Conceptual Dimensions of Crowding: A North Carolina Study

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In order to assess the dimensions distinguishing people's perceptions of crowded situations, a three-part, multidimensional scaling experiment was undertaken. In Phase 1, free descriptions of crowding instances were collected. Phase 2 involved a new set of respondents who made similarity judgments of the descriptions. The analysis revealed that respondents discriminated among the stimuli on three dimensions and suggested that women and men use different salience weights. Phase 3 sought to find objective measures of the attributes defining the three-dimensional space and found that the dimensions could be termed physical-psychological, familiar-unfamiliar, and resultant stress.

The predominant view of crowding, as represented in the current literature, portrays it as an experiential state whose antecedent conditions are not solely defined by high degrees of density. Despite this growing consensus, wide divergences exist concerning the variables that constitute the necessary and sufficient conditions for inducing the subjective state of feeling crowded. An impressive variety of definitions of crowding have been suggested, including such variables as perceived inadequacy of space (Stokols, 1972), excessive stimulation from

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social sources (Desor, 1972), exposure to too many unwanted interactions (Valins & Baum, 1973), inability to attain desired levels of privacy (Altman, 1975), or interference from others (Schopler & Stockdale, 1977). The literature, however, provides little guidance concerning which, if any, of these dimensions are actually operative in the minds of individuals. To fill this gap, we initiated a series of studies aimed at identifying the conceptual dimensions that determine people's perception of being crowded.

Although the aim of these studies was frankly empirical, the choice of research procedures was guided by several considerations. In the first place, it was of critical importance to avoid biasing the research in favor of particular theoretical conceptions of crowding. This consideration was especially critical for defining the relevant stimuli and for framing the permitted response language. Secondly, we wished to find a procedure that was not restricted to identifying dimensions whose labels were registered in the awareness of the respondents. Finally, it was desired to use a procedure that could be easily transported into other data collection settings. In order to meet these considerations we decided to collect data suitable for multidimensional scaling (MDS).

Multidimensional scaling is a family of data processing procedures developed explicitly to identify the conceptual dimensions, or factors, that individuals perceive and employ in discriminating among a set of stimuli. The steps required for an MDS analysis can be divided into three phases. The user begins by obtaining a set of stimuli that comprise the topic of interest. The stimuli may be of any form (e.g., colors, words, names of countries, written paragraphs), but should represent an adequate sample from the population being studied. The difficulty of assembling an adequate stimuli set will vary depending upon the topic of study. Defining the stimulus set for studying how people distinguish among American presidents will obviously be simpler than for identifying how people distinguish among crowded situations.

Once the set has been assembled, the second phase involves asking respondents to state their beliefs about the similarities/dissimilarities among the stimuli. This portion of the procedure may take many forms. It is common, however, to require respondents to rank order all stimuli in terms of their similarity to each single stimuli. For large stimulus sets, where the collection of a complete set of rankings would be extremely

time-consuming, a partial set of orderings may be obtained from each respondent. The collection of a portion of the rank orderings is done in a way that permits computation of the full set with as little loss of accuracy as possible. The full similarities matrix is the data input for MDS programs.

With most MDS computer programs the user is free to request the computation of multidimensional solutions in any number of dimensions. The choice of one solution over others depends upon the "difficulty" of fitting the data to a space of that dimensionality. A measure of the difficulty is the "stress" of that solution. Naturally, as the solution allows for more dimensions, the stress of the fit decreases. Assuming that the most appropriate solution is the one that promises to most accurately and parsimoniously represent the relationships among the stimuli, one observes increases in solution dimensionality and looks for large decreases in stress followed by a "leveling off" of the stress values. The solution that produces the greatest stress decreases before the "leveling off" is generally the correct solution.

Once the correct solution has been found, some MDS procedures also permit examining individual differences in weighting of the dimension. The respondent population may be divided into several parts, representing distinct groups of individuals (or single individuals). The user requests that weights be computed for each group (or individual) for each dimension. The assumption implicit in this procedure is that although all individuals perceive the stimuli in terms of the same set of dimensions, these dimensions are differentially important across groups (or individuals). Observation of the relative importance of each dimension for various groups (or individuals) is thus possible.

After the dimensionality of the stimulus space has been determined, the characteristics, or dimensions, that define the multidimensional configuration must be identified. This is the third step and it involves interpreting the meaning of the dimensions. Once a set of potential attributes is defined, respondents can be required to judge the extent to which each of the initial stimuli possess each of the attributes. Assuming that the true defining attributes are included in the set, the characteristics that best fit the actual multidimensional configuration are considered to be the dimensions that define the space. These are the dimensions that individuals use in discriminating among the stimuli.

PHASE 1

In order to obtain instances of crowding that were not biased by preconceived definitions, respondents were merely asked to write a description of a time in their lives when they felt very crowded. Generating a relevant instance was left solely in the hands of each respondent. Each person was given a standard sheet of lined paper on which to write an essay. Seventy undergraduates from the University of North Carolina wrote essays, which were typed verbatim on individual sheets of paper.

The experimenters read the essays and removed ones that were difficult to comprehend, due to serious errors in grammar or spelling. In order to create a manageable number of stimuli, duplicate descriptions were also eliminated. The remaining 46 essays comprised the crowding stimulus set. They ranged from five to 21 lines in length, with an average of 11.4 lines per essay.

PHASE 2

The people participating in this phase were asked to familiarize themselves with the 46 essays and then to rank order them in terms of their similarity to one of six "target" descriptions. The targets were chosen as exemplars of six different definitions of the concept "crowding" as contained in the stimulus set. Because the stimulus set was too large to obtain a complete set or rank orderings, the target procedure was employed to obtain sufficient data to compute the full set. It should be noted that the choice of targets assured representativeness, but should not have affected the dimensionality of the MDS solution. Selection of any six stimuli as targets should produce comparable solutions. The use of six targets does limit, to five, the number of dimensions it is possible to identify in the multidimensional stimulus space.

Twenty men and 21 women participated in Phase 2 in same-sexed groups consisting of from four to six people. Prior to working on the task, each respondent completed the North Carolina Internal-External Scale (Schopler, Langmeyer, Stokols, & Reisman, 1973). Internality-externality assignments were determined for all subjects on the basis of whether they were below or above, respectively, the mean obtained in the standardization sample.

In order to identify the multidimensional space that represented the respondents' perceptions of the crowding stimuli

the mean ranking of each stimulus relative to each target was computed, the dissimilarities matrix was developed, and a nonmetric multidimensional scaling program, ALSCAL (Takane, Young, & deLeeuw, 1977) was applied. Solutions were obtained in one, two, three and four dimensional Euclidean space. To determine which of the four solutions was the most accurate and parsimonious representation of the stimuli, the reduction in stress that resulted from the addition of each new dimension was considered. Because the four-dimensional solution did not appear to reduce the resultant stress to an appreciable degree, the three-dimensional solution was deemed to be the most adequate. Dimension weights were also obtained for men versus women and for internals versus externals.

Inspection of the way the 46 stimuli were arrayed in the three-dimensional space provided some clues about the possible meaning of the three dimensions. There is no guarantee, of course, that the dimensions used by the respondents to discriminate among the items are necessarily relevant to crowding. They might have used such irrelevant dimensions as story length or word difficulty for discriminating among the stimuli. To gauge the relevance of the attributes and to determine the meaning of the dimensions, phase 3 was required.

PHASE 3

The meaning of any dimension is determined by the fit between the locations of stimuli on a dimension and the extent to which they possess a particular attribute. The fit is expressed in terms of direction cosines of ideal attribute vectors and correlations between ranked values and location. As the magnitude of these indices increases, so does one's confidence in having correctly identified the meaning of the dimension. In order to simplify the complex attributes ranking procedure, preliminary ALSCAL analyses were employed to split the crowding stimulus set into two equivalent halves. The 14 attributes selected for study comprised our intuitions concerning the meaning of the dimensions, as well as such important theoretical factors as "extent of control" and "existence of too many inputs."

Sixteen men and 15 women participated in the experiment. They were given booklets containing 14 sheets, each of which named an attribute and provided spaces for recording their

rankings. The 14 sheets were randomly ordered in the booklets across respondents. Each person was also given a set of index cards on which were printed the 27 stimuli of their assigned set.

The attribute vectors were related to the obtained three-dimensional solution via the computer program PREFMAP (Carroll & Chang, 1970). Of the four models that could be used to quantify the degree of fit, the vector model was deemed most appropriate. It finds the vector that best represents each attribute's position in the three-dimensional space.

The "psychological-physical" attribute aligned most closely with dimension one (cosine = −.98). Several other attributes were also relatively closely aligned with the first dimension. These were the attributes of "personal-situational" (cosine = −.86), "physical density" (cosine = −.81) and "personal control" (cosine = −.85). We have labeled dimension one as psychological-physical. It is closely aligned with the attributes of whether the situation contains low or high density, whether the feelings of the actor appear to be generated by the actor or by the situation, as well as whether the actor is perceived as having much or little control. The physical-psychological dimension appears to define a cluster of attributes that essentially involve perceiving situational causation for behavior, on the physical end, and personal causation for behavior, on the psychological end. Reactions to the former kinds of situations are dominated by the physical arrangements of the setting and the structural organization of the participants. Reactions to the psychological situations, in distinction, have a uniquely personal cast.

Dimension 2 of the derived configuration appeared to be best represented by the factors "familiarity with the situation" (cosine = −.99) and "feelings of being an outsider" (cosine = −.93). The second dimension can be termed unfamiliarity. It is anchored at one end by descriptions such as the story in which the actor attended a huge military dance where she knew "no one," and at the other end by such instances as the story in which the actor was disturbed by a childish, spoiled roommate in a cramped dormitory room. Although the feelings of alienation from others or of unfamiliarity with settings can easily be understood as a component of crowding, the opposite end of the dimension is somewhat puzzling. Familiarity with people/settings does not seem to constitute a factor that contributes to crowding. Indeed it appears that in the presence of familiar people/settings, additional components, such as high density or constraints, must exist for crowding to occur. The presence of

unfamiliarity implies that the experience of crowding is unique to the actor(s) who feel(s) unfamiliar. It may well be that lack of familiarity, in itself, converts some ordinary situations into crowded situations.

The third dimension of the stimulus space was most closely approximated by the attributes "pleasant ending" (cosine = −.98) and "distressed author" (cosine = −.93). It involves whether the stress experienced by the actor at the end of the sequence is high or low, and has been termed resultant stress. The information needed to judge resultant stress requires knowledge of the outcomes experienced by the actor and is not contained in particular attributes of the setting.

Salience weights for each of the dimensions were calculated for internals and externals, as well as for men and women. A firm conclusion about these results is not possible because, at the time of data analysis, ALSCAL did not permit testing the significance of the salience weights. Our data set was simply too large. It does appear, however, that standing on internality-externality does not affect the salience weights for any dimension, whereas sex of respondent does affect use of dimensions 1 and 2. Compared to men, women place twice as much importance on dimension 1 and only half as much on dimension 2. Women appear to be more sensitive to the physical-psychological aspects of situations, while men are more sensitive to unfamiliarity. The possibility exists that the strategic problems for dealing with crowding are somewhat different for women than for men. Women might be more prone to react to the physical-psychological components while, with men, unfamiliarity might weigh more heavily.

The beginning made by the present research points to several directions for future research. It will be necessary to determine if the taxonomy of crowding situations created by the three dimensions makes a functional difference for reactions to particular situations, especially for combinations of the first two dimensions. The possible existence of differences in salience weights should be further explored both with respect to their distribution in different groups and for their behavioral consequences in reacting to crowded situations. Finally, it would also be informative to extend the present procedures to discover how crowded situations differ from situations that are not crowded. This information would complement the present results and provide a comprehensive picture of the cognitive dimensions people use to structure situations.

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