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Environment

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Environmental Psychology:
Theory, Methodology, and Research

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RUNNING HEAD: Environment

Abstract

The purpose of this literature review is to introduce the reader to the emerging field of environmental psychology. The first section deals with problems and challenges of theory and methodology in environmental psychology, and is followed by samples of research in the areas of visual perception, noise, and spatial perception. Finally, two areas, women and the environment and residential satisfaction, selected by the author as important topics for further investigation, are described briefly. It is concluded that since environmental psychology appears to be growing as a field, it is crucial that clear communication be established between environmental designers and those individuals they serve.

Environmental Psychology:

Theory, Methodology, and Research

A look at the research that has been carried out to date reveals that environmental studies have emerged in a haphazard manner, addressing a wide range of topics, and have therefore failed to build on one another to create a coherent, organized body of research. Why has this happened? Early researchers designed their studies for the sake of resolving practical problems and, therefore, were not concerned with devising a theoretical framework to contain them (Levy-Leboyer, 1982). This remains a difficult task because environmental psychology clearly overlaps with other established areas of psychology such as perception, and social psychology, not to mention another closely related discipline, architecture. As a result of this overlap, environmental psychology has borrowed theoretical models and assessment techniques belonging to these fields to explain the person-environment relationship, and has neglected to develop its own. Due to the difference in perspective between environmental psychology and traditional areas of psychology, there are questions which arise concerning the adequacy of these instruments for measuring and explaining the phenomena which environmental psychology addresses.

In a review of the literature on this emerging field, Stokols (1978) lists what he considers to be three main characteristics which set this field apart from others in psychology: first of all, the en-

vironment is analyzed, not by observing the effects of a single stimulus on a particular target, but by examining the multiplicity of variables that are present in the relationship of a person to his or her surroundings. That is, the environment is construed on a molar, not molecular level. Secondly, environmental psychology is more scientific in its approach to solving community-environment problems than are most areas in psychology. Thirdly, as was mentioned earlier, environmental psychology covers numerous disciplines in both its research and application. The first of these is perhaps the most significant characteristic of this rapidly developing field, and has been discussed by many researchers who see it also as the primary issue in environmental psychology: how to measure the effects and interaction of all these variables with each other and on the individual.

H.M. Proshansky (1976), writing about environmental psychology and how it relates to the "real world" stresses that the individual must be studied in the physical setting, taking into account content orientation (purposes and kinds of settings), time orientation, and context orientation (e.g. cultural factors). Cause and effect relationships need to be replaced by patterns of relationships, an approach which is more descriptive than it is explanatory, and more qualitative than quantitative. He adds, as have other writers on the topic, that environmental psychology is problem-oriented rather than principle-oriented. Attempts at formulating theoretical bases for environmental

psychology essentially fall into two categories, according to Levy-Leboyer (1982): the deterministic view, which presents the individual as a passive reactor to the environment, and the view, espoused by Proshansky above, that environmental psychology should be examined as an interaction of the person and the environment, one affecting the other with equal intensity. Stokols (1978) supports this analysis of the theoretical status of environmental psychology adding that controversy has also arisen as to whether the environment should be interpreted in objective or subjective terms. However, Levy-Leboyer believes that what appear to be opposing theories are really just different approaches to understanding environmental psychology.

One of the first models designed for evaluating the environment is included in the general framework of "ecological psychology," a term which is generally associated with the name, Roger Barker. Barker's model tried to move away from looking at the environment's effects on the individual and the individual's effect on the environment. Instead, he suggested the study of the "behavior-setting," which essentially is composed of physical boundaries, temporal boundaries, and particular activities as defined by physical, social, and cultural variables. When all of these factors are pulled together, the range of permitted, expected, and possible behaviors which can take place in a particular setting (e.g. church, bar, basketball court) becomes restricted. Levy-Leboyer presents three consequences of this theory: 1) the inhabitants have

control over what takes place in the environment--they set the goals and regulate the behaviors that take place therein 2) the environment-behavior relationship is flexible enough to adjust to individual differences and still remain within the expected boundaries 3) there is variability not only between the inhabitants of a setting, but also between ecological variables within the setting. For instance, Barker investigated the effects of having too few or too many people regulating behavior-settings and found that individual participation increased when a setting, such as a church or a school, had a small population, and that it decreased as the population size increased. So the behavior-setting is not defined by the person first, and the environment second, but by the two interacting simultaneously.

Another model which has served as the basis for some of the environmental research is that of "cognitive sets." Leff, Gordon, & Ferguson (1974) define a cognitive set as "a plan to select specific types of data for the processing or to perform specific mental operations on information being processed." (p.396). According to these authors there are five factors which cognitive sets can influence: 1) competence--it's important for people to experience this in relation to both the environment and themselves 2) comprehension--this is necessary in order for an individual to function effectively 3) complexity--refers to psychological arousal 4) composition--this refers to the content, meaning, and significance of the environment, which can determine affective arousal in the individual 5) adaptation (comparison) level--

cognitive sets may lead the individual to make changes in his or her surroundings in order to increase satisfaction. A study on cognitive sets and the perception of place (Ward & Russel, 1981) found that there are different cognitive sets, such as emotion, activity, and function, and identified five dimensions (i.e. natural versus man-made, vertical versus horizontal, land versus water, interesting versus dull, and small versus large) which a cognitive set might select for focused attention if the particular situation demanded it. However, these researchers indicate that most often cognitive sets are used to select those aspects of the surroundings which are relevant and useful for establishing the meaning of a place.

A new perspective on the person-environment relationship was recently presented by a Swiss psychologist, Urs Fuhrer (1983), who introduced Oekopsychologie, Oekologische Psychologie, and Umweltpsychologie, three concepts which combined refer to our broader English term, "environmental psychology." Fuhrer defines Oekologische Psychologie as being "concerned with the scientific investigation of the relationships between human action and its environment." He does not equate this with "ecological psychology," a theory in which he believes Barker has emphasized the "ecology" aspect much more than the "psychology" to the point of failing to adequately integrate the two areas. In spite of this criticism he does not recommend that Barker's concept of the behavior-setting be discarded, rather that it be researched further, and

possibly redefined. Oekologische Psychologie, Fuhrer states, encompasses everything which lies on the continuum between ecology and psychology, and is not just another branch of psychology, but actually a concept which "in its purest form . . . demands a re-thinking and a re-evaluation of the whole business of theory construction in psychology." (p. 241) This last idea suggests what was discussed earlier, that perhaps the evaluation of human response to discrete stimuli, in light of the constant and complex interaction of person and environment variables, is not an efficient means for investigating human psychology. While Oekologische Psychologie seeks to embrace all of psychology through its new perspective, Fuhrer describes Umweltpsychologie as the practical, scientific aspect of the field which is committed to solving environmental problems. Oekopsychologie is the framework which contains the more theoretical Oekologische Psychologie (a variation of ecological psychology) and the problem-oriented Umweltpsychologie. The focus of this paper will shift to the research which has been carried out in Umweltpsychologie, following a discussion of methodological problems in this field.

It is evident from what has already been said that environmental psychology is struggling with the problem of evaluating the environment plus its inhabitants as one entity. What are the implications of such an approach for methodology in this area? Four complications which arise when trying to dissolve the person-environment dichotomy were elucidated by one of the discipline's authorities, Proshansky (1976) and

summarized by Levy-Leboyer. They are as follows: 1) If the individual and the environment are not to be analyzed separately, then studies must take place in a "real world" environment. The effects of noise studied in a lab, for instance, cannot be generalized to real life because the affective and social variables which are present in such a situation are a part of the subject's response, as much as is the noise factor. However, these variables are not as amenable to analysis as are the physical factors; 2) In studying environmental effects, both behavioral and verbal responses of subjects must be dealt with simultaneously, because while the two types of responses may not necessarily coincide or agree with each other, both are valid and important measures. 3) The meaning which individuals attach to their surroundings is a network of values and motivations which interprets each setting differently for each individual--this is a concept which we are not accustomed to dealing with. 4) Individual experiences and expectations, which represent a part of the temporal dimension, must be taken into account as well as the intangible qualities of the environment, such as antiquity and historical links, which are part of the collective memory of the environment. In sum, not only can the physical environment not be analyzed without considering the individual, neither can it be viewed independent of social and cultural variables. As Levy-Leboyer writes, "The environment determines behavior because individuals who are present and vigilant make it so."(p. 31), and she provides as an illustration the Aztec temples of Mexico, which no lon-

ger hold the meaning or determinism they held for the Aztec civilization that once occupied the area.

In addition to these factors, an environmental researcher must consider three others which are of importance to any experiment: the selection of subjects, experimental site, and techniques. In selecting subjects, the question of their being representative of the larger population is always present. For this reason, in environmental psychology, perhaps more than in other areas, the role of comparative studies cannot be ignored. However, they have not been common practice up to now, so Levy-Leboyer suggests that comparisons within a sample, after carefully determining common subject characteristics, may be another approach to dealing with this problem. The site of the experiment is of obvious importance in environmental research, and specifically the choice of a microsite (the defined area of focus, e.g. building or room) or a macro-site, which is the microsite plus the surrounding contextual variables (e.g. the room within the building, the building within the neighborhood, etc.). Here, the decision to select a laboratory or the natural environment, each with its accompanying advantages and disadvantages, arises. Considering the control possible within the laboratory and the reality available in field research, it is perhaps wisest to not rely exclusively on any one setting, but to validate one with the other. Finally, although no one methodology has been formulated to test all these facets of the person-environment relationship, a variety of techniques have been used by different researchers, all of which have been questioned on some

dimension as to their validity for assessing this relationship. The following illustration by Levy-Leboyer lists a range of different assessment tools used in environmental psychology, and explains the kind of information they are helpful in acquiring (p. 40).

METHOD	DATA TYPE					
	Attitudes to the environment	Environmental evaluation	Environmental cognition	Non perceived effects of the environment on behavior	Perceived effects of the environment on behavior	Action on the environment
Discrete observation				X		X
Systematic observation				X		
Performance				X		
Factual questioning					X	X
Games	X		X			X
Attitudes and personality questionnaires	X	X			X	
Indirect methods	X	X	X			

To increase objectivity in systematic observation, the "behavior mapping" technique was devised by an environmental researcher which begins with a pilot study where behaviors are observed and then classified into activity types. Observers are then trained to record and classify behaviors according to places, individuals, and characteristics. Factual

questioning has the subjects estimate the amount of time devoted to or the frequency of a particular behavior, for instance, or to list priorities, or other factual information relevant to the study of the environment. This is an important method for assessing group needs or characteristics. Attitude questionnaires, on the other hand, request that subjects share their opinions concerning different aspects of the environment. To accomplish this, experimenters use techniques such as semantic differentials, Likert scales, multiple choice questionnaires, and adjective check-lists. Indirect methods include projective tests, cognitive mapping, and any other techniques directed at analyzing unconscious processes and motivations which underly attitudes and cognitions. Discussion of various studies will demonstrate how some of these techniques have been employed in environmental psychology research.

Research Findings

The perception of the environment is an obvious prerequisite for the evaluation of the environment. However, as was stated previously, it cannot be separated from the affective, social, or aesthetic assessment, if the overall evaluation of the environment is to be a valid one. Levy-Leboyer writes that the only way she sees to legitimately deal with this problem, given the difficulty, perhaps the impossibility, of analyzing all the facets of the environmental experience, is to study the "perceptual-evaluative process" one phase at a time. That is, studying subjects' perception of the environment experimentally is appropriate, as long as their evaluation of it is given equal importance. Since not all the research

has been conducted in the past taking this into account, the following samples of research are intended to acquaint the reader with the ways researchers have approached the study of the environment. The selection and grouping of the studies is purely arbitrary, and does not purport to be an exhaustive review of the research. Areas addressed include visual perception, noise, spatial perception, and topics for further investigation such as women and the environment and residential satisfaction.

Visual perception. Posner and Nissen (1976) write that in the study of perception it has been found that there is a tendency for the visual mode to dominate the other modes in making perceptual judgments. The mechanisms which our vision uses to orient us in our environment have been well-documented and include concepts such as perspective, texture gradient, height in the plane, shadowing, and relative brightness (Ward, 1984). However, studies of the way light influences our visual selectivity, and subsequent evaluative response have not been as numerous. One such study (Flynn, 1973) asked subjects to rate six different lighting arrangements on semantic differential scales. When the results were factor-analyzed, five "categories of impression" were identified:

- 1) evaluative, or general preference for a lighting arrangement
- 2) perceptual clarity, or the lighting subjects could best see in
- 3) spatial complexity, or visual clutter
- 4) spaciousness and
- 5) formality, a combination of two rating scales whose relationship is yet unclear.

Results indicated that the lighting arrangement of downlights plus wall

lights positively affected evaluative impressions and perceptual clarity, and that higher levels of brightness tend to create an illusion of increased spaciousness. In addition to using rating scales, Flynn had his observers informally record the reactions of subjects to the various lighting arrangements, and found that subjects' overt behavior was somewhat influenced by the variations in lighting. Not only were spontaneous negative comments made by subjects in the overhead diffuse lighting situation, but in the low-intensity downlighting arrangement subjects voiced associations with particular settings such as a nightclub and a church, which brings to mind Barker's behavior-settings mentioned earlier in this paper. Experimenters also observed that circulation patterns, seat selection patterns, posture, comments, gestures, facial expressions, etc. were influenced by lighting, with a tendency for subjects to select seats facing the light. Flynn (1973) explains that there seems to be a considerable amount of selectivity in the perceptual process of viewing, and suggests that this selectivity is related to a search for meaning in what is being viewed. If this is the case, he continues, then the focus of light design should not be on perceptual clarity only, but on providing cues through lighting which confirm expectations or answer questions about the particular environment. Depending on an individual's familiarity with a setting, his or her orientation with regard to spatial limits, relative position, and direction appears to be facilitated by size and patterns of light and dark shapes. Therefore, Flynn concludes, a lighting system should be evaluated taking into account a) its adequacy for

establishing spatial boundaries and b) its suitability for providing the individual with cues and information about the environment.

The use of color can assist the individual in identifying spatial boundaries and relevant information, as well. Wineman (1979), in an article on the impact of color on human behavior, cites research summarized by Smith (1969) which indicates that two areas of the brain are involved in color perception: the neocortex, which is responsible for the conscious, rational thinking process, and the limbic system, which produces emotional responses. While the neocortex is more responsive to subtle colors, the limbic system reacts to the brightness, shine, or glitter of a color, as well as any symbolic properties or associations which might be paired with the color. An interesting sidelight is that Smith suggests that the tension generated by the two types of responses (rational and emotional) is perhaps a main characteristic of great art. Wineman states that while responses to colors are the product of an individual's particular experience and background, there seem to be some responses which are typical of the general population. Basically, warm colors (reds, and related colors) are more stimulating than cool colors, and produce physiological reactions such as increased muscle tension, heart and respiratory rates, blood pressure, as well as increased brain activity. Cool colors (blue, and related colors) produce the opposite effects. She cites Bayes (1967) who found that tension and excitement were produced by the color red, while blue generated feelings of well-being, calmness, coolness, less anxiety and hostility, and less concern

for outside noise. He concluded that warm, bright colors tend to focus people's attention on the environment and that cool colors tend to reduce environmental distraction. Introverts, in his opinion, would probably prefer the relaxing cool hues, while extroverts might prefer the stimulating warm ones. With regard to perception, Wineman states that warm and dark colors cause objects to appear larger, heavier, closer, and room size to appear smaller, while cool and light colors increase perceived room size and cause objects to appear smaller and farther away.

The application of principles of visual perception to creating a more pleasant atmosphere have been explored experimentally. Wollin and Montagne (1981), who examined the effects of the classroom's physical environment on teacher and student performance, selected two identical classrooms for the site of this experiment, and two groups of college students who spent five weeks in each environment to be the subjects. One classroom was decorated by an interior decorator who had the walls painted in contrasting shades, altered the lighting by replacing half of the cool-white fluorescent tubes with warm-white ones, and added large plants, high-quality art posters, Chinese kites, area shag rugs, and coordinated cushions. Flexible seating arrangements allowed students to sit at desks or on the rugs with the cushions. The other classroom was left as it was, monochromatic and austere. The dependent variables in this study were student scores on tests, students' evaluations of the professor, the amount of student-teacher interaction, students' reaction to a questionnaire inquiring about room decor, and the amount of vandal-

ism or theft in the experimental room. At the end of the manipulation, the researchers concluded that students perform significantly better on academic tests, regard their teachers in a much more favorable light, and that teachers may actually improve their teaching performance in a classroom similar to the experimental one in this study. No vandalism occurred in either classroom, and while students found the experimental room to be more interesting, there were no differences in distraction between the two groups.

Not only can the perception of lighting and color affect the way a person relates to his or her surroundings, but that person's perception of space in those surroundings can affect it as well. Hayward & Franklin (1974) demonstrated that the ratio of the boundary wall height to wall distance (H/D ratio) mediated in an individual's impression of the openness or enclosure of an architectural space, regardless of the actual size of the space--as the H/D ratio increased, perceived enclosure increased. This principle, that perceived openness of a space can be manipulated through design, has been accepted by architects for a long time, but the perceptual mechanism for this phenomenon is still being explored. A more recent study (Sadalla & Oxley, 1984) found also that length-width proportions (L/W ratio) influenced perceived size of rooms, with increase in L/W ratio (increased rectangularity) being associated with the perception of increased space. They offer two explanations: 1) an increase in scanning activity due to a greater perimeter 2) "anticipated behavioral constraint," the notion that individuals associate more or less

space with corresponding degrees of crowding.

Studies have also been conducted which explore people's perception of the outdoor environment. An investigation of the relationship of environmental attributes to preference in the landscape (Nasar, 1983) examined four attributes of the environment--nuisance, diversity, openness, and clarity--and found that diversity (or complexity) and coherence (or structural organization) play a role in preference. However, Nasar emphasized that the effects of these attributes and others need to be explored after "extended intermittent exposure," the manner in which people generally experience the outdoor environment. The theme of "complexity" arises again in an experiment by Thayer (1978) who investigated the way plants affect complexity and pleasure in both urban and suburban surroundings. He did this by having his subjects evaluate slides of urban and suburban neighborhoods, with or without plants. His first hypothesis, that plants generally increase pleasurable responses to all landscapes, was supported. The second hypothesis, that plants would reduce complexity in the most complex slides was not supported. Instead, he found a tremendous increase in complexity with only a minimal increase in pleasure when plants were added to the industrial scenes, and a significant increase in pleasure with only a slight increase in complexity when they were added to residential scenes. Thayer concluded that plants are perceived as very complex and highly pleasurable stimuli, lending support to the idea that in the natural

environment, the higher the complexity, the more pleasurable the response.

The psychophysiological effects of viewing urban and natural landscapes were analyzed by Ulrich (1981) who exposed subjects to three kinds of slides (nature with water, nature dominated by green vegetation, and urban without either) and recorded subjects' heart rate as well as alpha amplitude, which measures pleasurable arousal. In addition, subjects rated their feelings on a semantic differential scale and completed an inventory of personal reactions. Results of this study indicated that exposure to the nature scenes, in particular those with water, produced the most beneficial effect on subjects. Perhaps the natural force versus natural tranquility dimension of preference for natural landscape (Calvin, Dearing, & Gurtis, 1972) is related to this difference. However, in Ulrich's study, this effect was not global, and tended to be the case with specific clusters of emotions such as sadness and fear arousal. Ulrich concluded that neither urban nor natural landscapes actually cause high arousal or anxiety, but that urban areas may inhibit recuperation from it, while exposure to nature may aid it. On the other hand, if an individual is understimulated, urban scenes may be more helpful in increasing arousal levels than nature scenes. Complexity in this experiment was found to be a less significant factor than environmental content in holding attention or interest, based on Ulrich's finding that the water scenes, which were similar in complexity to the urban scenes, held subjects' attention more effectively than did the ur-

ban views. The reasons behind these results are not clear, but Ulrich does not support a simple explanation based on culture or adaptation because of the existence or documented cross-cultural similarities in the effects of nature versus urban scenes.

Noise. Some of the more interesting findings on the effects of environmental noise on individuals are the result of research by Cohen and his colleagues, who investigated the effects of noise on children. One such study (Cohen, Glass, & Singer, 1973) tried to discover if there is any relationship between a child's auditory and verbal skills and the noisiness of the home. Observing children who lived in a 32-floor apartment building they found that the magnitude of the positive correlation between these factors was affected by the length of time the children had lived in the building, as well as the floor they were living on, with children in the lower floors showing greater impairment than those in the higher floors. Physiological damage and social class variables being ruled out as relevant factors, they concluded that auditory discrimination appeared to mediate the relationship between noise and reading deficits. A later study (Cohen, Evans, Krantz, Stokols, & Kelly, 1981) investigating the adaptation of children to aircraft noise and the effectiveness of noise abatement, tested elementary school children on measures of attentional strategies, learned helplessness, performance on cognitive tasks, and blood pressure. These measures were taken twice with a one year interval in between, the span of time during which noise abatement interventions were introduced. Results demonstrated little

adaptation to the noise and little improvement in cognitive performance, ability to hear teachers, and in learned helplessness.

There is evidence (Cohen & Lezak, 1977) that noise exposure is a selective focus of attention on task relevant cues at the expense of less relevant cues, regardless of whether the cues are social (social cues being defined in this experiment as the introduction of a distressed or non-distressed individual) or non-social. Broadbent (1978) summarized the harmful effects of noise on skilled performance, through an experiment on detection of visual signals, and concluded that noise resulted in a high false alarm rate, increased number of errors and slow responses, and concentration on some parts of a complex display while ignoring others. In addition, Sheldon & Weinstein (1981), reviewing the research on non-auditory effects of noise stress, acknowledge that psychological factors, especially predictability, controllability, and meaning of noise mediate the relationship between noise and human response.

Spatial Perception. Density and crowding in the environment are topics which have received considerable attention from researchers in psychology. The distinction between density and crowding is drawn by Stokols (1972) who explains that density refers only to spatial parameters (e.g. people per square mile) while crowding refers to the psychological state of arousal which is experienced when density factors, social interaction, and personal characteristics are combined. Density itself does not appear to raise anxiety levels, conclude Zeedyk-Ryan & Smith (1983) who conducted a study which required subjects to remain in a shelter under

high-density conditions. Measures of hostility and anxiety demonstrated that while both responses increased across the five testing occasions, subjects were not found to be significantly more anxious, though they were significantly more hostile, by the end of the experiment. A study by Freedman (1971) measured subjects' performance of tasks of varying nature and difficulty under different levels of crowding, and found no significant differences in performance among subjects. On the other hand, Glassman, Burkhart, Grant, & Vallery (1978) performed an experiment in a college dormitory, manipulating the density factor over a two-and-a-half-month period, and found that high density adversely affects extended class performance as measured by GPA. Glassman emphasizes the importance of conducting density research in a natural environment and over extended periods of time, but also indicates that their results may have been confounded by subject variables or activity variables. Subjects taking an exam in a crowded test room at a medium distance from a proctor, for instance, produced lower test scores and reported higher anxiety levels than subjects in the remaining treatment conditions involving two levels of crowding and three distances from a proctor (McElroy & Middlemist, 1983). As in studies of noise effects, the factor of perceived control has been cited by several researchers as an influential factor in human response to crowding (Baron, Mandel, Adams, & Griffen, 1976; Baum, Singer, & Baum, 1981; Epstein, 1981; Langer & Saegert, 1977).

The physical effects of crowding were investigated by Paulus, McCain,

& Cox (1978), who conducted a study on death rates, psychiatric commitments, blood pressure, and perceived crowding as a function of institutional crowding. Archival data revealed that death rates and psychiatric commitments were higher during years when the prison population was higher. Examination of the inmates showed that blood pressure was higher in the more crowded of the three housing facilities, and that the degree of perceived crowding was more strongly related to space per person than to number of occupants per housing unit. It was concluded that long-term, intense, inescapable crowding can generate high stress levels which, in turn, can lead to physical and psychological damage.

The organization of space and spatial boundaries can influence how individuals react in an environment, as well. A study by Becker, Gield, Gaylin, & Sayer (1983) determined that faculty-student interaction in a community college could be decreased significantly by placing faculty in open, as opposed to private, offices. High & Sundstrom (1977) showed that dorm residents' use of their room space for interpersonal tasks and interpersonal recreation exhibited a greater range when furniture could be moved about than when it was secured to the floor. Here again, the authors give credit to an increase in perceived control over the environment. Barnes (1982) demonstrated that decisions of little consequence can influence individuals' perception and control. He had his subjects report their perceived degree of choice when given a choice of chairs, and found that greater choice was reported with increasing number of chairs if the chairs were dissimilar, but not if they were identical.

When doors, which are relatively more important in a building than are chairs, were used these results were not repeated.

The classroom is undoubtedly a place where favorable environmental conditions are of great importance, and some researchers have attempted to identify environmental variables which exert an influence on its inhabitants. One researcher (Cotterell, 1984), who examined how student and teacher anxiety could be affected by school architectural design (i.e. open-plan versus conventional), theorized that psychological stress could be induced by environmental effects on individuals' spatial disorientation and social interactions. Spatial disorientation occurs when there are no distinguishable markers that separate space and aid the individual in situating him- or herself in relation to the environment; this leads to the confusion and anxiety that results when one feels lost. The environment affects social interactions simply because building dimensions affect crowding and personal space, and hence it can lead to anxiety and an inability to function at an optimal level. Results of this study indicated that both teachers and students experience more anxiety in the open-plan classroom, and Cotterell explains the results in terms of the effects of environmental load on information processing.

Ahrentzen & Evans (1984) suggest that future research in this area needs to use a continuum of containment/openness instead of categories such as "open" and "closed" to describe the classroom setting. They assert that categorizations can lead to the erroneous assumption that behavior is determined by the physical configuration alone. Using this

continuum approach, Ahrentzen & Evans sought to measure teacher and student satisfaction, distraction, and privacy as related to interior spaciousness, perimeter structures, and privacy amenities. They found that structural walls were related to less teacher distraction, more satisfaction with the classroom, and less restriction of the class's activities in order to eliminate disturbance to other groups. While open perimeter space was associated with greater satisfaction for teachers, it decreased satisfaction for children. Teacher distraction was reduced as interior spaciousness increased and if there was open perimeter space, but student distraction was not influenced significantly by architectural features. Student satisfaction was unrelated to interior spaciousness, and perceived privacy decreased when privacy amenities, such as secluded study spaces, were provided. Future studies might investigate how age and role differences between teachers and students influence these disparate perceptions of the same environment.

While environmental studies have frequently focused on discovering responses to the environment which people have in common, studies will eventually need to emerge which explore the differences between segments of the population in the way they perceive their surroundings. Two topics which await further attention and investigation are "women and the environment" and "residential satisfaction," which will be briefly introduced in this paper.

Women and the Environment

There is increasing evidence of differences in the way men and women relate to their environment. One study (Campbell, 1979) in which the manipulated variables were furniture arrangement, the presence of plants and aesthetic objects, and neatness, demonstrated that these factors had a stronger impact on females than on males. In the study on room flexibility and space use in a dormitory (High & Sundstrom, 1977) it was found that the women interviewed rated rooms as being less flexible than did the men, they were more concerned with the arrangement of their settings, and found the nonflexible rooms unsatisfactory for interpersonal task activities. Ulrich (1981) in his study on psychophysiological effects of viewing natural versus urban scenes, which was described earlier in this paper, also noted that the effects of the vegetated scenes were stronger for females than for males.

There has not been enough research carried out as of yet to determine possible causes of this disparity, but Moore (1979), writing on the current state of theory and research on environmental cognition, suggests that they may be due to sex-related differences in spatial relations ability, which in turn might influence cognitive mapping abilities. However, the actual relationships between women and their environments, as well as the origins or cause of these sex differences, are still unclear. In an article on women and environments, Peterson, Wekerle, and Morley (1978) emphasized the importance of investigating this relationship in light of women's changing roles in society, which interact with the manner in which

they perceive themselves and their surroundings. They point out that although both men and women share most environments, traditionally women's influence on the environment has been in the home sphere, while men have been in charge of designing those environments at the macro-level. In fact, even those environments which are occupied primarily by women (e.g. residential neighborhoods) have most frequently been designed without considering their needs for transportation, day-care, employment, or educational opportunities closer to the home setting. Therefore, it is crucial as women's roles in society become more diverse, that their perspective on what factors contribute to a comfortable environment be incorporated into guidelines for environmental design.

Residential Satisfaction

Research on environmental psychology can make an obvious impact on the manner in which the needs of low-income and underprivileged sectors of our society are dealt with. Determining which of the numerous necessities have the most influence on these people's well-being can lead to more efficient use of the limited funds allocated for this purpose. A study by Hourihan (1984) compared various residential groups in order to determine whether or not there are any differences in the way they evaluate a home environment. He examined four housing groups in Cork, Ireland, using a seven-point bipolar adjective checklist of neighborhood attributes and neighborhood satisfaction, which was completed by residents of the different neighborhoods. Hourihan found that there were significant differences between the groups on these two dimensions, and

most importantly, that each of the four groups combined attributes differently in its formulation of neighborhood satisfaction. This conclusion, he states, is in conflict with some previous findings which indicated that in the United States, satisfaction everywhere is derived from the same sources.

Four suggestions for increasing residential satisfaction which Galster & Hesser (1981) have formulated as a result of their research are that 1) the elements of residential satisfaction are very inter-related, and should be upgraded simultaneously to be most effective 2) rehabilitation, as opposed to renewal of structures, is best for perceived commonality and friendliness of neighbors in generating neighborhood satisfaction 3) racial homogeneity is most effective on a micro-, not macrolevel and 4) an increase in the role of neighborhood input in decision-making contributes to general satisfaction.

Conclusion

The body of research in environmental psychology has grown at a rapid pace even within the last five years (Stokols, 1978). However, continued attempts are needed at formulating theoretical models and more solid methodology with which to approach the study of the person-environment relationship. The studies presented earlier hopefully illustrated the wide range of subject matter which this field covers, as well as the complex issues researchers have to struggle with in conducting their experiments. Future studies need to investigate more closely personality variables, as well as group or collective variables, and the

way they mediate in the human response to the environment. However, as Craik (1972) points out, the task of improving communication between those individuals who design the environment and those who inhabit it needs to be a priority. Hopefully, if this gap is narrowed, environmental research will then begin to permeate public policy, and become an integral part of the decision-making process dedicated to the improvement of human environments.

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