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Density, Personal Control, and Design*

Here Sherrod and Cohen demonstrate the importance of control in ameliorating the stress of such adverse environmental properties as high density and low predictability. The cognitive perspective is central to their analysis: the way the person perceives or interprets the situation is the essential determinant of its influence.

■ High-density environments are often — but not always — uncontrollable environments. This distinction may be the key in understanding the circumstances under which density adversely affects behavior. In addition it suggests a number of design-related interventions that can increase the controllability and livability of environments.

High density determines the perceived controllability of environments in two ways. First, the close presence of others can restrict and interfere with the attainment of one's goals. Second, when high density involves the close presence of *strangers*, the environment is not only restricting but also unpredictable — a possible source of irritation or surprise — and thus potentially uncontrollable. Under other circumstances, high density may not be perceived as uncontrollable at all. For example, if goal attainment is not an important issue or if the others present are not strangers, people may experience no loss of control in high-density environments.

The distinction between the effects of density, on the one hand, versus those of control and predictability of environments, on the other, is helpful in clarifying the confusing results of crowding research. Studies of density by itself have found few effects on human behavior. In contrast, studies of uncontrollable environments have produced a variety of ill effects on human behavior. Thus, it may not be high density per se, but only uncontrollable high density which is responsible for the negative effects popularly associated with crowding and sometimes observed in research on human density. In a practical sense this could be a very fortunate finding. While high density is no

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doubt an unavoidable fact of life for most urban dwellers, controllability is a perceived relationship between self and environment. As a perceptual or cognitive phenomenon, controllability can be altered and fostered by a variety of cognitive, social, and environmental factors. As a result, the effects of "uncontrollable" density can be reduced without reducing density itself. The present paper is an attempt to distinguish between density and controllability in the research literature. In addition, we hope to show how controllability of environments can be increased by taking account of user needs at several stages in the design process.

RESEARCH ON HUMAN DENSITY

Research on the effects of human density is beginning to accumulate. Although differences in density manipulations, measures, and mediators make the findings difficult to compare, tentative conclusions are possible. One conclusion based on numerous correlational and experimental studies is that density by itself has fewer and smaller effects on human behavior than anyone expected (see Cohen, Glass, and Phillips, in press, for review). [Ed. Note: cf. McClelland's paper in chapter 7.] Overall, several studies — which primarily deal with families residing in high-density dwellings — have found no negative effects of density strong enough to register consistently on measures of crime, physical or mental health, and social disorganization.

Do these finding of well-controlled correlational studies suggest that density is unlikely to affect human behavior adversely in any context? We think not. When the focus of researchers shifts from general populations to specific subgroups low in environmental control, density effects do emerge. Also, laboratory studies suggest that high density does exert negative effects on behavior in certain situations and on certain kinds of tasks.

In contrast to the studies of residential density, research dealing with population subgroups low in environmental control has revealed pathological effects of internal density. Thus, Cohen et al. (in press) argue that the evidence for pathological effects of high density is largely limited to populations such as the young (Booth, 1975), the lower class (Mitchell, 1971), ship crews (Dean, Pugh, and Gunderson, 1975) and prisoners (D'Atri, 1975) — all groups with limited environmental control. Similar results have also been reported for college dormitory residents who were tripled in two-person rooms and presumably lacked control over their social interactions (Baum, Harpin, and Valins, 1974).

Recent laboratory research also suggests that the high density can have detrimental effects on human task performance, despite Freedman's (1975) well-publicized argument to the contrary. While

several studies have found no effects of short term high density on *simple* task performance (Freedman, Klevansky, and Ehrlich, 1971; Sherrod, 1974; Worchel and Teddlie, 1976; Evans, 1976; Rodin, 1976), two recent studies have shown that density can adversely affect *complex* task performance. Evans (1975) found that subjects in a high-density laboratory setting performed less well on a dual information processing task than low-density subjects, and Paulus and his colleagues (Paulus, Annis, Seta, Schkade, and Matthews, 1976) demonstrated that high density interferes with human maze learning. In addition, several studies have found that high density produces negative aftereffects on a measure of frustration tolerance (Sherrod, 1974; Evans, 1975; Dooley, 1976). Thus, while it is clear that short-term high density does not affect simple task performance in the laboratory, high density does seem to affect complex task performance, to reduce post-crowding frustration tolerance, and to interfere with verbal problem solving when combined with personal space invasion.

COGNITIVE FACTORS IN HUMAN DENSITY

What do the above situations have in common that may account for the effects of high density? We believe that they are all situations where controllability is important. The laboratory studies provide a clear demonstration of our point. Strangers in a crowded laboratory may be perceived as unpredictable, and thus potentially uncontrollable. According to a recent theoretical paper by Cohen (in press), the unpredictability of others is likely to impede complex but not simple task performance. Cohen argues that unpredictable and uncontrollable environments require close monitoring so that individuals may protect themselves from potential threat or surprise. Such monitoring of the environment demands attentional capacity that would otherwise be available for high information processing needs, such as complex task performance. Thus, unpredictability may disrupt complex task performance but not affect performance on less demanding tasks. Similarly, strangers who are invading an individual's personal space also increase the unpredictability of an environment, perhaps more seriously than strangers merely in close proximity. Consequently, the unpredictability of personal space invasion may impede performance on a cognitively demanding task such as verbal problem solving.

Crowded environments also have a second effect, as we noted at the outset of this paper. Crowding not only increases unpredictability of environments but also restricts freedom and constrains behavior, in effect producing a sense of helplessness. According to Seligman's theory of learned helplessness (1975), uncontrollability diminishes motivation by setting up an expectancy that an individual's responses are independent of outcomes — in other words, that responses don't

matter. As a result, organisms emit fewer responses, and this tendency can generalize to subsequent situations. Consequently, high density may create a sense of learned helplessness that could influence responses on postcrowding measures that are sensitive to motivational deficits, for example, a measure of frustration tolerance.

Each of the three performance situations in which high density has produced negative effects — i.e., complex task performance, personal space invasion, and postcrowding frustration tolerance — may therefore be interpreted as resulting from environmental unpredictability or uncontrollability rather than density per se. Two studies provide direct support for this interpretation. In the first, Rodin (1976) demonstrated that children from high-density environments performed in a laboratory setting as if they were "helpless."

In the second study, Sherrod (1974) showed that a perception of control can reduce the aftereffects of short-term laboratory crowding. In this study, subjects were exposed to either high or low density. Some of the high-density subjects were informed that they could leave the crowded room whenever they chose in order to work in another less crowded room. Although no subjects actually left the crowded room, subjects with perceived control over crowding performed better on postcrowding measures of frustration tolerance than subjects who had no control.

Indirect support for the assertion that perceived control can reduce the effects of crowding can be found in several other studies. Schopler and Walton (1974) found that Internals (people who generally feel in control of themselves and their environments) felt less crowded in a high-density setting than Externals (people who feel controlled by the environment). Similarly, Karlin, Epstein, and Aiello (1975) found that Internals were less influenced by group processes in a crowded environment than Externals. Also Baum, Harpin, and Valins (1975) found that members of cohesive groups felt less crowded in high-density dormitories than people who aren't members of cohesive groups. If we assume that cohesive groups allow for greater predictability and consequent controllability of one's environment, then this study fits in well with our perspective. Finally, Worchel and Teddlie (1976) found that when crowded people are distracted from attending to the close proximity of other persons by the presence of attractive wall posters, they experience the environment as less crowded and perform better on verbal puzzle-solving tasks. In this experiment, when subjects' attention was diverted from the presence of other people in the crowded environment, it is possible that subjects then felt less concerned about the issue of control than subjects whose attention was not distracted. Each of these studies, then, provides some indirect support for our perspective regarding human density and control.

EFFECTS OF PERSONAL CONTROL

Controllability also has independent effects on human behavior above and beyond the effects of density. The belief in one's ability to control the environment has been clearly shown to have a variety of important psychological effects. In their work on urban stress, Glass and Singer (1972) found that individuals who had some perception of control over loud noises, electric shock, or frustrating bureaucracies performed better on measures of frustration tolerance and attention to detail than did subjects who had no perception of control, even though none of the subjects with perceived control ever actually exercised their options and escaped the environmental stressors.

From another perspective, Seligman and his colleagues (cf., Seligman, 1975) have demonstrated that both animals and humans tend to give up in a free response situation if they have experienced prior uncontrollable aversive stimulation. Not only do such individuals tend to give up when their continued responses could actually bring about relief from stress, they even fail to learn when environmental contingencies have changed and their responses could finally be successful. In contrast, when individuals are exposed to prior escapable aversive stimulation, they easily learn that subsequent situations are also escapable and they quickly emit the necessary responses.

In still another approach to the control issue, de Charms (1968) has argued that uncontrollable situations cause individuals to see themselves as "Pawns" of the environment, while persons who feel in control of the environment come to see themselves as "Origins." A self-perception as an Origin or a Pawn affects one's general sense of competence and motivation for behavior. Pawns respond with passivity across a variety of situations as if they were helpless, while Origins emit a high level of voluntary responses, in the belief that they can successfully manipulate the environment. These theories suggest that a sense of controllability may not only reduce the effects of uncontrollable high density, but also may serve to alter an individual's expectations about the value of voluntary responses and to influence one's self perceptions as a competent human being.

PERSONAL CONTROL AND THE DESIGN PROCESS

If the perceived relationship between self and environment can produce such profound consequences in the laboratory, a relevant question then becomes, to what extent is it possible to increase people's perceptions of controllability in real-world settings. As we noted at the outset of this paper, while crowding is often an unavoidable physical fact, perceived control is an alterable cognitive phenomenon. It is important to emphasize that the belief in one's ability to control the environment need not imply the ability to actually implement control. Perceived control *may* result from actual control, but it can also result

from prior control experiences, from information suggesting that control is potentially available, from self inferences, or from any social or physical intervention that makes the environment appear more manageable or predictable. Perceived control may even be illusory, but its effects on human behavior can be significant, as numerous experiments have shown.

We believe that an individual's sense of control over the environment can be enhanced in a variety of ways. Environments can not only be physically designed so as to make them more controllable, they can also be made to *appear* more controllable as a result of social and cognitive interventions. [Ed. Note: While these comments may make it appear that a cognitive or informational perspective sanctions deception, quite the opposite is the case when a broader perspective is considered. Humans value information; they likewise would be expected to value reliable sources of information. The converse, however, is also likely. In other words, humans strongly dislike being lied to. A source that has lost its credibility is, effectively, a source no longer. This can make deception an unacceptably costly proposition.]

A major issue in designing more controllable environments is a problem that can be labelled "environment-function fit." Simply put, when the environment fits well with the functions to be performed there, the environment is manageable; if there is not a good fit, the environment is less manageable, less controllable. To determine environment-function fit, designers must take into account the demands of the tasks and behaviors to be performed in the environment. For example, what will be the effect of environmental distractions on task performance? How important is social support and communication, and to what extent does the environment allow for this? While it is impossible to outline all relevant factors for any particular environment, the essential point is that an advance analysis be made of the task functions and social functions to be performed in the environment. Manageable environments are predictable and controllable, while "nonfitting" environments deprive one of perceptions of control.

The best way of assessing potential environment-function fit is to go directly to the users — not the administrators and managers, but the users. Not only should uses and patterns of behaviors be observed and surveyed, but the users should also be directly involved in planning and specifying the design needs. [Ed. Note: This issue is discussed further in the last chapter.] User participation in the design process allows a sense of personal control over the environment. Even if users choose not to participate, they can still benefit from the opportunity.

Other design factors relate more specifically to high density. As we pointed out earlier, density can increase unpredictability in environments and can create feelings of helplessness by restricting be-

havioral options. While unpredictability is probably not a significant factor within the home,where others are generally well known, density may nevertheless produce feelings of helplessness, as demonstrated by Rodin's experiment. Perhaps a design feature which could increase feelings of control in residential environments would be to build "escape rooms" — private nooks or enclosed nodules — when economically feasible. Even when the space is not in use, its mere availability could ameliorate some effects of density. Such private spaces might be included in apartment houses or dormitories in the form of small private rooms that residents could reserve for reading, writing, or just a time to be alone.

Outside the immediate family, unpredictability becomes a factor that can influence the effects of crowding. For example, the greater the number of tenants in a building, or the more apartments on a corridor, or the more people who must use a recreational area, then the less likely are residents to know each other well and the more unpredictable are the others to whom one is exposed. However, friendship formation and predictability can be increased by building smaller apartment houses, breaking up long corridors, and decreasing the number of people served by a recreational area. Such practices would foster community, decrease anonymity, and make environments more predictable and controllable. In addition, by encouraging the development of cohesive groups, such environemnts may actually cause people to feel less crowded, as demonstrated by the research of Baum, Harpin, and Valins.

Other features can be incorporated into the larger urban environment to increase perceptions of control. As Lynch (1960) has argued, urban environments are more "codable" when they include salient features such as well-defined neighborhoods, landmarks, points of interest, and clear pathways. Such features allow individuals to form clearer cognitive maps of an area, facilitate information processing, increase predictability, and enhance perceptions of control. In addition, as Jacobs (1961) has argued, when buildings and communities are designed to encourage the use of streets and sidewalks, a sense of community develops and the streets become safer. From our own perspective, when the streets are friendlier and safer, they are less threatening and more predictable.

In summary, we have suggested a number of ways that predictability and controllability of environments can be increased. The research suggests that greater perceptions of controllability can influence a wide range of behaviors. Moreover, controllability may be the single most important factor that mediates the effects of crowding. As we have argued throughout this paper, the effects of crowding depend upon the behaviors being performed in an environment as well as the

individual's appraisal of the environment as controllable or uncontrollable. In a real sense, the most important determinant of human behavior may not be the physical environments we inhabit, but the cognitive environments we perceive. ■

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