location along any or all dimensions of the stimulus space, i.e., "more" of an attribute is not necessarily "better." For example, on both theoretical and empirical grounds, it would be expected that some individuals would be most attracted to other group members with status about equivalent to their own. The ideal point model (defined in Equation 1) represents each judge

as a point in the stimulus space and predicts that the closer another group member is located to that individual's ideal point, the more that person should be preferred. The model embodied in Equation 1 can be fit using Carroll's (1972) PREFMAP program, which uses regression techniques to estimate model parameters.

As Davison and Jones (1976) pointed out, because the similarity-attraction hypothesis implicitly assumes that a subject's ideal point corresponds to his or her self-perceived position along each dimension, it predicts that subjects having higher estimated ideals along a dimension of interpersonal perception should rate themselves higher on that attribute than persons with lower ideals. In the case where the judge is also a stimulus person, the joint space resulting from the two-stage MDS-unfolding analysis will contain two points for that judge: (1) a point summarizing his or her self-perceived locations along the r dimensions of interpersonal perception and (2) an implicit ideal point. This feature of the model could be used to test hypotheses about self-ideal-self discrepancies as a function of experience in the group, role, or other personality and attitudinal variables. Once again, this represents a level of analysis that is not possible with other paradigms for investigating interpersonal perception and attraction. It is a theoretically interesting level of analysis because it permits formulation and testing of hypotheses about the relationship between self-concept, ideal-self concept, and perception of others. Also, the ideal point model can be used to predict nonsymmetric sociometric choices or other dyadic relations data (see Jones, 1982).

Interpersonal Perception and Social Episodes

In an investigation very similar in design and methodology to that of Jones and Young (1972), Forgas (1978a) studied interpersonal perceptions among members of a large psychology department at a British university. An interesting additional purpose of Forgas's study was to explore the relationship between two structural variables (formal status and perceived position within the group) and perceptions of other group members and of prevalent social episodes. The social episodes, e.g.,

"discussing research with another group member," were elicited in interviews with group members and selected on the basis of frequency.

The dimensions of interpersonal perception derived from an INDSCAL analysis of interpersonal similarity ratings were identified as Sociability, Creativity, and Competence; these dimensions were comparable in meaning to those identified by Jones and Young (1972) and Davison and Jones (1976). For example, the dimension labeled Competence reflected the dominance and intellectual status of group members; members' scale values along the dimension correlated with unidimensional ratings of dominance, articulateness, self-confidence, and intelligence. Whereas "status" in the academic group studied by Jones and Young (1972) was very closely related to seniority and academic rank, status in the British group seemed to be more closely related to task competence and perceived personality characteristics correlated with competence.

An analysis of profile distances among social episodes, derived from judgments of the episodes on 11 bipolar scales, resulted in four dimensions: Anxiety, Involvement, Evaluation, and Socioemotional Task Orientation. The role and status positions of group members were related to their perceptions of the episodes: faculty judged episodes in terms of involvement, and students and staff relied mostly on the socioemotional dimension. Also, a variety of interesting relationships were found between the perceived characteristics of group members and their perceptions of episodes. For example, group members perceived as highly sociable tended not to discriminate among episodes in terms of whether they were tense-relaxed, pleasant-unpleasant, and so forth, presumably reflecting their self-confidence and social skills.

Forgas's (1978a) effort to relate group member characteristics, perceived social structure, and perception of social episodes is a research direction with considerable theoretical interest; this level of analysis addresses some of the central problems raised by interactionist theories (Magnusson & Endler, 1977) and relates these issues to ones found in more traditional theories of interpersonal perception and behavior (Tagiuri & Petrullo, 1958). By extending the research paradigm to include in-

terpersonal attraction and behavior, such that all three classes of variables (i.e., person perception, episode perception, and social behavior) could be studied together, the resulting scope and level of analysis would approximate that required to provide an empirical basis for a general theory of social cognition and behavior.

Studies of Therapy Groups, Academic Departments, and Organizations

Several other investigators, attracted by the convenience of studying groups and institutions close at hand, have used MDS methods to measure the social structure of academic departments, classes, and so forth, and then have used the derived structures as a basis for predicting sociometric choice, interpersonal communication, and other types of interpersonal behavior or attitudes. In one such study (Kaman, Shikiar, & Hautaluoma, 1979), the emphasis was on prediction of interpersonal communication and sociometric choice from information about the perceived structure of a psychology department. Two types of communication measures were used: (1) items tapping percentage of total communications falling into nine content categories (e.g., concerning department policies, research, nonacademic interests) and (2) items reflecting percentage of total communications directed to specific others. Stimulus persons' divisional affiliations within the department and saliences of dimensions of interpersonal perception derived from an INDSCAL analysis were found to be systematically related to both communication target and content.

Sprouse and Brush (1980) were interested in the nature and development of interpersonal perceptions for members of a psychotherapy group. Noting that traditional sociometric and directed judgment methods are inadequate for advancing understanding of these issues, they used the Jones and Young (1972) paradigm to investigate changes in interpersonal perception among members of an 11-person "quasi-therapy" group over eight sessions. Interpersonal similarity judgments were collected after each session; on three occasions unidimensional ratings on scales thought to be relevant

for identifying the MDS dimensions were collected. A three-way INDSCAL analysis was performed on the Subjects \times Occasions \times Stimulus Persons matrix—a type of modeling that results in salience parameters for both subjects and occasions. The stimulus person dimensions were identified as (1) High vs. Low Disclosure about Problems, (2) High vs. Low Participation, and (3) Race (i.e., black vs. white). Based on the occasion weights, the authors concluded that the salience of the first dimension remained relatively stable across the life of the group, importance of perceived participation became more important, while salience of Race decreased over the first four sessions and then stabilized. These results illustrate that MDS methods can yield insights about group structure, individual differences, and group processes.

An interesting possibility for future research would be to collect data on actual interpersonal behavior during the life of the group (e.g., interaction frequencies or data from a content analysis of group discussions). These process data then could be related to MDS parameters as a basis for inferences about the linkages between interpersonal perception, changes in perception over time, and interpersonal behavior.

Stiles, Tupler, and Carpenter (1982) investigated members' affective reactions to analytic groups (Bales, 1970). The 11 members and the facilitator rated each of 17 sessions on 20 bipolar adjective scales, e.g., good-bad, tense-relaxed, dangerous-safe. Also, members completed a variety of personality and attitude scales. Each member's ratings on the bipolar adjective scales were converted to a matrix of profile distances. The resulting twelve 17×17 "derived dissimilarities" matrices were analyzed using the ALSCAL (Takane, Young, & deLeeuw, 1977) individual differences MDS model. Session coordinates on the three ALSCAL dimensions were correlated with the mean rating of each session on each of the 20 adjective scales. (Note that the same data were used both as a basis for the MDS and as a basis for interpreting the derived dimensions.)

A three-dimensional solution was selected for interpretation. Based on the dimension-unidimensional scale correlations, the three dimensions were

interpreted as evaluation, potency, and activity (see Osgood, Suci, & Tannenbaum, 1957), which the authors have interpreted as dimensions of "participants' affective reactions." Inferences about "phases of development" across the sessions were based on an examination of changes in session coordinates over time, i.e., the 17 sessions. Subject weights on the three dimensions were correlated with scores on various personality and attitude scales, based on an N of 11. Members for whom session depth and power (Dimension 2) was highly salient tended to be "less socialized, less sociable, less responsible, and less feminine." A second conclusion was that those who reported feeling most satisfied and involved in the group "tended to be more sensitive to the smoothness and feeling tone of sessions (Dimension 1) and less sensitive to session depth and power."

Although the results of the Stiles et al. (1982) study seem generally reasonable, there are several methodological features of the research that deserve comment. First, the basic data from the study constitute a three-way, three-mode (Judges \times Scales \times Sessions) matrix. The obvious and natural method for analysis of such data is three-mode factor analysis (Tucker, 1964), a method that yields information about subject, scale, and session factors, as well as information about their interrelationships. Although three-way factor analysis and scaling models are closely related (Carroll & Chang, 1970; Tucker, 1972), the factor model is the more natural one for rating scale data because it models them directly. In contrast, application of the MDS model requires "collapsing" the data into three-way, two-mode form via computation of profile distances. Inasmuch as there are many varieties of profile similarity and distance measures, each possibly implying different MDS solutions, this approach is inelegant and (often) unjustified, i.e., rarely do investigators provide a rationale for selection of D^2 or whichever other measure is applied. Finally, results of MDS based on profile similarities depend on the selection of scales, whereas dimensions derived via MDS of judged similarities are a product of the subjects' "selection" of stimulus information. This issue will be taken up again in a later section.

Other studies using MDS to investigate interpersonal perception and structure among members of intact groups include Ennis's (1979) study of a Bales self-analytic group; Shikiar and Coates's (1978) investigation of black and white children's perceptions of role figures; Stone and Coles's (1971) study of graduate students' perceptions of psychology faculty; Stone, Coles, Sinnet, and Sherman's (1971) study of interpersonal perception among residents of a rehabilitation unit; Calder, Rowland, and Leblebici's (1976) work examining subdiscipline differences in the perceptions of a business school faculty; Smith, Pederson, and Lewis's (1966) study of the social structure of two classes of MBA students; Clark, Maguire, and Glass's (1972) longitudinal investigation of classroom teachers' perceptions of their students; Jackson, Messick, and Solley's (1957) investigation of personality perception in a college fraternity; and Karmel and Egan's (1976) study of dimensions of managerial performance.

Blackburn (1982) has provided an informative review of studies that used MDS procedures to study organizational structure and related problems. He has classified these applications into two categories: (1) studies that utilized MDS to determine empirically the underlying dimensionality of constructs from organizational theory, e.g., managerial performance, work unit structure, and job outcome, and (2) studies that sought to identify the "cognitive/perceptual maps" individuals hold about elements of the external and internal work environments, e.g., images of an organization held by key constituencies of the organization, hiring practices among accounting and management departments, and perceptions of work units and jobs.

Researchers and theoreticians interested in group and organizational structure (e.g., Blau & Schoenherr, 1971; Durkheim, 1947; Pugh, Hickson, Hinings, & Turner, 1968) have been concerned with differences between formal and informal structure in organizations and the implications of both for organizational functioning and effectiveness. Numerous proposals have been made for measurement of the various aspects of structure. The most prevalent methods include rating or ranking of members on scales specified by investigators, and derivation

of sociograms from sociometric choices or other types of interpersonal behavioral data (Cartwright & Zander, 1968). Measurement approaches based on ratings (Bales, Cohen, & Williamson, 1979; Pugh et al. 1968) often derive underlying "dimensions" via factor analysis. These factor analytically derived dimensions then become the basis for quantifying the structure of other groups, i.e., other than the group from which the dimensions were derived originally.

In contrast, in approaches which derive representations of group structure from MDS of general interpersonal similarity ratings, the derived dimensions and the structure embedded therein are a product of the analysis. Other advantages of paradigms based on MDS and cluster analysis of direct similarities data have been discussed by Blackburn, 1982; Calder et al., 1976; Isenberg and Ennis, 1981; and Jones, 1982.

Perception of Famous and Fictional Figures

Most of the research reviewed in the previous section was concerned with group members' perceptions of one another and the mediating role of interpersonal perception in social behavior. Another area of person perception research has focused on individuals' perceptions of fictional or famous figures, especially politicians and heads of state.

Several early studies of this type (e.g., Elster & Capra, 1972; Mauser, 1972; Sherman & Ross, 1972; Shikiar, 1974; Shikiar, Wiggins & Fishbein, 1976; Stone & Coles, 1972; Tucker & Messick, 1963) were designed (1) to identify dimensions underlying the perceptions of prominent political figures; (2) to examine individual and subgroup differences in perception and preference; (3) (in a few studies) to relate individual differences in dimensional salience to political attitudes, party affiliation, and other demographic and personality variables; and (4) to predict voting intentions.

Sherman and Ross (1972) obtained similarity judgments between pairs of 20 American politicians selected to span the national political spectrum. Their INDSCAL analysis suggested the following seven dimensions of political perception:

(1) Hawk-Dove, (2) Power within Party, (3) Acceptability as a Presidential Candidate, (4) Representativeness and Lack of Prejudice, (5) Liberal-Conservative Within Party, (6) Attractiveness, and (7) Wallace (because George Wallace projected highly on it). In contrast to earlier investigators who had relied on intuition to identify derived dimensions, Sherman and Ross used correlations with property scales to establish the meanings of the dimensions. Also, subjects' scores on political, social, and economic attitude scales were correlated with INDSCAL salience weights to explore individual differences questions. Higher political conservatism of subjects was related to lower salience of the Power within Party stimulus dimension and greater salience of the Liberalism-Conservatism stimulus dimension.

A subsequent series of studies by Shikiar and his colleagues (Shikiar, 1974, 1976; Shikiar et al., 1976) used MDS methods to investigate perceptions and preferences for potential candidates in the 1972 presidential election. Shikiar et al. (1976) obtained a three-dimensional stimulus configuration from similarity data averaged over all subjects. Using multiple regression techniques, they found a vector position in the MDS space that correlated very highly with the "average subject's" voting preferences and ratings on evaluative semantic differential scales.

Shikiar (1976) investigated individual differences in political perception over time. He found that 14 months after the 1972 presidential election, which the Democrats lost, the "Democratic evaluative dimension" became less salient for the Democratic respondents, but not for the Republicans.

Perceptions of Politicians and the Prediction of Voting

Nygren and Jones (1977) reviewed research employing MDS to study political perception. They identified several methodological problems of work in this area, including problems that contributed to lack of generality and inconsistencies in the results of prior studies. The primary purposes of Nygren

and Jones's study were (1) to determine the dimensions of political perception underlying subjects' similarity judgments of 16 potential presidential candidates, (2) to assess individual differences in the saliences of these dimensions, and (3) to evaluate the ability of external unfolding (i.e., vector and ideal point) models to predict choice and voting intentions.

An INDSCAL analysis and regression of the obtained dimensions on a variety of unidimensional rating scales indicated that the politicians were perceived as varying along three identifiable dimensions: (1) Liberal, Reform Oriented vs. Conservative, Nonreform Oriented, (2) Democrat vs. Republican, and (3) Conservative, Establishment Oriented vs. Liberal, Youth Oriented. Respondents were found to weight these dimensions differentially in accordance with their own political party affiliation and liberal-conservative orientations.

Nygren and Jones criticized the exclusive use in previous research of vector models for prediction of preferential choice; a vector representation of an individual's preferences assumes that his or her preference function along each dimension is strictly monotonic. In the case of political preferences, this implies that for a Liberal-Conservative dimension, the more liberal (or conservative) a particular politician is, the more he or she will be preferred. The authors noted that on both theoretical and empirical grounds, it would be expected that at least some voters would most prefer a "middle-of-the-road" candidate; for judges exhibiting this pattern of preference, the appropriate model is an "ideal point" model whereby each judge is represented by a point in the stimulus space—his/her ideal point. The closer a politician is located in the space to the individual's ideal point, the more that politician should be preferred (see Equation 1, above). Carroll's (1972) PREFMAP program was used to fit and to evaluate the suitability of vector and ideal point models of political preferences.

In the case where the vector model is appropriate for a subject's preferences, one implication is that when an ideal point model is fitted, the resulting ideal point should be located at extreme positions along each of the dimensions, i.e., under these circumstances, the vector and ideal point models

make the same predictions. In Nygren and Jones's (1977) results, this was not the case; only 14 subjects were found to have extreme ideal point coordinates along one or more of the dimensions. The relation between perceptions and preferences for the remaining 53 subjects was better represented by an ideal point model, indicating that their most preferred candidates were perceived as moderates or otherwise intermediate on the relevant dimensions. Fitting a vector model to these data would have missed important qualitative features of the data and mispredicted preferences.

The final purpose of the Nygren and Jones study was to explore the relationships among dimensions derived from MDS of judged similarities with dimensions from an internal analysis of preferences. The results indicated a very close correspondence between the dimensions underlying aggregated preferences and similarities. The authors noted that there is no general empirical or theoretical reason for expecting such a correspondence but have postulated that in judging politicians, subjects employ an "evaluative set" in formulating both types of judgments.

A series of studies by Forgas and his colleagues (Forgas, 1980; Forgas, Kagan, & Frey, 1977; Forgas & Menyhart, 1979) was very similar in purposes and methodology to the Shikier et al. (1976) and Nygren and Jones (1977) studies but emphasized identification of attitudinal, personality, cognitive, and cultural correlates of political perceptions. In their 1979 study of 20 Australian and foreign political personalities, three dimensions—identified as Political Conservatism, Likeability, and Rationality—defined the perceptual space. Based on an analysis of INDSCAL salience weights and scores on six attitude and cognitive style measures, Forgas concluded that judges who were conservative attached high salience to politicians' ideological positions and political "strength." Subjects scoring low on conservatism found the third dimension, Rationality, the most salient. A very similar pattern of results was found for high and low scorers on the "New Left" scale, providing evidence for the notion that ideologically extreme individuals, regardless of the ideology they embrace, tend to perceive politicians in a similar fashion.

Using data collected 12 months later from a second sample of subjects, Forgas explored temporal changes in perceptions of foreign and domestic politicians. One interesting finding was that the perceived positions of left-wing and foreign leaders were less stable over time than perceptions of domestic and right-wing politicians.

Both Nygren and Jones (1977) and Forgas (1980) noted that similarity scaling and multidimensional unfolding methods have several advantages over conventional polling and survey techniques for studying voter perceptions and predicting voter preferences. Although the data requirements for these types of models are relatively extensive, the gains in predictive accuracy and understanding of the processes underlying formation of voter perception and choice may justify the additional expense and effort.

The Role of Affect in Voting

Zajonc (1980) has hypothesized that two distinct systems for evaluation of social objects operate: one is a fast, somewhat crude affective system, whereas the other is a more deliberate and detailed cognitive one. In the spirit of this theory, a recent study conducted by Abelson, Kinder, and Peters (1982) was designed to assess the relative contributions of cognitive and affective components to the prediction of voters' preferences for candidates in the 1980 presidential election. Specifically, respondents were asked to ascribe personality traits to the candidates and to report the feelings that the politicians elicited. In two national surveys Abelson et al. found that good feelings and bad feelings about candidates were "nearly independent of each other" and that affect scores were "highly predictive of overall candidate evaluations, adding significant variance explained over and above that due to trait scores and party identification" (p. 626). Given that the study was exploratory and the constraints of interview-based survey research, the authors were not able to distinguish among several alternative methodological and theoretical explanations for these interesting results.

Multidimensional scaling and preference analysis methods, of the sort employed by Nygren and

Jones (1977), applied to general similarity judgments and appropriate trait and affect ratings, would permit a powerful test of Abelson et al.'s (1982) original hypotheses and a basis for distinguishing among alternative explanations of their results. Application of these methods would yield a description of the cognitive structure underlying a respondent's perceptions of political candidates, a detailed account of the relationship of this structure to affective reactions and cognitive "portrayals" of candidates, and a modeling of the relationships between these variables and preferences or voting decisions.

In addition to the applications of MDS to analysis of political perceptions and preferences, there have been several interesting applications of these methods to related phenomena. Marcus, Tabb, and Sullivan (1974) used INDSCAL to investigate individual differences in the structure and content of political ideology. Weisberg (1972) applied MDS methods in a study of legislator's roll-call votes. Lund (1974) investigated perceptions of seven Norwegian political parties; and Alt, Sarlvik, and Crew (1976) studied individual differences in perceptions of British political parties.

Scaling Person Prototypes and Fictional Figures

Another domain of person perception research where MDS techniques have been used is in the study of person prototypes. Forgas (1983b) elicited 16 person prototypes (e.g., "radicals," "intellectuals," "quiet loners") from university students. INDSCAL analyses of sorting data and rated similarities were used to scale the prototype descriptions. Four dimensions—Academic Performance, Extroversion, Social Status, and Radicalism—defined the prototype space. Independent judgments of cultural salience were related to the prototype coordinates via multiple discriminant analysis; the prediction was that salient prototypes would occupy more extreme and differentiated positions in the group's perceived prototype space than less culturally salient characters. The results supported the prediction and served as the basis for the design of an experimental study of the effects of proto-

typicality and cultural salience on information processing of person descriptions. Using free recall, behavioral predictions, and personality impression judgments as dependent variables, Forgas found that the cultural salience of the person prototypes was an important moderator of recall and impression formation; prototype-consistent information about high-salient characters and prototype-inconsistent information about low-salient characters resulted in superior processing.

Forgas's (1983b) study is a good example of how MDS results can be used to advantage in the design and interpretation of experiments; the prior scaling of the stimulus domain permitted systematic selection of stimuli, provided the basis for a convincing manipulation of a stimulus variable, and served as a psychologically relevant framework for interpreting the research findings.

A new method called prototype analysis (developed by P. DeBoeck) was applied by Rosenberg (1983) to a Persons \times Traits matrix extracted from character descriptions in Thomas Wolfe's fictionalized autobiography, *Look Homeward Angel*. Five descriptions of Wolfe himself, at different ages, and descriptions of family members were the basis for the analysis. The partitioning of Wolfe's self-descriptions allowed tracking Wolfe's identification with members of his family, particularly with his father. The prototype analysis method results in a tree representation of person concepts where position in the hierarchy corresponds to superordinate-subordinate relations among the characters. In Rosenberg's results, Wolfe's father emerged as the most superordinate prototype of the various family members, as well as the one with whom Wolfe increasingly identified as he matured.

The data collection method used in this research, and the sorting and free response methods employed in earlier work by Rosenberg and his students (e.g., Rosenberg, 1977; Rosenberg & Jones, 1972; Rosenberg & Kim, 1975), yield a Persons \times Traits matrix that can either be modeled directly or converted to co-occurrence data, which can serve as input to clustering and MDS methods. The sorting and free-response methods have the advantages of simplicity and efficiency compared to judgment of pairwise similarities, especially when the num-

ber of stimuli is large. Rosenberg (1982) has written a comprehensive review of both methodological and substantive research involving sorting methods.

Perception of Social Situations, Relationships, and Interpersonal Behaviors

Considering the diversity and complexity of social behaviors, and that the explanation and prediction of interpersonal behavior is a major focus of most social psychological theories, it is not surprising that much research by psychologists and sociologists has been concerned with categorizing social behavior and devising models for understanding its structure. A related research effort has concentrated on measuring perceptions of interpersonal behavior, identifying underlying dimensions, devising structural models, and establishing the correspondence between perceived and "actual" behavior. Interactionist theories of personality (Endler & Magnusson, 1975) and social learning theories (Mischel, 1973) have brought renewed interest to the problem of how social relationships, interaction episodes, and general situations are perceived, represented, interpreted, and remembered.

The units and levels of analysis in research on social episodes and situations have included dyads, groups, roles, behavior descriptions, and hypothetical or own relationships. The material analyzed has included live and videotaped interactions, transcripts, vignettes, and various other types of abstracted or condensed descriptions. Until recently, research concerned with the discovery of dimensions or categories underlying the perception of social relationships and situations has relied on factor analysis of unidimensional ratings on scales suggested by theory, elicited from subject interviews, or simply specified by investigators (e.g., Ekehammar & Magnusson, 1973; Frederiksen, 1972; Magnusson, 1971; Triandis, 1972). In varying degrees, these methods have resulted in dimensions contaminated by investigators' preconceptions and oversights, subjects' abilities and willingness to describe their affective and cognitive states, and artifacts resulting from aggregation of data across subjects. MDS and clustering methods applied to

“direct” measures of proximity avoid most of these problems (see Jones, 1982).

Most of the research applying MDS to the perception of social episodes and relationships has been exploratory and descriptive. In these studies the objectives have been (1) to identify the salient dimensions subjects use to construe social relationships and situations or (2) to establish a taxonomy that would serve as a framework for future research.

Forgas (1981a), Wish (1976), Frederiksen (1972), and others have argued that an understanding of actors’ cognitive representations of social situations and episodes is basic to construction of more general theories about the relationship between personality and social behavior, e.g., Mischel’s (1979) theory, which emphasizes the cognitive mediation of behavior in response to situational contingencies. Thus, on the premise that social episodes and situations are relevant “units” in social perception and cognition, there has been much recent research effort concerned with measuring social situations using MDS and factor analytic methods, and with identifying individual differences in subjects’ conceptions of these situations.

Dimensions of Interpersonal Relationships

In one of the first and most ambitious research programs using MDS to study interpersonal relationships, Wish and his colleagues (Wish, 1975, 1976; Wish, Deutsch, & Kaplan, 1976) investigated individual differences in people’s conceptions of dyadic relationships, e.g., husband-wife, supervisor-employee. In one study (Wish, 1976) subjects made three kinds of judgments about 25 kinds of interpersonal relations: (1) direct ratings of similarity between pairs of relations; (2) ratings of relations on 25 bipolar scales; and (3) “multiple groupings,” a task involving successive classifications of relations into similarity groups.

A matrix of similarities was derived from the grouping task by counting the number of times each judge placed each pair of stimuli (i.e., a pair of relations) into the same group; thus, the data for each subject was a 25×25 “co-occurrences” ma-

trix. Data from the bipolar rating task were converted to “dissimilarities” using a profile distance formula:

$$\delta_{jk}^i = \sum_{s=1}^p (x_{ijs} - x_{iks})^2 \quad [2]$$

where

δ_{jk}^i is the dissimilarity between stimulus j and stimulus k for subject i ,

x_{ijs} is the rating by individual i of relation j on scale s , and

p is the number of scales.

INDSCAL analyses of the sets of matrices for each of the judgment tasks suggested that the conceptual space for the interpersonal relations was four-dimensional. Correlations between solution coordinates across the three data types indicated substantial agreement among the solutions. The (unrotated) dimensions were interpreted as Cooperative and Friendly vs. Competitive and Hostile, Equal vs. Unequal, Socioemotional and Informal vs. Task-Oriented and Formal, and Intense vs. Superficial. Comparisons among mean salience weights for various demographic, religious, and political subgroups revealed small but systematic and generally reasonable differences. For example, the Unequal-Equal dimension, which concerns the distribution of power within a relationship, was more salient to subjects with “leftist” political views than to those with more conservative views. As noted by Wish, the dimensions that emerged resembled distinctions that had been made in prior factor analytic investigations (e.g., Bales, 1958; Triandis, 1972) of ratings of people, relationships, and interpersonal behaviors.

There are two methodological aspects of Wish’s (1976) study that should be noted. First, the MDS analyses of profile similarities (computed across bipolar ratings via Equation 2) and direct judgments of similarity resulting in similar configurations is not a generalizable result. In other words, there is no reason, in general, to expect that comparable dimensions should emerge from analyses of direct and derived similarity measures. The only condition under which such a result would be expected is when an investigator can (1) anticipate the relevant dimensions that subjects would utilize in forming general similarity judgments and (2)

construct bipolar rating scales that “capture” the meanings of subjects’ dimensions. The second point concerns the derived measure of dissimilarity δ_{jk} (or D^2) given in Equation 2. Although Rosenberg, Nelson, and Vivekananthan (1968) provided a rationale for use of this measure as applied to sorting data, neither Wish nor subsequent investigators who have applied this measure to Scale \times Stimulus matrices have adequately justified their choice. Even though the general statistical and psychometric properties of δ have been examined (Cronbach & Gleser, 1953), it is far from self-evident that δ is superior to other measures of correlation, association, and distance that are available. Drasgow and Jones (1979) have discussed some of the problems with δ as a measure of derived dissimilarity.

In a related study, Wish et al. (1976) asked subjects to rate, on 25 bipolar scales, 20 of their *own* interpersonal relations in addition to the 25 typical or role relations used by Wish (1976). Thus, the MDS-derived stimulus space contained all 45 relations. An INDSCAL analysis of the derived dissimilarities yielded four dimensions that were essentially the same as those identified by Wish (1976).

One purpose of the study was to explore the relationship between subjects’ construals of their own relationships and typical relationships. For example, Wish et al. (1976) mentioned that it would be interesting to know whether a particular man “views his relationship with his wife as being like that of close friends, business partners, parent and child, [or] master and servant” (p. 409). The answers to such questions would be of general theoretical as well as clinical interest.

From an analysis of subgroup differences in dimension saliences, Wish et al. concluded that in evaluating own relations, the Cooperative-Friendly vs. Competitive-Hostile dimension was more salient to older, married, and politically conservative subjects, relative to their complementary subgroups. Wish et al. compared their findings with results of previous factor analytic investigations of interpersonal relationships and roles (Marwell & Hage, 1970; Triandis, Vassilou, & Nassiakou, 1968) and concluded that there is close resemblance between subsets of obtained dimensions across methods and studies.

Construal of Social Episodes

Forgas (1983a) studied the relationships between personality variables, including measures of social skills and social competence, and the ways individuals “cognitively represent significant interaction episodes” within their cultural milieus. In an earlier paper Forgas (1978) defined a social episode as “a natural unit of interaction, with consensual boundaries in time and space, and with a culturally defined scheme of accepted and appropriate behaviors” (p. 204). In a pilot study undergraduate students were asked to describe all of their interactions in a 24-hour period, as well as their other routine social encounters. Also, subjects were asked to list adjectives characterizing their perceptions of the elicited episodes. The 21 “most salient” episodes and the 14 most salient, diverse, and independent adjectives were selected for use in the main study.

Based on an INDSCAL analysis of subjects’ general similarity ratings of episode pairs and correlations of the derived dimensions with ratings on bipolar scales, a four-dimensional episode space was selected as being optimally interpretable. The dimensions were identified as Self-confidence, Evaluation, Seriousness, and Involvement, dimensions that corresponded to those reported in other taxonomic studies of episode cognition (e.g., Forgas, 1976; Magnusson, 1971; Pervin, 1976). Forgas (1983a) commented that “what is remarkable is the extent to which such representations are encoded and cognitively represented in terms of the different affects associated with the episode, rather than in terms of the ‘objective’ features of the interaction” (p. 41). This general conclusion about the salience of affective dimensions in social cognition is a good example, not only of how MDS methods can enhance general understanding of a domain of social stimuli, but also another instance where MDS results tell something about underlying processes.

Forgas (1983a) used canonical correlation and discriminant analyses to evaluate the relations between personality variables and “style” of episode cognition. The results suggested that “subjects who were male, introverted, fearful of negative evalu-

ation, low assertive, and incompetent in social situations relied particularly on the first, self-confidence dimension in their cognitive representation of social episodes." A second style that was identified was seen as "characteristic of subjects for whom an evaluative, critical view of social episodes is of particular importance, and who give considerable weight to the involving nature of interactions in their cognitive representations . . . those individuals manifest no feelings of inadequacy, and are extroverted and socially competent" (p. 43).

Forgas discusses the implications of the research approach and his results for diagnosis and treatment of social skills deficits, arguing that the techniques are well suited to identifying faulty or inadequate episode representations. This suggestion is consistent with implications of social construal and learning theories (Bandura, 1977; Kelly, 1955; Mischel, 1973) and some of the author's recent suggestions (Jones, 1982) about the behavioral and other consequences of deviant or "nonconsensual" representations of self and others in social and work groups. In this connection, note that a full understanding of an individual's maladjustment in a group would require assessments of his or her (mis)construals of self, relevant other(s), and relevant social episodes or situations. It seems unlikely that conventional MDS and clustering methods applied to similarities data aggregated over subjects would have adequate "resolving power" to reveal the type of details in misrepresentation implied by these suggestions. However, sufficiently rich and reliable data for MDS modeling can be acquired from single subjects; thus, results from single-subject analyses, compared across subjects, would permit inferences about specific (e.g., dyadic) misconstruals, as well as Subject \times Dyadic-relation \times Episode "interactions"—a likely locus of maladjustment and dissatisfaction.

Mothers' Construals of Mother-Infant Interactions

A recent study by Neff (1983) used MDS methods to investigate maternal sensitivity to infant be-

havioral cues during social interaction. Neff's research is based on the premise that maternal sensitivity and responsiveness to these cues underlies the development in the infant of a representational model of his mother as accessible and responsive; this model, in turn, influences the quality of the infant's attachment to her and is the basis for engagement with other social partners. Specifically, Neff's research explored the possibility that mothers of insecurely attached infants differ from mothers of securely attached infants in the ways in which they perceive and interpret behavioral signals.

Attachment of infants to their mothers was assessed with the Ainsworth "Strange Situation" method. The pattern of mother-infant behavior observed in this situation was the basis for assessing proximity seeking, contact maintenance, avoidance, and resistance. The pattern of scores on these variables, in turn, was used to classify infants into one of three categories: A—insecure-avoidant, B—secure, and C—insecure-resistant.

Next, mothers of the three types of infants rated a set of mother-infant interaction episodes; these depicted interactions between other mothers and their infants and had been chosen to vary along behavioral dimensions known (from results of previous research) to differentiate A, B, and C mothers. Thus, the intent in Neff's study was not to "discover" the dimensions underlying perceptions of the interactions but rather to measure the relative saliences of dimensions already "present."

In Neff's main experiment, mothers rated the overall dissimilarity of all pairs of 15 selected episodes, followed by ratings of the episodes on a set of unidimensional scales assessing aspects of the episodes hypothesized to be related to construal.

Separate INDSCAL analyses of the episode dissimilarity matrices for the three types of mothers indicated that all three groups construed mother-infant interactions in terms of very similar, but not identical, dimensions. The first (and overall most salient) dimension reflected both the affective valence of the infants' behavior as well as the degree to which the infant was engaged in behavior that was accepting versus rejecting of the mother's at-

tentions; the second dimension concerned the perceived need of the infants to maintain physical contact with their mothers; and the third dimension reflected perceptions of infant responsiveness to maternal overtones, as well as the extent to which the infant sought or avoided interactions with the mother. The pattern of intercorrelations between unidimensional ratings and the infants' scale values on the MDS dimensions suggested that mothers' construals of the interaction episodes were very affectively loaded—a result that has been noted repeatedly in investigations of the construal of social episodes and relationships.

Differences among the three types of mothers in the relative saliences of the three dimensions were striking, interpretable, and consistent with theory-based predictions and with results of previous research. For example, Neff found that the first dimension, valence of infants' affective cues, was less salient to mothers of "avoidant" infants, relative to mothers of secure infants.

Neff's research is exemplary in its attention to important details of stimulus selection and task design. Moreover, this study is another good example of how MDS results can provide important insights about social and cognitive process issues, even though the processes were not being modeled directly. Finally, the research paradigm used by Neff can be viewed as a new method for assessing maternal competence; as such it has numerous advantages over conventional questionnaire, self-report, and observational methods, including lack of demand characteristics, and ability to tap affective reactions that would be difficult to elicit with other methods. Realizing that the similarities data from a single (well-motivated) subject are adequate for MDS modeling, and that the results of such an analysis could yield detailed information about deviant construal styles (relative to results from a "normal" sample), it can be seen that the results would be diagnostic of aberrant mother-infant relationships and possibly helpful in designing an intervention strategy. An interesting modification of the method would involve including a videotaped interaction of the mother and infant being assessed in the set of stimuli. Then, the resulting stimulus space would reflect the mother's percep-

tions about the relationship of her own interaction style to that of other mother-infant pairs.

Other Studies of Social Episodes and Relationships

Other investigations where cognition of specific social behaviors, interaction sequences, or situations have been researched using MDS and/or clustering techniques include Rands and Levinger's (1979) work on differences between generations in perceptions of interpersonal relationships, social behaviors, and their interrelationships; Falbo's studies of individual differences in perceptions of social power strategies (1977) and power strategies in intimate relationships (Falbo & Peplau, 1980); Stiles' (1980) study of dimensions underlying ratings of dyadic conversations and relationships of these dimensions to Bales' (1950) interaction process analysis codings of interpersonal acts; Wish, D'Andrade, and Goodnow's (1980) scaling of videotaped interaction episodes from the "American Family" TV series and relating of the resulting dimensions to a structure derived from a content analysis of the verbal content in these episodes; King and Sorrentino's (1983) investigation of the dimensions of goal-oriented interpersonal situations; Forgas's studies of the situational perceptions of housewives and students (1976) and aggressive episodes and crimes (Forgas, Brown, & Menyart, 1980); Horowitz's (1979) application of MDS and cluster analyses to perceived relationships among interpersonal problems treated in psychotherapy; Passer, Kelley, and Michela's (1978) investigation of the dimensions underlying attributions about the causes of negative behavior in close interpersonal relationships; Hirschberg and Jennings's (1980) study of individual differences in perceptions of communications and interactions with significant others; and Rudy, Merluzzi and Henahan's (1982) MDS analysis of positive and negative assertion situations. Finally, several researchers (Schopler, Rusbult, & MacCallum, 1978; Stockdale, Wittman, & Jones, 1978; Taylor, 1981) have used MDS and/or clustering methods to explore people's perceptions of crowded situations.

King and Sorrentino (1983) have attempted to integrate the findings of studies that used MDS and factor analysis to investigate dimensions of various interpersonal domains; they have provided a useful discussion of the relevance of these investigations to the formulation and testing of interactionist theories of social behavior. Forgas (1981b) has reviewed much of the same research but has focused on the role of mood and emotion in episode perception and has discussed the relevance of work on episode cognition for formulation of comprehensive theories of social cognition.

Methodological Issues

Two disturbing features of many of the studies discussed or cited in this section are (1) the (exclusive) reliance on derived measures of dissimilarity based on unidimensional rating scales (e.g., Forgas et al., 1980; Stiles, 1980; Wish et al., 1980) and (2) a tendency to interpret stimulus and subject spaces (resulting from MDS analyses) based on derived dissimilarity measures as though the input data had been direct ratings of similarity (or some other direct estimate of psychological proximity).

Although the relevant empirical and analytic work has not yet been conducted, it should not be difficult to demonstrate that estimates of overall dimension saliences, individual subject's salience weights (e.g., from INDSCAL analyses), as well as stimulus scale values, are dependent in undesirable and complex ways on the variances, covariances, and other distributional characteristics of the rating data on which these analyses are based. (Obviously, the emergence or nonemergence of stimulus dimensions is heavily dependent upon scale selection). Moreover, even when careful attention is given to sampling and selection of rating scales, the selected set of scales will contain items representing constructs that are differentially relevant and meaningful to different subjects. It is fanciful to expect (1) that this sort of information can somehow be recovered by MDS methods and (2) that "priming" a subject with, for example, a bipolar (adjective) rating scale evokes the same kind of stimulus comparison and attribute-eliciting pro-

cesses evoked when a subject is asked to make general similarity ratings of stimulus pairs.

General Conclusions

In her preface to a book on applications of multivariate models to social science phenomena (Hirschberg & Humphreys, 1982), Hirschberg discussed the distinction between structural and process models of cognition. She noted that whereas structural models "deal with states of mind, process models attempt to account for changes in these states; put in this simplified way, it is clear that structural models have a certain logical priority" (p.2). Taking this line of argument one step further, it is proposed that meaningful investigations of social information processing should be based on domains where structures have already been delineated and calibrated by previous empirical investigations. MDS and clustering methods are well suited for this task. These methods can be used for asking questions and testing hypotheses about social cognition and behavior, organizing the resulting data, and providing precise descriptions of the cognitive structures presumed to mediate interpersonal behavior. Also, these methods can be used to investigate interpersonal perception, cognition, and behavior in intact groups, where the stimuli of interest are group members per se, rather than hypothetical individuals, roles, or behavioral descriptions (see Jones, 1982). Finally, there is a large class of hypotheses about social perception and behavior that amount to predictions about the effects of manipulations, interventions, or intervening experience on cognitive structure. MDS and clustering methods can be used to track changes in cognitive structure over time, thereby "capturing" phenomena usually considered to be the province of process models.

The research covered in this review suggests that MDS methods are important tools for modeling the various domains of social knowledge and experience. Usually, the results of such modeling efforts are of intrinsic interest, but results from such descriptive studies can also provide a good basis for the design of further research. Moreover, results from many of studies reviewed here should be pro-

paedetic to constructing theories about processes of social cognition and behavior.

An encouraging trend noted in several of the research areas reviewed is that investigators are starting to realize the power of MDS methods for theory construction and testing. Whereas many of the original applications of MDS were merely descriptive, several recent investigations have used MDS as a basis for theory construction or as a framework for testing theory-based predictions about social perception, cognition, and behavior. Although MDS techniques are not designed to model dynamic processes, important insights about the selection, encoding, and organization of social stimuli can be achieved from informed application of these methods.

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