SOME PSYCHOLOGICAL EFFECTS OF CROWDING

A thesis submitted in partial satisfaction of the requirements for the degree of Master of Arts in Psychology

by

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ABSTRACT

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Conflicting findings have raised the problem of the psychological effects of crowding. In the present experiment, selected variables related to social perception and behavior were studied as a function of interpersonal distance, the presence or absence of territorial boundaries, and the sex of subjects. Forty subjects, equally divided between males and females, were assigned to the eight treatment cells; with five subjects of the same sex serving together as a group for each condition. Subjects were seated around a circular table and observed a videotape presentation which featured instructions for a series of tasks designed to measure feelings toward, and perception of, the other individuals associated with the experiment. Results indicated that the only identifiable main effect of interpersonal distance was on the perception of crowding. However, an interaction between sex and interpersonal distance and between sex and the presence or absence of territorial boundaries achieved statistical significance for some combination of the response variables. Although no individual dependent variable reached statistical significance, examination of the means for each response indicated that the direction of the sex-interpersonal distance interaction was that of less negative
social responding for females under crowded conditions, with a reverse trend for males. The direction of the sex-territorial boundary interaction was that of less negative social responding for males under partitioned conditions, with a reverse trend for females.
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SOME PSYCHOLOGICAL EFFECTS OF CROWDING

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One of the most serious problems facing the human community is the extent to which our species has succeeded in populating the planet. With a world population of about three and a half billion people currently, a number expected to double in 35 years, it may be anticipated that crises will develop around the use of resources and their distribution. Although such resources as food, water, and air have received a great deal of attention, there is as yet little concrete data on another resource which is in increasingly short supply: Space itself.

The earliest attempts to determine the effects of a larger-than-normal population density were observations of nonhuman species. The results of these efforts have suggested the possibility of the aggravation of social pathology in man under conditions of excessive crowding. The further examination of this possibility led the Massachusetts Health Commissioner to state, "...now it is increasingly observed among humans that overcrowding causes alcoholism, psychosis, and behavior deviations apart from the influences of low income, inadequate food, and lack of education."¹

Despite this strong statement by a public official, it must be noted that the experimental evidence on this problem is at best marginal. When separated from the other variables which usually
accompany crowding in the natural environment, the simple state of too little space for each individual (a concept which will, for the moment, remain undefined) has not been definitively demonstrated to have any effect on human behavior at all, short of the physical restraints that are imposed by the spatial situation.

Although it is not the expectation of this study to finally resolve the questions associated with crowding, it will attempt to examine the current state of research in this area and examine some responses to crowding in an experimental setting which might suggest directions in which to search for negative consequences of crowding in the natural environment. Throughout the following text, the limitations of this approach must be kept in mind; crowding will be studied in a laboratory setting, for a short time span, and under highly formal and structured conditions. Generalizations of the results of this line of research to crowding in the natural environment must be made with great caution.

It has long been known that animals recognize spatial considerations and respond to them. As early as 1920, H. E. Howard, in *Territory in Bird Life*, recognized the existence of claims staked by birds and defended against members of the same species. Although this is the first formal account, naturalists have made observations of the events which went into Howard's formulation as far back as the 17th century.

Reports of territoriality have been made by a variety of authors for a variety of different organisms. Tinbergen (1952), for example, has described the elaborate rituals used for territorial
defense during mating season by a fish known as the stickleback. Other researchers who have made similar contributions with other species include Tinbergen and Kluyer (1953), Kirchshofer (1953), Koenig (1951), Greenberg (1947), Curio (1959), and Lind (1961).

Hediger (1950, 1955, 1961) has described social distances in animals which he feels serve to propagate the species by regulating density. Among these are the critical distance, within which a cornered animal will attack an invader; the flight distance, within which an organism flees from an invader (and which varies with the size of the animal; for example, six feet for the common wall lizard versus 1500 feet for certain antelope); and the social distance, which represents the normal distance between members of a noncontact species (organisms which do not huddle together or require continuous physical contact) in the open environment.

The importance of the regulation of density in animal populations is underscored by the work of Schafer (1956) who described a critical distance for crabs. When breeding is such that overcrowding forces retreat of individuals into domains smaller than this critical space, the population becomes cannibalistic, feeding particularly on immature specimens which cannot defend their territories.

Several other studies in the natural environment have pointed out the need for density regulation. Chitty (1952), for example, suggested that intraspecific strife limits the population of the vole in conditions of high density. Clarke (1955) found that voles in high-density regions are characterized by more scars from fighting and a more debilitated condition than voles from less densely populated areas.
Christian, Flyger, and Davis (1951) reported a decline in reproductivity with increasing density in a population of deer on an isolated island. Dubos (1965) notes the existence of the so-called population crash which occurs when an animal population is severely crowded. The phenomenon is characterized by physiological deterioration in members of the crowded group, and was originally hypothesized to be due to pathogens, particularly Pasteurellae and salmonellae. More recently, however, speculation is that infections are secondary and stress may be the central factor in such population breakdowns. Deevey (1960), for example, has proposed a sugar bank model to describe pathological effects of crowding. This involves the withdrawal of blood sugar by the adreno-pituitary system as a response to stress, ultimately leading to hypoglycemic shock in extreme and lasting conditions. Christian (1963) has verified that density and adrenal weight in the woodchuck covary.

Other physiological conditions which vary with crowding cited by Dubos include arteriosclerosis in chickens, toxicity of CNS agents such as amphetamines, and effects on the vitality of offspring of crowded mothers.

Throughout his speculations, Dubos notes the difficulty in generalizing from animal studies to human beings. Perhaps the study which must be regarded most carefully in this respect is the widely publicized work of Calhoun (1962). By allowing Norwegian rats to breed without limit in an enclosed environment, given sufficient food and water, an overpopulation crisis was created. As the population rose above normal density levels, negative social
consequences began to appear. These included such effects as the following: Some males became overaggressive, others became overpassive; individual nests were marauded by some males; females often did not build adequate nests; infant mortality and unsuccessful pregnancies rose sharply; pansexuality and other sexual aberrations occurred; litters were mixed and infant care deteriorated; some cannibalism developed; social hierarchies came into being so that dominance guaranteed adequate space and escape from the general contamination of behavior. In short, a negative social situation (which has since been labeled "the behavior sink") resulted which threatened the survival of the colony.

The observations of animals, such as those in Calhoun's study, have led some observers, including Leyhausen (1965) and Lorenz (1966), to suggest that high density necessarily leads to violence and aggression. In particular, Leyhausen points out that nonsocial animals can normally adapt to a social situation (either induced or maintained temporarily for breeding purposes) through the establishment of a hierarchy; however, overcrowding (as observed in captive cat and wolf communities) results in social breakdown. This author draws a parallel between such animal reactions and the reports of the behavior of prisoners of war in crowded camps.

Despite the suggestiveness of the animal research, one must agree with Dubos (1970) that, "The readiness with which man adapts to potentially dangerous situations makes it unwise to apply directly to human life the results of experiments designed to test the acute
effects of crowding on animals. Animal research can only properly be taken as a starting point for ideas, not as verification. Even with such striking parallels as that observed by King (1965, 1966) between the relationships of dominance and territoriality in chickens and in human children, human research in this area must be more exhaustive to be conclusive.

One avenue of approach to human crowding is the correlational study of populations living in conditions of differing density. Schmitt (1957), for example, conducted a study involving five measures of density (population/acre; average household size; married couples sharing dwelling space; dwelling units in complex structures) and rates of juvenile delinquency and adult crime in Honolulu, Hawaii. All density measures were found to correlate positively with the measures of crime.

Schmitt (1966) attempted to correlate the same density measures with the following factors: Infant mortality, tuberculosis rate, suicide rate, venereal disease, admissions to mental hospitals, illegitimate births, juvenile delinquency, and adult crime. All density measures except household size correlated with all measures of social, physical, and mental breakdown, with population/acre correlating the most.

It must be realized, however, that density is also correlated with other variables, such as income and level of education. Socio-economic class is highly associated with mental illness, death rate, infant mortality, and crime. Obviously, these other variables must be controlled.
In the 1966 study, Schmitt used partial correlations to control for education and income and still found a strong correlation except for suicide and infant mortality rates. Freedman (1971), however, has questioned the measures used for the control factors, without providing details of his objections.

Winsborough (1965) found that density/acre is highly correlated with infant mortality, tuberculosis rate, public assistance rate, and public assistance to minors rate in Chicago, Illinois. This researcher used partial correlations to control for the following factors: Types of profession, income, years schooling, age, rent, structural deficiencies, and others to find that infant mortality still correlated with density/acre but that all other correlations were reversed. This unlikely occurrence, particularly with regard to the tuberculosis rate, leads to the suspicion that some factors may have been removed more than once by the statistical treatment employed.

It is clear that the relationship between pure crowding and various measures of morbidity is hardly well established. Although the relationship between population density and negative social consequences has been observed as both a positive association and a negative association by many individuals (including Landis and Paige, 1938; Shaw and McKay, 1942; Schmid, 1960; National Commission on the Causes and Prevention of Violence, 1970), no conclusion can be drawn. Perhaps the end product of this line of research is with the results obtained by Pressman and Carol (1969) who found no correlation between population density and crime for major metropolitan
areas of the United States when income and percent nonwhite population were controlled.

Another approach to the effect of crowding is through investigation of human territoriality. Hall (1966, 1969) and Sommer (1969) have been concerned with such matters as how people use given amounts of space, how close they stand to each other, whether or not they move away from each other, and effects on social interaction. Their underlying interest is in spatial invasion rather than crowding.

Hall has generated a map of human social distances based on observation and interviews with middle-class, healthy adults, mainly native of the northeastern seaboard of the United States. These distances may be summarized as follows.

1. Intimate Distance — Unmistakable sensory involvement with another body
   a. Close Phase — physical contact or high probability of physical involvement; distance for love-making, fighting, comforting, protecting.
   b. Far Phase — six to 18 inches; contact for adults regarded as inappropriate in public; invasion characterized by defensive stance.

2. Personal Distance — Distance consistently separating individuals
   a. Close Phase — 18 to 30 inches; relationships signalled by position of others relative to this distance.
   b. Far Phase — 30 inches to four feet; limit of physical
domination (arm's length); subjects of personal interest and involvement discussed at this distance.

3. Social Distance — Limit of domination
   a. Close Phase — four to seven feet; impersonal business distance; distance usually used by co-workers.
   b. Far Phase — seven to 12 feet; formal business and social discourse; can be used to insulate or screen people.

4. Public Distance — Outside the circle of involvement
   a. Close Phase — 12 to 25 feet; alert individual can take evasive action if threatened; formal style.
   b. Far Phase — 25 feet and beyond; distance set around important figures; much subtlety in communication lost.

Although the various distances used change with different cultures, Hall claims that the fourfold classification system is inherent in all cultures and in animals as well. It is also important to note that Hall indicates that particular distances are situationally variable as well as culturally variable.

Sommer (1969) reports on the results of research on approach distance under various conditions. Williams (1963), for example, found characteristic distances at which subjects reported approaching persons to be too close. Introverts were found to have larger such distances than extroverts. Leipold (1963) measured the approach distance of students pulling up a chair to a teacher's desk. The distance increased under conditions of stress.
McBride (1965) measured GSR as related to approach distance from different angles. Ss held people at greater distances, in order to remain comfortable, than inanimate objects. Similarly, Ss held members of the opposite sex at greater distances than members of the same sex.

Argyle and Dean (1965) measured approach distance to objects of various kinds, including a book, a plaster head, a life-sized photograph of one of the experimenters with eyes open, and the same photograph with the eyes closed. Ss were found to approach closer to the relatively nonhuman objects than to the photographs, and closer to the photograph with the eyes closed than to the one with the eyes open. In a similar work, Horowitz, Duff, and Stratton (1964) used normal and schizophrenic Ss to measure approach distance to another person or a hatrack. The schizophrenics held all objects farther away than did normals, and the interpersonal distance for all Ss was greater than the distance between the S and the hatrack. The penetrability and extent of what these authors termed "the body buffer zone" was suggested to be a function of situation, ego and drive states, and culture.

Sommer also describes research revolving around observations of space use in the environment of mental hospitals or other restricted confines. Altman (1960) describes behavior in simulated fallout shelters under conditions of extreme crowding. Noted by this author were the facts that Ss showed little movement, erected particular spots or territories which were observed by other Ss, and entered into social cocooning in order to insure the privacy of all of
the members of the community. Law (1960) notes a similar cocooning in response to forced invasion of privacy in the restricted environment of the antarctic station. Altman and Haythorn (1967) note that in pairs of isolated sailors, withdrawal from social interaction and rigorous respect for privacy and personal space were common responses.

Esser, Chamberlain, Chapple, and Kline (1965) observed patients in a psychiatric ward and how they used the available space. It was observed that patients compete for, and defend, definite territories in response to dominance hierarchy. Similarly, Lipman (1968) notes the establishment and mutual defense of territories in British homes for the aged. Marine (1966) has described the territorial boundaries established by racial gangs and, at the opposite end of the spectrum, Stea (1965) cites the work of Richards and Dobyn (1957) in observing the arrangement of offices to meet the territorial needs of the employees, and the responses to changes in the arrangement.

Sommer (1969) also discusses work on spatial invasion, noting that the concept has been utilized under various circumstances previously. He mentions, for instance, the method of interrogation of prisoners described by Inbau and Reid (1963) which includes specific instructions on the creation of a spatial invasion against the interrogatee to induce stress and help extract information.

As reported by Sommer (1969), Nancy Russo conducted spatial invasions at library reading tables. She observed that, relative to control Ss, Ss whose bubble of social space was violated left the
scene much sooner and showed a variety of defensive gestures, postures, and attempts to increase the interpersonal distance.

Skolnick (unpublished) has conducted spatial invasions of patrons of Southern California beaches and found similar defensive reactions.

Sommer (1969) invaded patients in a mental hospital. He found an almost universal defensive pattern in his Ss. Furthermore, pressing an invasion when a S moved away resulted in a maximization of flights from the scene. Interestingly, Sommer notes that only two out of 69 invaded Ss asked the E to move away, providing support for the notion of Hall (1959) that, "We treat space somewhat as we treat sex. It is there but we don't talk about it."3

Although a great deal of work related to the effects of crowding has been conducted, controlled experimental evidence is scarce. In an early study, Hutt and Vaizey (1966) observed children at free play. Small and large groups were used, as well as small and large rooms. It was found that normal children were more aggressive and less social in larger rooms. In addition, the following results were obtained: With increasing density, some children characteristically sought out the periphery of the room; brain-damaged children became more aggressive and destructive with increasing density; autistic children interacted least in a middle-sized room whereas brain-damaged children interacted greatest in a middle-sized room.

Although the Hutt and Vaizey study is suggestive, it must be realized, as pointed out by Freedman (1971), that the sample size was small and the number of playthings probably remained constant,
leading to increased competition in the larger groups. Freedman has also questioned the design used.

In a somewhat similar study, Proshansky, Ittleson, and Rivlin (1970) observed patterns of behavior in psychiatric wards with large and small rooms. It was observed that higher percentages of passive behavior occurred in the larger rooms. However, there was a lack of control for several important variables. There was no random assignment of Ss to conditions, and disease and ability to pay were thus confounded with size of room. There is also obvious confounding with group size since the larger rooms held more patients.

Griffit and Vetch (1971) found that Ss in crowded conditions were generally more negative than Ss in uncrowded conditions. There was, however, no specific measure of aggressiveness. Price (1971) found no effect of density on aggressiveness in a study using 22 different groups of Ss.

A careful attempt to test the hypothesis that crowding acts at least as an aversive stimulus condition was conducted by Freedman, Klevansky, and Erlich (1971). A review of earlier research by the authors indicated that the effect of other individuals on one's performance of various tasks was not clear. Allport (1924), for example, predicted that a person would work better with another person in the same work area, even if no contact took place. Further work, however, demonstrated that company is not always beneficial. In a literature review, Zajonc (1965) argued that the presence of others raises motivation and drive. As with any increase in drive level, performance on an easy task which is well-learned should be
facilitated, while complex, poorly learned tasks should be negatively affected.

Freedman et al. (1971) hypothesized that if the presence of others has such an effect, density should magnify the effect still further. The authors suggested that sociological literature implies that crowding would be an aversive stimulus which increases drive. It was determined that the effect of crowding should produce a decrement in complex and poorly learned task performance, and interference with any task involving competition, creative thinking, flexible manipulation of materials, or the learning of new material. The authors also noted that temporal effects may occur.

Using noise, Broadbent (1957) and Glass, Singer, and Friedman (1969) have shown that humans adapt to a continued aversive stimulus after a brief period of disruptive effects. On the other hand, it might be expected that continued exposure to an aversive stimulus will produce effects not immediately apparent. In order to ascertain the effects of crowding which are immediate (rather than long-term), the authors measured responses to differing conditions of density along the dimensions of performance on simple and complex tasks. Also used were tasks involving memory and creativity. The results indicated the absence of effects due to density. It was concluded by the authors that crowding does not act as a simple aversive stimulus.

Certain aspects of the experimental method, however, must be brought into question. In particular, three characteristics of the experiment may have produced a situation which militates against the
observation of simple effects of crowding. First the Ss were caused to interact prior to the taking of the measures. Such interaction may create an atmosphere of camaraderie which counteracts the aversive effects of the spatial situation. Second, the Ss were run in all conditions. This may have supported various S effects which encourage adaptation to the experimental situation. Third, the types of chairs used, which had desks attached, may have provided territorial boundaries such that, although density was high, there was no need for territorial defense reactions by the Ss.

In discussing their findings, Freedman and his colleagues assert that it is likely that any effects of crowding are social, and that reactions are determined by a complex set of other factors, including particular conditions, differences in individual reactions, set, initial relations among people, and so on.

In another effort, Freedman, Levy, Buchanan, and Price (1972) attempted to measure the effect of crowding on certain social behaviors, particularly aggression. Using, in one experiment, a modified prisoner's dilemma game to measure competitiveness or cooperation and, in a second, a mock jury situation, the authors manipulated crowding using large and small rooms in a fashion similar to the earlier study. As before, no main effects of crowding were observed. There was, however, an interaction of sex and density in same-sex groups.

Again, the authors suggest that crowding of itself has no simple effect, but rather other factors surrounding the interaction of people determine what effect the crowding will have. A distinction
was made between physical crowding and psychological, with the implication that the subjective experience of crowding may be disassociated from the spatial condition. Factors to be considered would include duration of exposure, type of task, formality of the situation, expectations of the individuals, sex of the individuals, and so forth.

It must be noted, however, that some of the same objections which applied to the earlier study still apply to the more recent one. Interaction was fostered and the spatial arrangement may have created artificial territorial boundaries.

Stokols (1972) has summarized the indications of this line of research by underscoring the differences between crowding and density. To be crowded, certain social and personal circumstances must be superimposed on density which sensitize the individual to the constraints of physical space. Responses to crowding may be behavioral, such as leaving the scene. When normative constraints require tolerance of the situation, responding may be in perceptual and cognitive modes. Stokols suggested that Ss experiencing subjective crowding may modify the demands of spatial adequacy, enhance the attractiveness of the tasks demanded of them, attempt to coordinate more with others in the group, or reduce the salience of the perceptions of spatial constraint.

It is the latter possibility which is the major concern of the present study. Assuming that the manipulations used to induce crowding will create a state of perceived crowding (a state which should be verified at least by subjective reports, according to Stokols), it may be possible to measure certain changes in social
perception which would suggest explanations for some of the effects observed to correlate with crowding in the natural environment. In addition to simple hostility toward others in the group, which has been the central concern of earlier work, it would be useful to analyze such dimensions as perceived hostility in others, the extent to which one regards others as threatening, and the perceived authoritarianism of local agents of social control. Also, a measure of perceptual defense which might be expected to serve as a screen to reduce the impact of others in the crowd (and particularly of emotionally charged aspects of the stimuli in the environment) might help to resolve the complexity of the crowding problem. It is thus the purpose of this study to explore some of the possible ways in which adaptation to the crowded condition is facilitated. If an individual does not automatically respond to density with hostility (as some of the research would suggest), it may be fruitful to discover what modifications in the perceptual-cognitive processes are responsible for socialization under certain circumstances and not under others.

It is essential to the design of the current study that possible errors in creating psychological crowding overlooked by earlier studies not be repeated. Thus, S interactions are kept at a minimum and the spatial situation is designed to produce not so much a condition of excessive density as a condition of spatial invasion in the context of a group. Manipulations involve both the amount of personal space available to each S and the necessity of territorial defense as regulated by the presence or absence of clear boundaries which delineate the division of available space.
In view of previous research, the following predictions seem warranted. Under conditions of decreased interpersonal distance or an absence of territorial boundaries under such conditions as to cause a subjective situation of spatial invasion:

1. Ss will exhibit greater hostility and less affection as measured behaviorally and with pencil-and-paper techniques toward other Ss.
2. Ss will perceive other Ss as being more hostile and more threatening.
3. The experimental personnel will be regarded with greater hostility, as measured by pencil-and-paper techniques.
4. The experimental personnel will be perceived as more hostile and more threatening.
5. A member of the experimental team who is not physically present but who (through the medium of television) provides the bulk of instructions to Ss will be regarded as having a greater degree of authoritarianism.
6. The relationship of hostility toward, perceived hostility in, and perception of threat for all categories of stimulus person will be as follows: Greater negative affect and perception will occur for the experimental personnel, followed by Ss adjacent to a given S, followed by Ss not adjacent to a given S.
7. A greater degree of perceptual defense will be observed, as measured by the method of McGinnics (1949).
METHOD

General Overview of Procedure

Upon arriving, Ss were seated at a long, rectangular conference table with the other Ss assigned to the condition. Five Ss were assigned to each condition, and one condition was run at a time. All of the Ss in a given condition were of the same sex. Each S was given a subject number and a preliminary questionnaire to complete. Seating at the table was in order of subject number to facilitate later recognition.

As the questionnaires were completed, one of the two Es, who shall be known as E.1, gave the Ss a set of preliminary instructions. These instructions contained the following major points. The Ss were in a study designed to determine the effects of television in the academic classroom. They would shortly be seated around a circular table from which they would view a television program. This program would contain instructions for subsequent exercises using materials they would find in front of them. Attached to the forearm of each S would be a harmless electrical cable to measure responses of an emotional nature in the form of the GSR. No talking would be allowed at any time, except for essential requests for assistance from one of the two Es. When requested to do so, Ss could identify the subject number of anyone else around the table by remembering that seating would be clockwise (a point reiterated on a blackboard on a wall visible to the Ss from the circular table). The television location was indicated by a gesture from E.1, as well
as the location of a projector screen which would be used later and a mirror for ease in viewing the images on the monitor should one's back be to the monitor. E. 1 was naive as to the density and territorial boundaries employed for any given condition until these instructions were completed, a precaution taken to minimize the introduction of bias by the E who had most contact with the Ss prior to the taking of the measures.

Following completion of the presentation of preliminary instructions, the Ss were individually seated and connected to the electrical cable in order of subject number by the second E, who shall be known as E. 2. E. 2, whose interaction with the Ss was kept at a minimum since he had set up the spatial arrangement which constituted the condition, adjusted the location of the end of the cable on the forearm of each S so as to keep each S pressed closely against the edge of the table and thus control interpersonal distance which could otherwise be adjusted by any S by moving away. The table size set an interpersonal distance at a maximum of six or 30 inches. The lights were dimmed by E. 1 to a standardized level and the television monitor was engaged by E. 2.

The television program which appeared on the monitor consisted of a 50-year-old Caucasian male, dressed in a coat and tie, reading instructions for exercises and comments designed to facilitate the simulation of an experiment dealing with classroom conduct and performance. The style of the commentator, who shall be known as Instructor, was flat, neutral, and rather (according to later feedback from Ss) boring.
Before each S on the table was a stack of answer materials for the tasks which followed a few brief introductory comments by Instructor. The order of the materials represented the order of the tasks themselves and were labeled with the name of each task. They were also color-coded and marked with the number of each S to prevent possible confusion during the exercises (and thus minimize possible E interaction with the Ss, a purpose served as well by the use of videotape to present instructions). The only other marks on the neutral brown surface of the table were, in half of the conditions, a set of partitions which divided the table radially, into equal portions centered on each S. The purpose of these partitions was, as will be discussed, to mark the territory of each S and militate against the necessity of territorial defense reactions.

The tasks which were carried out consisted, in order of presentation, of the following: (1) a modified form of the McGinnies (1949) perceptual defense task, consisting of tachistoscopic presentation of words on the screen to determine the threshold of recognition for neutral and emotionally charged stimuli; (2) the distribution of black and red tokens, in separate trials, designed as representing love and hate and which could not be retained by the original holder; (3) a questionnaire which sought information on hostility toward, perceived hostility in, and threatening quality of all Ss and the experimental personnel; (4) a modified form of the Berkowitz and Wolkon (1964) forced-choice F-scale, designed to gain S impressions of the degree to which Instructor possessed the qualities associated
with the authoritarian personality (Adorno, Frenkel-Brunswik, Else, Levinson, and Sanford, 1950).

Following completion of all tasks by Ss, a final questionnaire was passed out by E.1 which sought perceptions of the spatial situation. This was presented to the Ss as an attempt to improve the physical design of an experiment which was still in the pilot stage. Other misrepresentations of tasks to prevent S effects resulting from knowledge of intent included the following: (1) the perceptual defense task was represented as being a speed-reading test; (2) the questionnaire was represented as an attempt to gain insight into attitudes formed during classroom competition for grades; and (3) the F-scale was represented as an attempt to gauge student reactions to various kinds of teachers.

Following the experiment, which lasted 60 minutes, Ss were individually disconnected by the Es and were awarded their subject credits. All Ss were cautioned both by Instructor and the Es not to discuss the experiment with anyone else.

Subjects

The 40 Ss were enrolled in introductory psychology classes at California State University, Northridge, and included a wide variety of majors and ages. Ss were recruited from a posted sign-up sheet entitled "Television as a Teacher."

Ss consisted of 20 males and 20 females. Males and females were separately assigned to four experimental conditions. Assignment to condition was random, except for the restriction to same-sex groups. Five Ss thus served in each condition.
Design

The experiment was a $2 \times 2 \times 2$ factorial. Treatments were randomly arranged in time.

Independent and subject variables. The independent variables consisted of the distance between adjacent Ss, the presence or absence of territorial boundaries for all Ss, and the sex of members of the group. These factors may be specified by the following operational definitions.

1. Interpersonal Distance: Using Hall's (1969) classification of distances, two distances were chosen to represent spatial conditions which might result in extremes of violation of norms for voluntary seating distances. These were a maximum of six inches or 30 inches.

The distance of six inches represents the outer limit of the far phase of intimate distance. Intrusion into this region is sometimes characterized by a set of behaviors which Hall labels defensive devices.

The distance of 30 inches represents the outer limit of the close phase of personal distance. Social intercourse concerning matters of personal importance is often carried out at such a distance.

The distance between Ss was measured from elbow to elbow while seated at the table, with arms fully adducted and the upper extremity perpendicular to the table. The distance is regulated by the diameter of the table, which was set at 120 inches or 240 inches. The amount of space occupied by each S's body was taken
from pilot work to be an average of 18 inches in the posture described. Distance between the table and the Ss was controlled by the electrical cables which were, in fact, inert and served only the purpose of fixing the S's position in space.

2. Territorial Boundaries: According to Sommer (1969), some evidence indicates that individuals use personal belongings to establish territories or defend them against a spatial invasion. In order to facilitate or militate against territorial defense reactions by the Ss, tables were used which were either unmarked and devoid of personal effects (answer materials were stacked in such a way as to inhibit movement and use as a territorial marker) or segmented by 3/4-inch partitions. Should physical factors created by the physical proximity of another human body affect the measures used in this study, the use of partitions should have provided an opportunity to separately consider the effect of a territorial invasion.

3. Subject Variable: Sex. All groups of five Ss were composed of members of the same sex. Since the Es were always male, this unfortunately also means the presence of same- and different-sex E situations as well. E interaction was, however, minimized.

Some work, such as that of Freedman et al. (1972); Hall (1969); Horowitz, Duff, and Stratton (1964); and McBride (1965) indicates that sex is one determinant of spatial behavior. In order to gain sensitivity to phenomena which might be quite different, and possibly opposite, for the two sexes, homogeneous sex groupings were used.
Dependent variables. There were five categories of dependent variable. These were the perceptual defense task, the distribution-of-affect task, the questionnaire, the F-scale for Instructor, and the final questionnaire.

1. Perceptual Defense: This measure consisted of the presentation of 18 words, randomly ordered, at five increasingly greater exposure durations. The words were the same as used in a similar task by McGinnies (1949), and consisted of 11 neutral words and seven emotionally charged words. McGinnies noted a difference in threshold of recognition for such classes of words. Room illumination was controlled by means of a light meter and an adjustable light bank mounted in the ceiling, and the F-stop of the tachistoscope was set at 7.5. The exposure times, whose optimal settings were determined in pilot work, were 1/125 second, 1/100 second, 1/75 second, 1/50 second, and 1/25 second. The shortest time was found to produce images unrecognizable by most Ss in pilot work, and the longest time produced universally recognized symbols.

The literature of crowding suggests that one response to undesirable proximity is the creation of barriers between the individual and the situation. The purpose of this measure was to examine one manifestation of a S's attempt to, as put by Stokols, "alleviate the sensation of crowding." It might be particularly probable, in view of the process which has been described as "cocooning" or "cooling it" (Altman, 1960; Law, 1960), that emotionally charged stimuli will be discriminated against even more than neutral perceptions of the environment to a greater extent in
crowded than in uncrowded situations.

2. Distribution of Affect: This was a behavioral measure designed to probe the demonstration of hostility in an overt way. The representation of emotions by tokens, and the possession of a finite amount of the emotion, were explained to the Ss with a reference to the grounding of such a concept in some psychological literature. The restriction against keeping any of the tokens was made to prevent a trivial solution to the strain produced by the request to distribute them.

Twenty-four tokens were used for the negative and positive trials, with black and red colors used to represent hostility and affection, respectively. All tokens were coded to permit Ss to keep track of tokens being handed out and those being received and to permit E to determine the origin of the tokens received from other Ss. The number of tokens used was restricted to make for ease of handling within the time allowed. However, from pilot work it seemed both a sufficiently large quantity to discourage exact counting and allow a sufficiently fine degree of subtlety in rating. Also, the number 24 is evenly divisible by the four Ss to which each S must distribute his tokens.

The distribution of negative affect, or hate, tokens preceded the distribution of the positive affect, or love, tokens. Received tokens were placed in an envelope after a sufficient time had passed to allow a S to estimate the origins of his tokens if he so desired.
3. Questionnaire: The questionnaire was designed to gather impressions of social perceptions by Ss. Three questions, followed by a ten-point Likert-type scale, along the dimension of little-much, were asked for each of the following individuals: The other Ss adjacent to a given S; the Ss not adjacent to a given S; E. 1, E. 2, and Instructor. The use of two Es reflects the need to give the Ss the opportunity to form impressions of agents of social control who have direct contact with them without the restrictions which would be imposed by the use of only one, unique personality.

The following questions were asked:

a. How much do you like this person?
b. How much does he like you?
c. To what extent do you think this person could be a threat to you?

4. F-scale: The scale used in this portion of the experiment was a variation of that developed by Berkowitz and Wolkon (1964). In this experiment, Ss were asked to answer the forced-choice items for Instructor rather than for themselves, circling the one which he would view as applying most strongly to himself. The purpose of this was to gain an estimate of the degree to which Ss considered this figure to possess an authoritarian personality, or potentially fascist syndrome.

The selection of the Berkowitz and Wolkon scale to modify for this purpose was made because of the desirability of a short form, as time was in short supply, and one which corrects for acquiescent response set. Successful use of this scale in detecting
authoritarianism in its normal application is described by Berkowitz (1968) and Lambley (1970). The existence of acquiescence as a factor which must be considered in F-scales is discussed by Cloud (1970). The freedom from acquiescence of the Berkowitz and Wolken scale is discussed by Klein (1967).

5. Final Questionnaire: The final questionnaire consisted of four questions relating to the perception of crowding and territorial invasion at the table embedded in six questions related to general features of the experiment. The score on this measure consisted of the average of the four scores on the space-relevant questions, as these questions were similar in form and in the information they sought. Limitations on the sensitivity of the statistical analysis militated against separate analysis of the questions. The space-relevant questions were:

a. Did you feel crowded around the table?

b. Did you feel that your neighbors were so close as to be intruding on you?

c. Would you have been more comfortable if you had more room in which to work?

d. Would you have been more comfortable if there had been more room between you and your neighbors?
RESULTS

A multivariate analysis of variance was conducted to analyze responses to 20 dependent measures used in the study. These measures included responses to each item, the difference scores for the distribution of tokens to adjacent and nonadjacent Ss in the negative and positive distributions, and the difference scores for the three classes of stimulus person employed in the social perception questionnaire. Social perception questions relating to the Instructor were analyzed separately from those relating to the Es and the other Ss, which were treated together.

The statistical treatment employed followed the union-intersection principle of S. N. Roy (1953). A method of this kind is advisable because the 20 measures were administered to a common population, and a series of univariate tests would, as a result of the number of tests and the correlations among the responses, lead to a different and unspecifiable significance level from the one chosen for the critical value of the statistic. The method used takes into account all intercorrelations between response variables.

The source of the statistic used in the analysis of the data was the greatest root of the determinantal equation $|H - \lambda E| = 0$, where $H$ and $E$ are sums of squares and cross-product matrices which, when divided by the appropriate degrees of freedom, become estimates of the variance-covariance matrix for the response variables. The matrix $H$ represents departures from a particular null hypothesis while $E$, when divided by its appropriate degrees of
freedom, gives an unbiased estimate of the population variance-covariance matrix. This quantity can be shown to be proportional to the maximum value of all univariate F-tests conducted on any linear combination of response variables. Should the value of this quantity exceed the value of the critical statistic drawn from the upper percentage point charts of the greatest root distribution described by Heck (1960) for a given level of significance and for given levels of three additional parameters (based on the design of the experiment), the multivariate null hypothesis may be rejected. This would indicate acceptance of the alternate hypothesis that there is some linear combination of data values which is significant for the hypothesis being tested.

The actual computations used in this study extracted the greatest root described above from the matrix $HE^{-1}$. The nonzero characteristic roots of this matrix are equal to the nonzero roots of $|H-\lambda E|=0$.

In the case of an experimental design at two levels, as in the present instance, one of the three parameters of the greatest root distribution is equal to one, and the single nonzero root can easily be converted into an F-value with degrees of freedom $2m+2$ and $2n+2$, where $m$ and $n$ are the remaining two parameters. As there are no charts of the upper percentage points of the greatest root distribution available for this special case, the results of this study will be described in terms of F-values.

Analysis of the 20 variables showed a main effect for crowding ($F=3.89, \text{df}=20, 13, p<.01$) and interactions between crowding
and sex ($F = 2.463$, $df = 20, 13$, $p < .05$), and between sex and territorial boundaries ($F = 3.02$, $df = 20, 13$, $p < .05$). All other main effects and interactions failed to reach significance. The results of this analysis are summarized in Table 1.

The main effect results from some linear combination of response measures in the set defined by the main effect parameter. Several of the more obvious possible combinations were analyzed, but no significant results were obtained. Examination of Table 2, however, indicates the trend among the dependent measures. It may be seen that all but six of the measures are in the predicted direction, toward what may be termed "negative social responding" on the variables used, although none reached statistical significance individually. This may have been because of the large number of different measures and the relatively small number of $S$s, conditions which give low discriminating power. More specifically, there is a larger latency or greater perceptual defense, higher projective F-score, greater hostility, more perception of threat, less behavioral positive regard for adjacent $S$s, and so on for the crowded condition.

With respect to the interaction between sex and crowding, examination of the means in Table 3 indicates that the direction of this effect was that of females having fewer negative responses under crowded conditions and more negative responses under uncrowded conditions on a number of the measures, with a reverse pattern for males. Males showed greater negative responses under uncrowded conditions on only four of the measures, including responses to the hostility perception question of the social perception questionnaire.
for the Instructor and for the Es and other Ss.

The interaction between sex and territorial boundaries manifested itself by the fact that for males, more dependent measures showed effects in the predicted direction—that of greater negative responding in the absence of partitions. Females did not show this trend. As can be seen in Table 4, among these variables for males are the perceptual defense measure, the distribution of positive affect, the hostility perception from the social perception questionnaire, and the projective F-scale. The final questionnaire which measured perception of crowding, the distribution of negative affect, and the remaining items on the social perception questionnaire showed opposite trends for males and females.

A correlation matrix was generated and dependent measures were examined for the extent of their intercorrelations. As can be seen from Table 5, the highest correlation for the final questionnaire was –.30. These results indicate that this measure was not highly correlated with the others. As a result of this relative independence and the fact that it seemed desirable to separate the social perception and behavior variables from the actual perception of crowding, a univariate analysis of variance was performed on the final questionnaire. As can be seen from Table 6, this analysis yielded a significant main effect for crowding ($F = 14.27$, $df = 1, 32$, $p < .01$), with all other main effects and interactions failing to reach significance. The direction of this effect was that of greater experience of crowding with decreased interpersonal distance. It is likely that this measure was the major contributing factor for the main effect
of crowding detected by the multivariate procedure for all 20 measures.

The remaining 19 variables without the final questionnaire were once again subjected to a multivariate analysis of variance. As can be seen from Table 7, no significant main effects or interactions were found in this analysis.
# TABLE 1

Multivariate Analysis of Variance

F Table for All Dependent Measures

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<th>F</th>
<th>p</th>
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TABLE 2
Mean Responses for Crowding*

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<th>Uncrowded</th>
<th>Differences</th>
<th>Est. of Std. Deviation</th>
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Dependent Measures

1. Final Questionnaire
2. Perceptual Defense
3. Negative Distribution
4. Positive Distribution
5. Question 1
6. Question 2
7. Question 3
8. Question 1, Experimenter-Adjacent Subject Difference Score
9. Question 1, Adjacent-Other
10. Question 1, Experimenter-Other
11. Question 2, Experimenter-Adjacent
12. Question 2, Adjacent-Other
13. Question 2, Experimenter-Other
14. Question 3, Experimenter-Adjacent
15. Question 3, Adjacent-Other
16. Question 3, Experimenter-Other
17. Question 1, Instructor
18. Question 2, Instructor
19. Question 3, Instructor
20. F-scale

* The higher score indicates greater negative social responding.
TABLE 3

Mean Responses for Males and Females*

<table>
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<tr>
<th></th>
<th>MALE</th>
<th></th>
<th>FEMALE</th>
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<td>Crowded</td>
<td>Uncrowded</td>
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Dependent Measures

1. Final Questionnaire 11. Question 2, Experimenter-Adjacent
2. Perceptual Defense 12. Question 2, Adjacent-Other
3. Negative Distribution 13. Question 2, Experimenter-Other
5. Question 1 15. Question 3, Adjacent-Other
6. Question 2 16. Question 3, Experimenter-Other
7. Question 3 17. Question 1, Instructor
8. Question 1, Experimenter-Adjacent Subject Difference Score 18. Question 2, Instructor
9. Question 1, Adjacent-Other 19. Question 3, Instructor
10. Question 1, Experimenter Other 20. F-scale

*The higher score indicates greater negative social responding.
### TABLE 4

Mean Responses for Males and Females

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**Dependent Measures**

1. Final Questionnaire
2. Perceptual Defense
3. Negative Distribution
4. Positive Distribution
5. Question 1
6. Question 2
7. Question 3
8. Question 1, Experimenter-Adjacent Subject Difference Score
9. Question 1, Adjacent-Other
10. Question 1, Experimenter-Other
11. Question 2, Experimenter-Adjacent
12. Question 2, Adjacent-Other
13. Question 2, Experimenter-Other
14. Question 3, Experimenter-Adjacent
15. Question 3, Adjacent-Other
16. Question 3, Experimenter-Other
17. Question 1, Instructor
18. Question 2, Instructor
19. Question 3, Instructor
20. F-scale

*The higher score indicates greater negative social responding.*
### TABLE 5

**Correlation Matrix**

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### Variables

1. Final Questionnaire
2. Perceptual Defense
3. Negative Distribution
4. Positive Distribution
5. Question 1
6. Question 2
7. Question 3
8. Question 1, Experimenter - Adjacent Subject Difference Score
9. Question 1, Adjacent - Other
10. Question 1, Experimenter - Other
11. Question 2, Experimenter - Adjacent
12. Question 2, Adjacent - Other
13. Question 2, Experimenter - Other
14. Question 3, Experimenter - Adjacent
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18. Question 2, Instructor
19. Question 2, Instructor
20. F-scale
TABLE 6

Analysis of Variance

F Table for Final Questionnaire

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**TABLE 7**

Multivariate Analysis of Variance

F Table for Nineteen Dependent Measures

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DISCUSSION

The significant main effect for crowding obtained from the univariate analysis of variance of the final questionnaire supports the assertion that Ss assigned to the crowded conditions experienced a subjective state of perceived crowding. The use of subjective reports of restriction and discomfort is recommended by Stokols (1972) to distinguish between the experience of crowding and that of the simple physical density of the surrounding population.

The absence of other main effects and interactions involving sex and territorial boundaries in this univariate analysis indicates that crowding was perceived equally by males and females and in partitioned and nonpartitioned situations.

The main effect for crowding and the interactions between crowding and sex and between sex and territorial boundaries obtained from the multivariate analysis of all 20 dependent measures supports the notion that behavior, as measured by some combination of these dependent measures, was altered by the manipulations employed. While this is certainly not unexpected in the case of the main effect of crowding, given the significance of the final questionnaire for this effect when analyzed separately, the disappearance of the two interactions on the univariate analysis of the final questionnaire and the nonsignificant results of the multivariate analysis of the 19 social perception and behavior measures indicates that the relationship between crowding and our measures is complex, obscure, and probably not very strong. In short, the final questionnaire contributes
something when taken in combination with the other 19 variables that makes for statistical significance, but precisely what this "something" is, is not clear.

With respect to the finding of an interaction between crowding and sex in which females showed a greater number of negative responses in uncrowded conditions than in crowded conditions relative to males, it is interesting to note that Freedman, Levy, Buchanan, and Price (1972) report a similar interaction. In the Freedman et al. study, which resembled the present study in many ways, the authors found that males were more competitive in small rooms while females were more competitive in large rooms. Furthermore, males were more severe in handing out sentences in a mock jury situation in small rooms while females were more severe in large rooms. The explanations offered by these authors for this effect are of interest in light of the findings of the present study. They speculate that the first and most obvious possible explanation is that males and females are innately different with respect to limitations on their personal space. This was, however, described as implausible by Freedman et al. because of the need for positing some sort of counter-territorial reaction for females consisting of positive reactions to lack of space in order to account for the results obtained in that study. A second possible explanation is that innate differences exist in terms of activity level, with males requiring more space because of their greater physical activity. Again, however, an opposite tendency would have to be ascribed to females for the explanation to be valid. A third possible explanation is a
difference in expectations about personal contact. Females may interpret crowding in terms of friendship and intimacy, while males respond negatively because they view the situation in terms of antagonism and threat. A final explanation is that crowding tends to emphasize typical responses to a particular situation rather than a generalized response.

The stated preference of Freedman et al. is for the final alternative. This position is consistent with the variability found to be associated with particular settings in research on crowding. Thus, crowding in a subway produces a different subjective set from crowding at a football game or in a theater line. Such a reaction would suggest the difficulty in detecting phenomena associated with crowding in an experimental setting, which is highly formal and structured, and generally very limited in time span.

The contrast between males and females is shown in the distribution of negative affect. Although not individually statistically significant, there was a greater amount of negative affect for adjacent Ss for females under uncrowded conditions. In addition, for females, the distribution of positive affect was in the direction of more positive affect for the adjacent Ss under crowded conditions.

This suggests the possibility that proximity increases positive regard under certain conditions. The fact that values for the positive distribution are all negative for both males and females indicates that, regardless of crowding, adjacent Ss received more positive tokens than others. In the case of males, however, crowding decreases the relative amount of positive tokens given to adjacent Ss.
and increases the relative amount of negative tokens. The sex
difference on this item may reflect different expectations about
personal contact which have also been noted by Freedman et al.

Examination of the pencil-and-paper items from the social
perception questionnaire indicates that the relative hostility
expressed for adjacent and nonadjacent Ss was consistent with results
of the behavioral measure. Males expressed less hostility for adja-
cent Ss in the uncrowded condition, but more hostility for adjacent Ss
in the crowded condition. Females showed an opposite tendency.

The explanations offered by Freedman et al. for the crowding-
sex interaction are of further interest with respect to the territorial
boundary-sex interaction found in the present study. The data on
males with respect to partitions suggest that the maintenance of per-
sonal space by an external agency (partitions) tended to reduce the
possible threat experienced by males in dealing with other males.
These threatening expectations would be emphasized by crowding.
A reduction in threat might result from the absence of a need to
defend territory in a physical way when partitions are present. The
defense of territory is more closely associated with the social role
of the male than that of the female. In addition, partitions reduce
the possibility of physical contact, which could have more aggressive
or homosexual overtones for males.

Although none of the dependent measures is statistically
significant taken by itself, it is nonetheless interesting to examine
the variables which were affected by this interaction for males.
Three of these were the hostility perception question from the social
perception questionnaire (for Es and Ss), the distribution of positive (but not negative) affect, and the perceptual defense measure. Consistent with the possible explanations which have been offered for this interaction above were the findings that the presence of partitions increased positive social responding in males, increased the public display of affection for adjacent Ss, and increased the selective tuning out of emotionally charged stimuli in the environment.

From the multivariate analysis of the 19 social perception and behavior measures, it is apparent that crowding did not affect performance on our individual measures in the ways predicted to a significant degree, although crowding does have a significant general effect when the perception of crowding is included in the combination. Freedman et al. (1971, 1972) and Stokols (1972) have discussed possible reasons for the failure to observe experimental effects of crowding. According to Freedman et al., one limiting factor on studies of this kind is that exposure to the crowded situation is brief and Ss are aware that the time is limited. "Spending one's life in a high-density environment or returning to a crowded apartment every evening are different experiences from spending 20 minutes on a crowded subway or three hours in a crowded department store."4

Freedman also notes that the assumption that short exposure to a high-intensity stimulus condition will produce the same kind of effects as longer exposure to a lower-intensity condition, at least in terms of direction, may prove to be false in the case of the effects of crowding.
Another limiting factor on work of this kind is that Ss are aware of the experimental nature of the setting. Circumstances other than the perception of population density seem to be of importance in determining behavior. What is intolerable as a lifestyle may be perfectly acceptable for participation in an experiment. Stokols (1972) has suggested several ways in which one may adapt to crowding to which one has voluntarily submitted. These include modification of the standards of spatial adequacy, enhancement of the value of the tasks at hand, and attempting to achieve a greater degree of cooperation with other members of the group.

Other situational factors which may be mentioned include the facts that there was no mutual interference between Ss in the conduct of their tasks, that Ss were strangers and had no expectation of forming lasting relationships, and that moving around in the crowded circumstances was not necessary.

The failure to achieve significance for one dependent measure in particular is of interest. According to Ericksen (1954), the perceptual defense reaction varies under conditions of increased stress. It is possible that this reflects a change in social conditions since these particular emotionally charged words were selected by McGinnies in 1949. The absence of significant perceptual defense reactions in our study echoes the findings by Freedman, Klevansky, and Erlich (1971). It may be that crowding is not a simple, aversive, arousing stimulus; that is, it may be unlike such stressful sensory stimuli as electric shock and loud noise.
In addition, the findings of the present study that behavioral and pencil-and-paper hostility did not show any simple significant effect of crowding agrees with the results obtained by Freedman, Buchanan, Levy, and Price (1972), who observed no main effect for crowding on measures of aggression.

The failure of this study to find significant changes in social perception and behavior as a simple effect of crowding does not mean that crowding may now be regarded as no longer an important social factor in itself. The findings of this study do support the idea that crowding has some effect on human behavior, but that the nature of this effect is complicated by factors associated with the particular situation. As stated by Freedman, "The obvious implication of this is that, rather than focusing on the question of how crowding affects human behavior, we should turn our attention to the more pertinent question of what factors determine how human beings react to high density."5

Future research, in order to eliminate situational factors and expectations associated with the laboratory, must turn to the natural environment. It may be possible to establish controlled conditions outside the behavioral science laboratory which allow the manipulation of variables associated with particular situations and the taking of observations without influencing behavior. Such research may have to increase the salience of cues related to population density by requiring physical movement and mutual interference in the accomplishment of tasks. Exposure to crowded conditions may have to be of long duration or possibly repeated frequently over time. Should
sufficient controls be available, the use of an equivalent time-
samples design is suggested. In addition, the subject population
should be considerably larger than that used for the present study,
which was too small to provide sufficient sensitivity to investigate
the types of variables and effects being considered.

In conclusion, the main identifiable effect of crowding was on
the actual perception of the state. However, an interaction between
sex and crowding reached statistical significance, as did an inter-
action between sex and the presence or absence of territorial bound-
daries. Taken alone, none of the measures related to social percep-
tion and behavior showed significant effects of crowding, territorial
boundaries, or sex under the time, spatial, and population conditions
of this study.
NOTES


REFERENCES


Chitty, D. In Philosophical Transactions of the Royal Society, 1952, 236, 505.


Greenberg, B. Some relations between territory, social hierarchy, and leadership in the green sunfish. Physiological Zoology, 1947, 20, 267-299.


McGinnies, E. Emotionality and perceptual defense. Psychological Review, 1949, 56, 244-251.


INSTRUCTIONS TO SUBJECTS

1. Preliminary Instructions

You are about to participate in an experiment designed to determine the effect of a televised, rather than live, teacher on some measures which are known to relate to classroom performance and behavior. Please fill out the forms which are in front of you while I describe what you are to do.

In a few moments my assistant will seat you, one at a time, around the circular table in the back of the room. From this table you will view a program presented on the television monitor. This program will contain instructions for tasks which will be performed with the materials you will find stacked in front of you. Please follow all instructions carefully and exactly. The program will last approximately 45 minutes.

Attached to your arm will be a harmless electrical cable which measures emotional responses by means of the GSR, or galvanic skin response. This device should produce no discomfort, so do not be concerned about it.

You will notice that a mirror has been exposed. While normally used as a two-way mirror, its purpose here is simply to allow you to see the television image if your back is to the monitor due to the location of your seat. You will also notice that a screen is located near the table. Images will be flashed on this screen at the direction of the Instructor you will see on the monitor, so be aware of its presence.
As you can see from the forms which are now in front of you, each of you has a subject number. You are seated in order by that number right now. When you are seated around the circular table, you will again be arranged by subject number. Seating at the table will be clockwise so that, when you are called upon to do so, you can figure out the subject number of anyone else around the table. A reminder to this effect is posted on the far blackboard.

It is extremely important that you remain silent during the entire experiment. Please do not talk to each other or to either of us two experimenters unless it is absolutely necessary. Should some eventuality cause you to require assistance from an experimenter, raise your hand and the situation will be dealt with as quickly as possible.

A few changes have been made in the experiment since the videotape was made. You will hear a reference to a slot in the center of the table where you are to deposit answer materials when you are finished with them. The construction of the table has forced us to do without the slot, so please deposit used materials under your chairs when instructed to do so. You will also hear a reference to black and white tokens that will be passed out among you. We have changed the white tokens to red and have cut down the number of tokens to make for easier handling.

Now, if you are all finished with the preliminary questionnaire, we can begin. We wish to thank you for your participation. Please remember to remain silent and follow all directions carefully.
Remain seated until you are escorted to your seat at the table by my associate.

2. Concluding Instructions

We have one final task remaining before we can conclude. As this experiment is still in the pilot stages, we are eager for feedback on the physical arrangement we have used and our success in establishing a classroom atmosphere. Please answer the questions on the form that I will now distribute. When this is completed, you will be disconnected and allowed to leave the table. Bring your subject participation cards to one of us after you have left the table and you will be awarded your credits.

Please do not discuss this experiment with anyone else, as more subjects will be required during the year, and contamination must be avoided if our efforts here today are to be of value.

Thank you.
APPENDIX B

58
TEXT OF PRESENTATION BY INSTRUCTOR

The purpose of this session is to gather data relating to the behavior of students in a simulated classroom under the influence of a televised, rather than live, teacher.

During the next hour, you will be asked to perform a series of tasks based on instructions or data supplied by me, your televised teacher. Your cooperation in this study is greatly appreciated, and the experimental team hopes that you will be alert and will carefully follow the instructions you will be given. Some of these will be complex, and you will need to be both silent and attentive.

Before you on the table is a packet of answer materials. The booklets in this stack are in the order that you will need them. For your convenience, they have been color-coded and labeled with the name of the task involved and the instructions for that task in an abbreviated form.

Please remove the wire holding your materials together. This may be accomplished by simply untwisting the ends of the wire and letting the ends dangle free. Be careful not to disrupt the order of the materials. Should you do so, however, you will be able to identify the proper materials at the proper time by the labels on them.

Now, remove the top item from the stack. This is a booklet marked SPEED-READING TEST. You may examine it while I explain the instructions for the first task.
The purpose of this first task is to simulate an exercise in speed reading. We will employ a device known as a tachistoscope, which is an instrument that flashes a word or other image onto a screen for a brief exposure. An example of a word flashed in this manner would look like this:

Word one, trial one.
(pause)
Word one, trial two.
(pause)
Word one, trial three.
(pause)
Word one, trial four. And so on.

You will notice that your booklet has 20 pages. Each page corresponds to a word which will be flashed on the screen five times. Each time the word is flashed will be longer than the last. After five presentations of a word, a new word will be similarly presented.

Each of the blanks on the page correspond to one trial of the word. In order to determine the threshold above which you can perceive words on the average, we would like you to write in each blank space what you see or think you see on each trial. Start with the first blank on the first page and proceed through to the last blank on page 20, in order. Please write something in each space. If you cannot make out even a few possible letters, then draw a line through the blank. Of course, you may not go back on any trial or word.

In order to make this experiment meaningful, we must request that you do not look at the answers of the other members of
this group. Please keep your eyes on the screen or on your answer book during the exercises. Please remain silent at all times.

We will now begin. I will announce each word and each trial before the image is flashed. You may thus catch up if you become lost.

Now, turn to page one. Watch the screen for word one, trial one. (eight-second pause for presentation of the word) Word one, trial two. Word one, trial three. Word one, trial four. Word one, trial five.

Now turn your attention to page two. Watch the screen for word two, trial one. Word two, trial two. Word two, trial three. Word two, trial four. Word two, trial five.

(This procedure continues through word 20.)

This concludes this task. Please take your answer booklet and deposit it in the slot in the center of the table. With this accomplished, we can proceed to the second task.

(ten-second pause)

The second task involves the feeling of competition which often develops in a classroom situation in which students must vie for a set number of As, Bs, and so on. You will notice that your next answer packet is an envelope. Please remove it from the stack, carefully open it, and remove the contents.

The envelope, labeled NEGATIVE AFFECT, and colored blue, should contain 100 black tokens.

As you may know, traditional psychological theory supposes the existence of finite amounts of emotion in the psyche which are
distributed to significant others by an individual. Two prominent emotions of this kind are love, or positive regard, and hate, or negative regard.

We would like you to regard the black tokens as hate, or negative regard. Upon my signal, please distribute your negative regard to the other members of the group. More tokens given to a member of the group represents a higher amount of hate, or negative regard. This situation might seem discomfoting except for the following stipulation which makes these circumstances rather artificial: You may not keep any of the tokens for yourself. All of your tokens must be distributed to others, in whatever ratio you deem suitable.

Please be careful to keep the tokens you receive from others separate from the tokens you now possess and will be passing out. The tokens you receive should be kept in a pile.

Be sure to note that the tokens have your subject number printed on them. This makes it possible to keep the tokens separate.

Now, upon my signal, distribute all of your black tokens to the other members of the group. You may give all, or none, or any number in between to any individual or individuals. You do not have to count the exact number of tokens you give to each member of the group. You will have one minute to make your decisions and pass out your tokens. As always, please remain perfectly silent during this and all exercises. Ready, begin.

(30-second pause)

There are 30 seconds left.
(20-second pause)

There are now only ten seconds left. Please finish up if you have not already done so.

(ten-second pause)

The allotted time for this exercise is over. Please place your received chips in the blue envelope out of which your chips came and carefully seal it. When you have completed this, place the envelope in the slot in the center of the table.

(30-second pause)

We may now proceed to the second portion of this task. You will observe that in your pile of materials is another envelope, this one colored green and labeled POSITIVE AFFECT. Remove this envelope from the stack.

Open the green envelope and within you will find 100 white tokens. We would like you to consider each of these white tokens to represent a unit of positive regard, or love. As in the first portion of this task, upon my signal you are to distribute the white tokens to the other members of this group. You may do this in any ration or order you wish. The only stipulation is that all of the white tokens must be passed out and none retained for oneself. As in the earlier case, try to keep separate those tokens that you are receiving from those you now possess and will be distributing.

You will have one minute for this exercise. Ready, begin.

(30-second pause)

You have 30 seconds left. As in all cases, please remain silent.
(20-second pause)

You have ten seconds left. Please finish up if you have not already done so.

(ten-second pause)

Time is up for this exercise. Please place the chips you have received in the envelope, seal it, and place it in the slot in the center of the table. Please be sure and seal the envelope carefully.

(30-second pause)

We will now turn to the next item in your stack of materials, an orange-colored booklet labeled QUESTIONNAIRE. Please remove this booklet from the stack without opening it.

Upon my signal, you will open the booklet and answer the questions in order. Whatever questions may appear in your particular booklet, the answers consist of scales which ascend from one to ten in increments of one. The opposite ends of the scales are labeled in such a way as to indicate what kind of an answer is expected of you. For example, consider a scale that ranges from bad (1) to good (10). If you thought that the answer to a question followed by this scale was "pretty good," you might place an X or other mark at the 7 on the scale.

Now, open the booklet and answer the questions as best you can. Do not leave any scale blank but, rather, guess if you have no idea at all. You will have five minutes for this portion of the task. Do not observe the work of your neighbors, as the forms are different and answers must be kept confidential because of their nature. When you have completed the task, close your booklet and deposit it
in the slot in the center of the table. As always, please remain silent during and after the exercise.

(one-minute pause)

You have four minutes left. Do not observe the work of other members of the group and remember to keep silent.

(one-minute pause)

You have three minutes left.

(one-minute pause)

You have two minutes left.

(one-minute pause)

You have one minute remaining. You should be finishing up if you have not already done so. Upon completion of the task, place the closed booklet in the slot. You need not wait until time runs out.

(At this point the tape was stopped and E. I made the following announcement: "You will have as much time to complete this exercise as you need." Tape was restarted as the final S's approached completion of the questionnaire.

Time is up for this task. Please place your closed booklet in the slot in the center of the table.

The experimental team wishes to thank you for your cooperation in this study. It is hoped that some meaningful data will be garnered from this experiment which will help to improve the quality of life, not only of students but the population in general. By your participation, you will have made a contribution to this worthwhile pursuit.
In order that our data be meaningful, however, we must ask you not to discuss this study with anyone else. Your classmates may be asked to serve as subjects at a later date, and prior knowledge of the experimental setting may have an undesirable biasing effect.

Again, your cooperation has been appreciated. I will now turn you over to the proctors for further instructions. Please do not talk or get up until you have been told to do so by your proctor. Thank you.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Subject number</td>
</tr>
<tr>
<td>2.</td>
<td>City of residence</td>
</tr>
<tr>
<td>3.</td>
<td>Age</td>
</tr>
<tr>
<td>4.</td>
<td>City of birth</td>
</tr>
<tr>
<td>5.</td>
<td>State or country of birth</td>
</tr>
</tbody>
</table>
b. Negro (Black)  
c. Mexican-American  
d. Oriental  
e. Indian (native American)  
f. Other (please specify)  |
| 7. | Occupation: a. Student  
b. Other (please specify)  |
| 8. | Current income of parents: a. Under $1,000 yearly  
b. $1,000-$3,000  
c. $3,000-$8,000  
d. Over $8,000  |
| 9. | Where did you grow up (city and state or country)?  |
| 10. | With how many people did you live (at the same time) while growing up?  |
| 11. | How many bedrooms did your family have while you were growing up?  |
| 12. | With how many people did you share a bedroom while growing up?  |
| 13. | Do you know anyone else in this room? (Please specify person and degree of acquaintance.)  |
FINAL QUESTIONNAIRE

1. Did you find that the study accurately simulated a classroom atmosphere?
   
   |   |   |   |   |   |   |   |   |   |   |
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
   | little |   |   |   |   |   |   |   |   | much |

2. Did you feel crowded around the table?
   
   |   |   |   |   |   |   |   |   |   |   |
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
   | little |   |   |   |   |   |   |   |   | much |

3. Did you feel that the instructor resembled a regular teacher?
   
   |   |   |   |   |   |   |   |   |   |   |
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
   | little |   |   |   |   |   |   |   |   | much |

4. Did you feel that your neighbors were so close as to be intruding on you?
   
   |   |   |   |   |   |   |   |   |   |   |
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
   | little |   |   |   |   |   |   |   |   | much |

5. Were you able to see both the monitor and the screen well?
   
   |   |   |   |   |   |   |   |   |   |   |
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
   | little |   |   |   |   |   |   |   |   | much |

6. Would you have been more comfortable if you had more room in which to work?
   
   |   |   |   |   |   |   |   |   |   |   |
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
   | little |   |   |   |   |   |   |   |   | much |

7. Would you have been more comfortable if there had been more room between you and your neighbors?
   
   |   |   |   |   |   |   |   |   |   |   |
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
   | little |   |   |   |   |   |   |   |   | much |

8. Did you feel that the tasks demanded of you were reasonable?
   
   |   |   |   |   |   |   |   |   |   |   |
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
   | little |   |   |   |   |   |   |   |   | much |

9. Did the current generated by the GSR measurement device cause you any discomfort?
   
   |   |   |   |   |   |   |   |   |   |   |
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
   | little |   |   |   |   |   |   |   |   | much |

10. If you have any thoughts on the study which would help in making future sessions more comfortable or productive, please briefly state them below:
SOCIAL PERCEPTION QUESTIONNAIRE

The questionnaire used in the experiment consisted of five pages in a four-inch by five-inch booklet. The form reproduced here consists of the directions and questions in the order in which they were originally presented.

Please answer all of the following questions which pertain to the people involved in this experiment. Do not omit any questions. Scales go from one (LITTLE) to ten (MUCH). Place a pencil mark (/) across the line at the appropriate point.

The following questions pertain to:

**SUBJECT 1**

1. How much do you **dislike** this person?

<table>
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<tr>
<th>1</th>
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<th>4</th>
<th>5</th>
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<th>7</th>
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<td>much</td>
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</table>

2. How much does this person **dislike** you?

<table>
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<tr>
<th>1</th>
<th>2</th>
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<th>4</th>
<th>5</th>
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<td>much</td>
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</table>

3. To what extent do you think this person could be a threat to you?

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<tr>
<th>1</th>
<th>2</th>
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<td>much</td>
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</tbody>
</table>

**SUBJECT 2**

1. How much do you **dislike** this person?

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<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<tr>
<td>little</td>
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<td></td>
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<td></td>
<td></td>
<td>much</td>
</tr>
</tbody>
</table>

2. How much does this person **dislike** you?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<td></td>
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<td></td>
<td></td>
<td>much</td>
</tr>
</tbody>
</table>

3. To what extent do you think this person could be a threat to you?

<table>
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<tr>
<th>1</th>
<th>2</th>
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<th>4</th>
<th>5</th>
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<td>little</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>much</td>
</tr>
</tbody>
</table>
SUBJECT 3

1. How much do you dislike this person?
   1 2 3 4 5 6 7 8 9 10
   little much

2. How much does this person dislike you?
   1 2 3 4 5 6 7 8 9 10
   little much

3. To what extent do you think this person could be a threat to you?
   1 2 3 4 5 6 7 8 9 10
   little much

SUBJECT 4

1. How much do you dislike this person?
   1 2 3 4 5 6 7 8 9 10
   little much

2. How much does this person dislike you?
   1 2 3 4 5 6 7 8 9 10
   little much

3. To what extent do you think this person could be a threat to you?
   1 2 3 4 5 6 7 8 9 10
   little much

SUBJECT 5

1. How much do you dislike this person?
   1 2 3 4 5 6 7 8 9 10
   little much

2. How much does this person dislike you?
   1 2 3 4 5 6 7 8 9 10
   little much

3. To what extent do you think this person could be a threat to you?
   1 2 3 4 5 6 7 8 9 10
   little much

The following questions pertain to EXPERIMENTER 1, who first met you.

1. How much do you dislike this person?
   1 2 3 4 5 6 7 8 9 10
   little much
2. How much does this person dislike you?
   1  2  3  4  5  6  7  8  9  10
   little  much

3. To what extent do you think this person could be a threat to you?
   1  2  3  4  5  6  7  8  9  10
   little  much

EXPERIMENTER 2, who seated you.

1. How much do you dislike this person?
   1  2  3  4  5  6  7  8  9  10
   little  much

2. How much does this person dislike you?
   1  2  3  4  5  6  7  8  9  10
   little  much

3. To what extent do you think this person could be a threat to you?
   1  2  3  4  5  6  7  8  9  10
   little  much

The following questions pertain to INSTRUCTOR, who appeared on the screen.

1. How much do you dislike this person?
   1  2  3  4  5  6  7  8  9  10
   little  much

2. How much does this person dislike you?
   1  2  3  4  5  6  7  8  9  10
   little  much

3. To what extent do you think this person could be a threat to you?
   1  2  3  4  5  6  7  8  9  10
   little  much
QUESTIONS FROM F-SCALE

The F-scale was presented at the end of the questionnaire and in the same booklet. The following instructions and questions were employed.

The following questions pertain to the INSTRUCTOR who appeared on the television screen. Please answer all items NOT AS YOU WOULD, but AS YOU THINK INSTRUCTOR MIGHT if he were answering for himself. Do not omit any questions.

1. a. It is highly unlikely that astrology will ever be able to explain anything.
   b. Someday it will probably be shown that astrology can explain a lot of things.

2. a. Sex crimes, such as rape and attacks on young children, are signs of mental illness. Such people belong in hospitals rather than in prison.
   b. Sex criminals, such as those who rape and attack young children, deserve more than mere imprisonment. Such criminals ought to be publicly whipped, or worse.

3. a. No sane, normal, decent person could ever think of hurting a close friend or relative.
   b. It's only natural for people to sometimes have thoughts about hurting a close friend or relative.

4. a. If it were not for the rebellious ideas of youth, there would be less progress in the world.
   b. Young people sometimes get rebellious ideas, but as they grow up they ought to get over them and settle down.

5. a. There are many difficulties a person cannot overcome no matter how much will power he has.
   b. No weakness or difficulty can hold us back if we have enough will power.

6. a. Many people have too great a fear of plots hatched in secret by politicians.
   b. Most people don't realize how much of our lives is controlled by plots hatched in secret places.

7. a. A person with bad manners, habits, and breeding can hardly expect to get along with decent people.
   b. People should be willing to overlook failures in manners and unpleasant habits in other people.
8. a. Human nature doesn't make war inevitable; man may someday establish a peaceful world.
b. Human nature being what it is, there will probably always be wars and conflicts.

b. You may dislike a person very much, but if you get to know him well, the chances are that you will have more respect for him.

10. a. It would be a good idea if people spent more time thinking and talking about ideas just for the fun of it.
b. If people would talk less and work more, everybody would be better off.

11. a. What a youth needs most is strict discipline, rugged determination, and the will to work and fight for family and country.
b. In the long run, it is better for our country if young people are allowed a great deal of personal freedom and are not strictly disciplined.

12. a. Nowadays more and more people are prying into matters that should remain personal and private.
b. There are times when it is necessary to probe into even the most personal and private matters.

13. a. The businessman and the manufacturer are much more important to society than the artist and the professor.
b. The artist and the professor are probably more important to society than the businessman.

14. a. Science has its place, but there are many important things that can never possibly be understood by the human mind.
b. The findings of science may someday show that many of our most cherished beliefs are wrong.

15. a. Obedience and respect for authority are the most important virtues children should learn.
b. One of the most important things children should learn is when to disobey authorities.

16. a. Most honest people admit to themselves that they have sometimes hated their parents.
b. There is hardly anything lower than a person who does not feel great love, gratitude, and respect for his parents.

17. a. The wild sex life of the old Greeks and Romans was tame compared with some of the goings-on in this country, even in places where people might least expect it.
b. In spite of what you have read about the wild sex life of people in important places, the real story is about the same in any group of people.
18. a. Even though people of all sorts mix together nowadays, you don't have to worry about catching an infection or a disease.
b. Nowadays when so many people move around and mix together so much, a person has to be especially careful to protect himself against catching an infection or disease from them.

19. a. It's nobody's business if someone is a homosexual as long as he doesn't harm other people.
b. Homosexuals are hardly better than criminals and ought to be severely punished.

20. a. People can be divided into two distinct classes: the weak and the strong.
b. It doesn't make much sense to divide people into groups like the weak and the strong; too many people are weak in some ways and strong in others.

21. a. When a person has a problem or a worry, it is best to face it and think it through, even if it is so upsetting that it keeps him from concentrating on other things.
b. When a person has a problem or worry, it is best for him not to think about it, but to keep busy with other things.

22. a. It is more important for this country to have a just legal and political system than a series of trustworthy leaders however courageous, tireless, and devoted they may be.
b. What this country needs most, more than laws and political programs, is a few courageous, tireless, devoted leaders in whom the people can put their faith.

23. a. An insult to honor should always be punished.
b. Insults to our honor are not always important enough to bother with.

24. a. Some people are born with an urge to jump from high places.
b. An urge to jump from high places is probably the result of unhappy personal experiences, rather than something inborn.

25. a. Every person should have complete faith in some supernatural power whose decisions he obeys without question.
b. It's all right for people to raise questions about even the most sacred matters.
Mean Responses to All Dependent Measures

<table>
<thead>
<tr>
<th></th>
<th>MALE</th>
<th></th>
<th>FEMALE</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Crowd-</td>
<td>Crowd-</td>
<td>Non-</td>
<td>Crowd-</td>
</tr>
<tr>
<td>1.</td>
<td>4.02</td>
<td>6.64</td>
<td>3.0</td>
<td>2.07</td>
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<tr>
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1. Final Questionnaire
2. Perceptual Defense
3. Negative Distribution
4. Positive Distribution
5. Question 1
6. Question 2
7. Question 3 (for all stimulus persons except Instructor)
8. Question 1, Experimenter-Adjacent Subject Difference Score
9. Question 1, Adjacent-Other
10. Question 1, Experimenter-Other
11. Question 2, Experimenter-Adjacent
12. Question 2, Adjacent-Other
13. Question 2, Experimenter-Other
14. Question 3, Experimenter-Adjacent
15. Question 3, Adjacent-Other
16. Question 3, Experimenter-Other
17. Question 1, Instructor
18. Question 2
19. Question 3
20. F-scale