Effects of Crowding on the Elderly: A Preliminary Investigation

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Elderly people living in dense urban environments experience many brief but repeated episodes of crowding in a number of settings. The purpose of the present investigation was to examine what effects, if any, short-term crowding involving close physical proximity has on the elderly. While men and women were more affected physiologically by the close physical proximity condition and reported feeling more crowded, they did not find the experience particularly aversive. These elderly subjects were not the least bit disturbed by bodily contact. In fact, they responded *more* positively to the members of their crowded group and rated the environment as "cozy." Results are discussed in the context of current theories of aging, control, and crowding.

At the present time, there is a growing concern over the problems confronting the aging individual in our society. The elderly represent the most rapidly growing minority in this country (Brotman, 1974). Between 1960 and 1970 their numbers and their proportion in the general population increased to a much greater extent than those below the age of 65 (Brotman and Williams, 1973). If the current decline in birth rate con-

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tinues, by the year 2000 one American in six may be beyond the age of 65 and there will be approximately 28 million older people (Brotman, 1971).

A number of negative consequences accompany the aging process and, as a result, many individuals feel less control over the environment as they grow older. Reductions in physical competence, along with the loss of major social roles, reference groups, and norms, negatively influence the older individual's feelings of usefulness and competence. As a result of this reduction in control over the social and physical environment, the elderly may further experience a number of basic changes in orientation (Clark, 1967). Further consequences of these feelings of loss of control and helplessness may involve withdrawal, depression, and sometimes early death (Schulz and Aderman, 1973).

When considering the impact of the preceding negative consequences that accompany aging, one must consider the amount of variability, individuality, and diversity that exists in the elderly population. The stereotyped view of old people as senile, feeble, isolated, and sick is inaccurate (Brody and Brody, 1974). Every individual who lives beyond the age of 65 does not necessarily experience feelings of helplessness and loss of control. A distinction may be made between "young old" and "old old" (Neugarten, 1974), with the "young old" representing those older people who are still able to exert active control over their environment. For example, as Sommer (1969) has indicated, only the affluent are clearly in a position to choose and can afford the comfortable settings of retirement communities segregated from the rest of society and best suited for their needs. Lower income groups must struggle just to maintain a minimal subsistence level and are often forced to live in run-down hotels or old-age homes (Thompson, Streib, and Kosa, 1960).

The unfortunate fact is that for many older individuals considerable disparity exists between their housing needs and preferences and the variety of living environments in which they are found (Woodward, Gingles, and Woodward, 1974). Most elderly people, because of their decreased physical, social, and financial status and their need for services, are forced to live in small, urban living units located in the inner city (Lawton, 1975). Atchley (1972) estimated that in 1960, 70% of all older Americans lived in urban areas. Moreover, these elderly populations were overrepresented in the urban core, where crowding is a major problem, and were underrepresented on the fringes of

cities. Similarly, Kennedy and DeJong (1975), using 1970 census data, found the aged to be overrepresented in the central city when they studied ten U.S. metropolitan areas, ranging in population size from 62,000 to 1.5 million. As a function of living in dense residential environments in these urban areas the elderly also experience many *brief but repeated episodes of crowding* in a number of settings (e.g., restaurants, shops, supermarkets, lines at popular movies, subways, buses, and trains). On many occasions these crowded city areas may be characterized by unpredictability and uncontrollability. Schulz (1976) has suggested that many negative consequences of aging (e.g., physical and psychological impairments) are mediated by exposure to unpredictable and uncontrollable environments. It is evident, therefore, that these crowded settings may have a tremendous impact on the behavior and functioning of the elderly.

Unfortunately, to date, there have been few attempts to assess the effects of these environments on the elderly. Physiological, behavioral, and social consequences have been demonstrated for non-elderly people, however, under crowded conditions even when the duration of exposure has been relatively brief (Aiello, 1976; Aiello, DeRisi, Epstein, and Karlin, 1977; Aiello, Epstein, and Karlin, 1975a). Moreover, under chronic residential conditions these effects have been found to be intensified (Aiello, Epstein, and Karlin, 1975b; Baum, Aiello, and Calesnick, 1977; Baum and Valins, 1977).

The present study was designed to investigate the effects of short-term (acute) crowding, involving close physical proximity, on the elderly. The available literature indicates that this form of crowding involving close physical proximity can be stressful. Aiello, Epstein, and Karlin (1975a) found that groups of males and females in small rooms evidenced higher levels of stress-related arousal and pronounced increases in these levels over time than they did when they were in a moderate-sized room. Similarly, Sundstrom (1975) found nonverbal concomitants of stress reactions among crowded subjects. Two factors, bodily contact and personal space preference, have been shown to function as mediators of short-term crowding involving close physical proximity. Nicosia, Hyman, Karlin, Epstein, and Aiello (1976) reported physiological evidence of stress reactions among crowded subjects and also found that a significant contributor to the stress of this form of crowding for many people was bodily contact. In a recent study, Aiello, DeRisi, Epstein, and Karlin (1977) found that individual differences in

personal space preference functioned as a mediator during the crowding experience for young adults. Crowding did not dramatically increase stress levels for subjects who felt comfortable interacting with others at close distances. In contrast, crowding acted as a noticeable stressor for individuals who preferred to interact at greater distances with others, and resulted in higher and more immediate increases in skin conductance levels as well as in greater reports of somatic indications of stress. These results may be explained in the context of the loss of established control processes and the breakdown of interaction-regulation mechanisms.

Few investigators have examined the desired involvement levels and spatial preferences of elderly persons that may influence their reactions when they are in crowded settings involving close physical proximity. Goffman (1963) has noted that in American society the very young and the very old have "special license" with respect to involvement levels, such that there are fewer restrictions applied to these age groups as pertains to appropriate distance norms. One might, therefore, expect that, as has been found for children (Aiello and Aiello, 1974), the elderly may choose to interact at smaller distances. DeLong (1970), in a study of the interaction distance preferences of mentally impaired, hospitalized elderly patients, found that they interacted at much closer distances than is typically observed for young adults. DeLong further noted that the interactions among the elderly are characterized by very high levels of sensory contact involving constant touch and bodily contact with each other.

In recent years, several models relating to the impact of environmental conditions on the elderly have been advanced. The "environmental docility hypothesis" proposed by Lawton and Simon (1968) states that the less competent people are, the more sensitive they are to changes in the environment. On the basis of this hypothesis, therefore, one might anticipate that complex crowded environments may have a significant impact on the elderly. The older person may be more dependent on the external environment because of reductions in physical competence due to poor health, limitations in cognitive skills, ego strength, and social role performances. Consistent with this expectation is the conceptualization of the "loss continuum" by Pastalan (1970) that holds that an individual's ability or desire to deal with complex environments decreases as they grow older. Additional support for the environmental docility hypothesis is

found in the data of a number of studies that have demonstrated that the elderly are affected by changes in their physical environment and that they are limited in their ability to overcome environmental constraints and limitations (Friedman, 1966; Messer, 1967; and Sommer and Ross, 1958).

An opposing viewpoint is held by DeLong (1970). He believes that older individuals, many of whom have experienced a decrease in sensory capabilities are actually living in a "different" perceptual world and are therefore less sensitive to environmental constraints and manipulations. Further, since the elderly interact at closer distances and prefer more bodily contact than young adults, one would expect them to perceive a dense, cramped area as less crowded. DeLong further cites anecdotal evidence indicating that the elderly actually prefer densities of people and objects nearly intolerable for the younger members of the American population.[1]

The preceding two views are not necessarily mutually exclusive, however. Even if the elderly do prefer close interaction distances as DeLong suggests, it does not necessarily mean they will not experience any stress-related arousal when placed in a crowded setting. A recent study by Aiello (1976) demonstrated that crowding can have negative consequences even for young children, who have smaller physical structures and smaller personal space preferences than adults. Crowded subjects, even at nine years of age, showed greater increases in skin conductance level over time and reported greater feelings of annoyance and greater discomfort. Following crowding, they were more competetive than their noncrowded peers. Therefore, it may be possible that, despite the fact that they prefer closer distances, the elderly may still perceive a situation as crowded. Moreover, once perceived as crowded, the elderly may even be more sensitive to the negative effects of crowding (e.g., increasingly high levels of physiological arousal) than younger adults.

In the present experiment, the dependent variables were chosen to reflect reactions across observation levels so as to better assess the effects of short-term crowding on the elderly. This is consistent with our previous suggestion that multiple levels be employed in studies of human crowding (Aiello, Epstein, and Karlin, 1974, 1975a). There were three principal ques-

[1]Caution should be employed in generalizing DeLong's findings, however, since his sample consisted of "mentally impaired," institutionalized elderly individuals.

tions to be answered by the present study: (1) how would groups of elderly men and women characterize a small or moderate-sized room after experiencing one of these rooms for a short period of time; (2) would elderly subjects in the small room experience greater stress-related arousal over time than their counterparts in the moderate-sized room; and (3) how would elderly men and women characterize their fellow group members under each of these experimental conditions.

METHOD

Subjects

The subjects were 56 white elderly people (36 females, 20 males) who were members of various community organizations (e.g., church groups, women's clubs, and senior citizens' clubs). Ages ranged from 60 to 90 years, with a median age of 70. All of the subjects volunteered for participation in the experiment, titled "Investigating the effects of environment on human behavior." The subjects were screened for extremely poor visual handicaps which might have interfered with their ability to complete the written post-experimental questionnaire. Information regarding medication was also gathered and all individuals who had high medication levels or who were on tranquilizers were excluded from participation.

Background demographic information obtained from the subjects at the time of the investigation indicated that half of the subjects were divorced or widowed and half were married; 70% were high school graduates; and that subjects represented a number of different ethnic groups. Most subjects reported residing in towns with populations of under 100,000 for most of their lives. At the time of the present investigation, one-third of the subjects were living in residential settings consisting of 2-3 rooms, one-third in dwellings with 4-6 rooms, and the remaining third in settings consisting of 7 or more rooms. In addition, one-third reported living alone, one-third with another person, and one-third with two or more people.

Procedure

Given the nature of the population under study in the present experiment, it was deemed appropriate to carry our laboratory out into the community centers where senior citizens are located. Portable partitions were brought to each of the neighborhood settings in order to create the small and moderate room-size conditions. In the small (4'x4') room, subjects sat so close together that their shoulders touched the shoulders of the person adjacent to them and their knees touched the knees of the person seated opposite them.[2] In the

[2]This spatial density manipulation was chosen so as to reflect the particular type of short term (episodic) crowding that involves close physical proximity of others and violations of personal space.

moderate sized (8'x8') room, subjects sat five feet from the subject adjacent to them and five feet from the subject across from them. Identical plastic molded chairs without arm rests were arranged in two rows of two seats each in both experimental conditions and distance between them was held constant throughout the experiment. Two same-sexed groups of four subjects each were run simultaneously in the two experimental conditions for each experimental session. On two separate occasions, however, there were fewer than eight subjects available, and consequently only single same-sexed groups (one male and one female, both of the small-room condition) were run.

When eight same-sexed volunteers were selected from a group of senior citizens, they were first screened in order to ensure that they were not well-acquainted. Subjects were then randomly assigned to either the small or moderate-size room conditions and received a colored number badge from one to two female undergraduate experimenters. Subjects who were assigned to the small room received one of four red badges; those assigned to the moderate-sized room received one of four blue badges. Next they were taken to one of the two experimental rooms, seated in chairs whose numbers corresponded to the number of their badge, and asked to remove any watches or jewelry. The palmar surface of the third finger of each subject's nonpreferred hand was then rubbed with acetone. Zinc electrodes coated with a zinc-sulfate-sodium chloride in "unibase" mixture were then fastened to the third finger of each subject's hand. These electrodes were used to measure each subject's skin conductance level (for a more detailed description of this procedure, see Aiello et al., 1975a).[3] Subjects were told that the experiment was investigating the effects of different environments on physiological responses. They were further instructed to remain seated, not to talk and to rest the hand with the "measuring device" on their thigh. No tasks were performed while subjects were in the small or moderate-sized rooms so that subjects would not be distracted from the environment. Subjects were reassured that there was no danger involved in the electrodermal skin conductance measure. Upon conclusion of these instructions the experimenters left the rooms and entered a second room, where after 3 minutes they began recording skin conductance level responses, both for each total group and for each individual subject. Responses were recorded at 15 second intervals for a period of 15 minutes, yielding a total of 12 equally spaced trials.

After sufficient physiological data were collected, the experimenters returned to the rooms and removed the subjects' electrodes. Both groups of subjects were then taken to a single area where the Tajfel task was administered by a third female undergraduate experi-

[3]It should be noted that precautions were taken throughout the experiment (e.g., experimental sessions were scheduled at similar times of the day and room temperature and humidity were controlled), since the measurement of SCL is subject to a number of artifacts (Montagu and Coles, 1966). In addition, the composition of the electrode paste used minimized the possibility of any hydration artifact (Blank and Finesinger, 1946).

menter. A detailed description of this measure of group cohesiveness that asks subjects to choose between allocating points to an unidentified member in their group or in another group can be found in Tajfel (1970). On the two occasions when only four same-sex subjects were available the Tajfel directions were modified for a single group run. These subjects were told that our colleagues at a local college were currently conducting this same investigation with another group of same-sexed senior citizens.

Following the completion of this task, the subjects were given a post-experimental questionnaire assessing: their perception of the experimental environment, their reactions to various phases of the experiment, and their attraction to their group, along with some questions requesting background demographic information. In order to facilitate legibility, the entire questionnaire was typed in upper case letters and was double-spaced. The experimenter also read the questionnaire and the instructions aloud and encouraged subjects to ask for help if they experienced any difficulty in reading or understanding the material. Finally, upon completion of this questionnaire, subjects were debriefed.

RESULTS AND DISCUSSION

Post-experimental questionnaire data (see Table 1) indicated that the crowding manipulation was effective.[4] Compared with noncrowded counterparts, subjects in the crowded condition considered the experimental room smaller ($F = 3.00$) and more crowded ($F = 34.50$). However, unlike younger adults and children who have also reported feeling crowded under similar environmental conditions, the crowded elderly subjects did not characterize their group room as confined or uncomfortable. Moreover, they did not report feeling tense or irritated, or lacking privacy as one might also anticipate on the basis of previous research findings (Aiello, 1976; Aiello et al., 1977; Aiello et al., 1975a). Instead, it appears that although the elderly subjects in the small room reported feeling crowded, they rated

[4]Two-way weighted means analyses of variance (Sex x Room Size) were carried out on the post-experimental questionnaire responses and the scores of the Tajfel task. The total number of subjects per cell were: 20 crowded female subjects; 16 uncrowded female subjects; 12 crowded male subjects; and 8 uncrowded male subjects. Degrees of freedom associated with the obtained F ratios are 1 and 52 or 53. The twelve measurements of skin conductance levels gathered for each subject were divided into three trial blocks; means were computed for each block; and log transformations performed on these means. These log transformed scores were then analyzed with a 2 x 2 x 3 analysis of variance with repeated measures on the last factor (Sex x Room Size x Trial Block). Degrees of freedom associated with the obtained F ratios are 2 and 104. Due to the exploratory nature of this study and so as to increase the power of the tests being performed, all results reported in this study will be evaluated using an alpha value of .10.

Table 1
Mean Post-Experimental Questionnaire Ratings and Tajfel Task Scores as a Function of Experimental Condition*

	Condition	
	Crowded	Noncrowded
Characterize Group Room:		
Crowded	6.2	2.0
Smaller	6.2	4.9
Cozy	6.8	5.5
Individual Feelings While in Group Room:		
Less aggressive	6.7	4.7
Less afraid	8.1	6.7
Less scrutinized	4.9	3.5
Friendly	8.3	7.0
Smiling Eased Discomfort	5.2	3.7
Disturbed by Bodily Contact	1.3	1.8
Characterized Other Group Members:		
Helping	8.5	6.6
Friendly	7.6	6.7
Kind	8.4	7.6
Warm	6.8	5.9
Happy	7.4	6.5
Tajfel Task Score	28.9	24.5

*Scale ranges from 1 to 9 for questionnaire responses and from 3 to 42 for Tajfel Talk scores; higher scores are more characteristic of designated responses or or Tajfel scores, of greater cohesiveness.

the experimental room as rather "cozy" ($F = 2.81$). When compared with the noncrowded subjects in the moderate-sized room, crowded subjects further reported feeling less aggressive ($F = 6.57$), less afraid ($F = 4.35$), less scrutinized ($F = 3.51$), and friendlier ($F = 4.41$) while in their small group room. In addition, these elderly subjects more commonly perceived that the smiling of their group members eased any discomfort they may have been experiencing ($F = 3.40$) in the crowded room. It is also of interest to note that the elderly subjects in the crowded condition reported that they did not feel the least bit disturbed by the bodily contact they experienced while in the small room ($F = 3.40$). This finding clearly diverges from previous research evidence obtained with younger adults, in which bodily contact has been found to contribute significantly to the amount of stress experienced in reaction to a crowded environment (Nicosia et al., 1976). Nevertheless, the preference for touching

exhibited by our elderly subjects is quite consistent with previous observations others have reported regarding their predilection for closer physical contact with others (DeLong, 1970; Lawton, 1975).

Overall, these results indicate that elderly subjects in the small room condition perceive the environment as crowded but apparently do not find the experience particularly aversive. In fact, as the above findings indicate, it was actually viewed somewhat more positively than the noncrowded experience. When compared with their noncrowded counterparts, the elderly subjects in the crowded condition characterized other members of their group as: more helping ($F = 9.60$), friendlier ($F = 2.97$), warmer ($F = 5.90$), kinder ($F = 2.90$), and happier ($F = 2.97$). Moreover, analysis of the Tajfel task scores revealed that crowded elderly subjects had a greater preference for their own group members (indicating greater cohesiveness) than did the noncrowded elderly subjects for members of their own groups (who were less cohesive). Taken together this is exactly what one might expect to find on the basis of DeLong's (1970) observations that the elderly prefer to interact at closer distances and, therefore, actually prefer densities of people and objects that would be nearly intolerable for younger people. Two alternative explanations should also be noted. First, the elderly subjects were probably quite happy to participate in the study (as it was something interesting and different to do) and to get together with their peers. Thus, the high spatial density may have intensified their experiencing and reporting of greater levels of positive affect, as would be predicted by Freedman's (1975) density-intensity model. Second, as Worchel and Teddlie's (1976) misattribution model might predict, the crowded elderly subjects might have mislabeled any feelings of arousal which they may have experienced. Since the nonverbal cues emitted by the other subjects (e.g., smiling) may have suggested that they were experiencing the crowded situation as a happy, pleasant one, these subjects may in turn have labeled themselves as happy.

In spite of the fact that elderly subjects did not perceive the crowded environment, which involved bodily contact, as aversive and that they perceived a great deal of social support from fellow group members, they were nevertheless strongly affected by the experimentally created, crowded environment.

The physiological data obtained in the present study revealed that crowded men and women experienced greater increases in skin conductance level over time than did those

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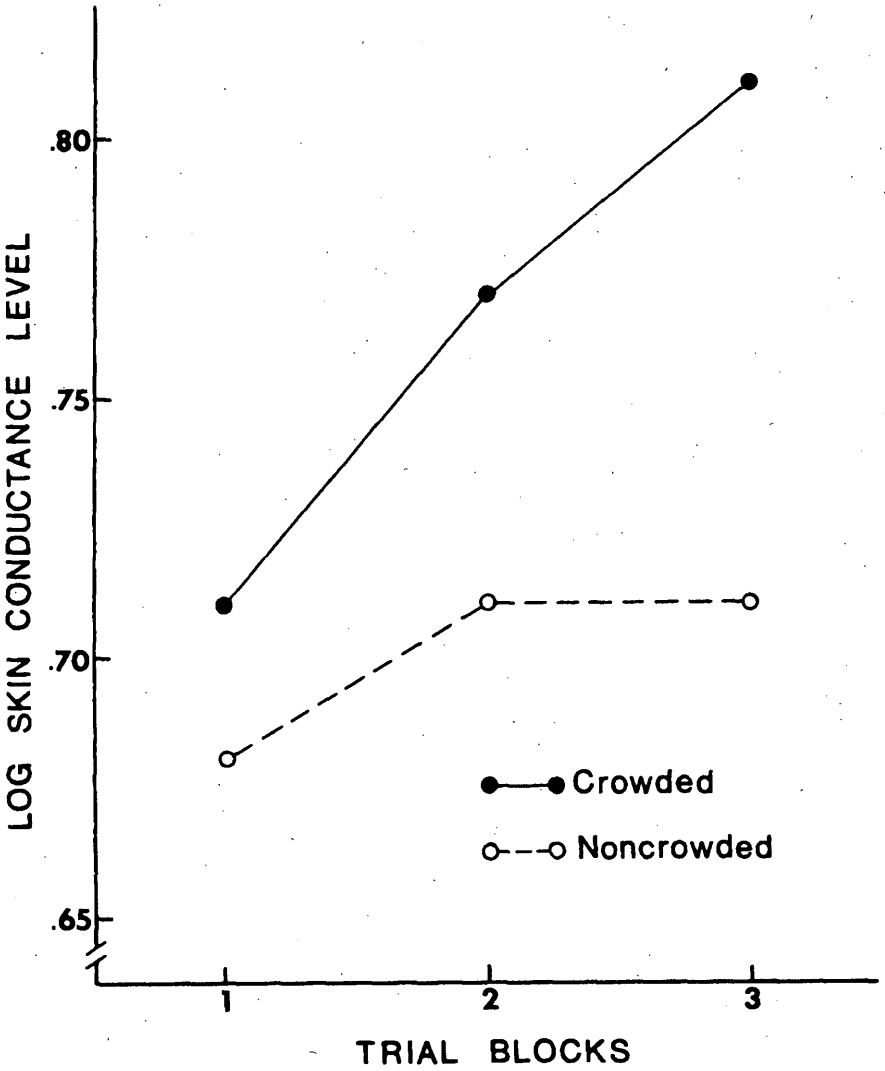

FIGURE 1. Mean log skin conductance level as a function of room size (N=56).

elderly subjects who were in the noncrowded comparison group condition ($F = 3.00$). Therefore, Lawton's "environmental docility" hypothesis does receive support from the data in the present study.

An interesting pattern of responses appears to have emerged. The above results demonstrate that despite the fact that they are quite strongly affected physiologically by the

crowded environment the elderly view their experience "positively." It also appears that under conditions which are characterized by unpredictability and uncontrollability and are labeled as "crowded" elderly individuals seek support and comfort from their fellow group members. This pattern of responses is very similar to that which has been observed for younger female adults in crowded environments (Aiello et al., 1977; Epstein and Karlin, 1975; Freedman, Levy, Buchanan and Price, 1972). Like younger crowded women, elderly men and women react *more* positively to the members of their crowded group than do their noncrowded counterparts to members of their groups, apparently finding some consolation in sharing the crowding experience. This process may also be lending support to Lipman's (1961) contention that there is a generalized merging of the traditional sex roles in later life.

While elderly males and females reacted similarly to the crowded conditions on the above factors, they do exhibit some disparate responses on several other variables that are consistent with (but, in general, somewhat weaker than) patterns exhibited by younger adult males and females. For example, elderly males showed a greater tendency to report feeling more uncomfortable in the crowded room, whereas females tended to feel more uncomfortable in the noncrowded room ($F = 2.60$). When asked to characterize members of their group, crowded males viewed their peers as less friendly ($F = 2.93$), while females characterized their fellow group members as less friendly in the noncrowded condition. Consistent with this, males tended to prefer to socialize with their group members at a later date more in the noncrowded condition than in the crowded condition. In contrast, females showed a tendency for preferring to socialize after participation in the crowded condition ($F = 2.65$). Moreover, when asked to what extent they had focused on something other than how crowded they were, crowded females indicated less of a need to psychologically escape from their environment than did the other three groups ($F = 2.65$). Lastly, crowded males and noncrowded females expressed the greatest desire to actually leave their group room ($F = 2.80$). Taken together, these results (see Table 2) indicate that there remains some residue of the sex differences in response to crowded conditions that have been found for younger adults, but that there is a considerable narrowing of these differences between the sexes later in life.

It should be noted again that this was an exploratory study of

Table 2
Mean Post-Experimental Questionnaire Rating as a Function of Room Condition and Sex*

	Crowded		Noncrowded	
	Male	Female	Male	Female
Uncomfortable	4.2	3.2	2.9	4.5
Unfriendly	1.9	1.1	1.6	2.6
Prefer to socialize with their group at a later date	7.1	7.7	7.8	6.3
Extent focused attention on something other than how crowded they were	3.8	2.2	3.0	3.9
Extent they wanted to leave the group room	6.6	5.9	5.4	7.2

*Scale ranges from 1 to 9 for questionnaire responses; higher scores are more characteristic of designated responses.

the effects of crowding on the elderly. Our purpose was to determine whether short-term crowding was a relevant topic for study with the elderly, who are the most rapidly growing minority in our country, especially since they are so over-represented in crowded urban environments. The intriguing pattern of results that we obtained clearly suggest that further work in this area would indeed be desirable.

The present findings that indicate the elderly do experience high and increasing levels of arousal under short-term crowded conditions (even if they do not fully recognize it), suggest that repeated exposure to these crowded settings (e.g., transportation facilities) may have a significant impact on the behavior and well-being of elderly individuals. Schulz (1976) has noted that many of the consequences of aging are in fact influenced by exposure to unpredictable and uncontrollable environments (e.g., crowded settings). Both Schulz and Langer and Rodin (1976) demonstrated the positive effects of increased control upon the general physical and psychological well-being of institutionalized elderly. Future research could explore how noninstitutionalized elderly residents of urban areas may be provided with a greater sense of personal control to more effectively cope with the stressors present in these environments.

Since crowding was associated with higher levels of arousal,

more information is needed regarding the relationship between physiological indicators of stress and their effects on the elderly. At the present time, architectural plans for living environments that would be the most comfortable and the most preferred by the elderly would most likely consist of numerous, small, cozy rooms. It could prove extremely dangerous, however, to limit the space available to the elderly if high levels of arousal result from crowding, since stress is so extremely hazardous in this latter phase of life. Of course it is necessary to keep in mind that the present results were obtained under "crowded" conditions in which four people were present in the environment. Since two-thirds of our elderly subjects reported living alone or with one other person, our results should be generalized with caution. Our findings, therefore, may only generalize to settings in which a number of other people are present and not to densely populated residential areas in which people live alone and not frequent dense urban facilities or settings.

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