

**PERCEPTIONS OF STRESS AND ADAPTATIONS TO STRESS IN
RESIDENTIAL INTERIORS DESIGNED FOR THE OLDER ADULT:
A POST-OCCUPANCY EVALUATION CASE STUDY**

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Abstract

Six residents of a newly constructed apartment building designed specifically for the older adult were interviewed in a small longitudinal post-occupancy case study. The study was conducted both at the time of relocation and seven months later in an effort to determine stress perceptions and any adaptations to alleviate the perceived stress. Questionnaires were used to measure perceptions of stress, specific stressors, adaptations to the environment, social climate, and overall satisfaction with the environment. The builder-designer was also interviewed to determine the effectiveness of design decisions made in the construction of the building. In general, residents reported low levels of stress and high satisfaction in this environment. Factors such as limited storage space and inadequate soundproofing continued to cause slight stress after seven months of residency. In general, time did not appear to have a statistically significant effect on perceptions of stress in this small study.

Introduction

Research in environmental design has attracted increasing attention in recent years. Information collected on privacy, personal space, stress, mobility patterns, and methods of adaptation has been instrumental in understanding the effects of environmental conditions on human behavior.

Of particular interest to some researchers has been the housing behavior of older adults. As the United States experiences a strong increase in the number of people over 65 years of age, it becomes necessary to understand the needs of that population and to provide resources for their care and well-being.

With the onset of retirement, most senior citizens spend more time in the home than ever before. This increase in the amount of time spent in the dwelling has important ramifications for the older adult as well as for the designer of residential environments. Those environments which are well designed can serve many purposes for the older adult. As Hiatt (1985) stated, "While spaces are no substitute for family, income, and health, they can be designed to facilitate independent living" (p. 15). The home can provide not only shelter from the elements, but a sense of identity for the occupant, too. It can provide stimulation, comfort, and a feeling of security. For some, the home should provide access to medical care as well as shopping facilities, transportation, and other personal services. Social opportunities often need to be provided at or near the home with this shrinking of parameters in the lives of older adults.

In many cases, this need for more support may lead to relocation for the older adult. This act of adjustment is one way of dealing with the housing deficiencies they may be experiencing if their dwelling or community does not provide for their needs (Morris and Winter, 1978). Rural elderly often move closer to an urban center; owners of large

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homes opt for a smaller unit. Those residing in single-family dwellings may relocate to multi-family housing, while residents of family neighborhoods may choose a community provided specifically for older adults.

However, previous research shows a desire of older homeowners to remain in their own homes (Tremblay and Bamford, 1988). Although a wide variety of housing alternatives have been planned and developed to fit the needs of the older adult, the acceptability of these alternatives is low (Phillips and Gaylord, 1985). In fact, a study by Gilly and Zeithaml (1985) shows that the elderly are among the last to adopt a product, service, or idea innovation. Whatever other decisions are made, the majority of U.S. senior citizens are choosing to remain independent as long as possible.

There is also research which suggests that the preferences of older adults in reference to urban or rural living does not change drastically from late, middle age to old age (Golant, 1987). If in fact a dramatic change is made, it may very well indicate a major change in individual needs such as demand for health care and other services.

The effects of environmental conditions on the well-being of the elderly have been the topic of several research studies. Noelker and Harel (1981) studied aged and disabled residents of public housing in Cleveland. From the data collected, they discovered that residents who perceived their housing situation to be positive had higher levels of morale. What constitutes this positive feeling may vary from one subject to another, but the overall positive feeling seemed to be important. This confirmed the findings of other studies dealing with the same topic (Langer and Rodin, 1976; Noelker and Harel, 1978).

Lawton and Cohen (1974) also conducted research aimed at linking environmental factors with the well-being of older adults. Basing their work on the assumption that older people with housing problems would be more likely to be influenced by their environment, the researchers found only moderate support for their hypotheses. Although functional health appeared to decline, other indicators of well-being did not decline.

Schulz and Brenner (1977) suggested that perceived control may be a factor in satisfaction with relocation. They hypothesized that persons who feel in control of their fate may have a difficult time adjusting to an environment where they have very little control. Noelker and Harel (1981) reported related findings indicating that residents who had a higher level of knowledge about available services and benefits seemed to exhibit higher levels of personal well-being. The researchers attribute this to the sense of control and predictability this gave the residents.

Other researchers have identified time as the pervading factor in adjustment to relocation. Gelwicks (1970) stated, "The ability of an individual to adapt to a particular physical environment or social situation may vary with the amount of time involved" (p. 28). Echoing this belief are others who found time to be important (Lawton, 1975; Kalish and Knudtson, 1976; Cooper, 1974). The longer one lives in an environment, the more familiar and the more relaxed one feels with it.

Inappropriate or poorly designed environments account for a great loss of time and energy for users of those environments (Hershberger, 1974). In his study based on the meaning of architecture, Hershberger used conclusions drawn from his own research as well as others to encourage designers to consider the ultimate users of their creations. It was suggested that there is often a wide gap between the use designers intend for facilities and the actual use made of the facilities by occupants. This difference is rooted in the meanings of architecture which are unique to every individual.

One factor which seems essential for housing satisfaction is the match between the needs of the resident and the characteristics of the environment. In research by Brennan, Moos, and Lemke (1988), the authors found that "prospective residents who seek out facilities with features best corresponding to their own design priorities may increase their chances for housing satisfaction" (p. 87).

Understanding environmental meaning seems to be extremely important in understanding the complexities of housing satisfaction and stressors. Rubinstein (1989) investigated the linkages between person and place in order to clarify some aspects of housing satisfaction. He proposed a number of psychosocial processes that are used by older persons to comprehend features of the home environment. Of major importance is the concept of residential relocation and the changes which may occur in environmental meaning because of it. Rubinstein suggests that if an elderly person relocates and the routine of the new setting does not allow him/her to carry on normal activity, this disruption may cause a more fundamental internal struggle for that person than what is outwardly apparent.

At a time when the older adult is experiencing many other losses and changes in his/her life, relocation can be very traumatic. By employing proper design methods, builders and planners may be able to mediate this stress and make the transition easier.

The building project examined in this study presented a unique opportunity to collect data both before and after the occupancy of the dwelling. The objective was to aid in the improvement of design for the older adult by identifying factors of stress and methods of adaptation upon relocation. Through in-depth interviews, the researchers compared these phenomena over time, in an effort to identify changes that took place in the environment as well as on the personal level. Because of the small size of the study, the findings are applicable mainly as indicators of factors that need further research.

Methodology

This case study was conducted in Kouts, Indiana at the Oakwood Apartments, a privately owned housing project consisting of six, two-bedroom units and four, one-bedroom units. Although it was built with older adults in mind, the housing unit only accommodates wheelchair use in two of ten units.

Kouts is a rural community of approximately 1,500 people with a small business center three blocks from the housing project. The business center offers basic shopping and personal care resources, as well as a post office, banks, and fire and police protection.

Participation in this longitudinal study was voluntary, for both the residents and the builder. The study commenced during the construction of the building, with the builder being interviewed at that time. Residents of the apartments numbered eight at the time of the initial interviews; six of these participated in the study. The subjects were very healthy, had no apparent disabilities, and were all ambulatory at the time of the study.

Interviews with the builder-designer consisted of questions written by the researcher. The questions dealt with design decisions as well as predictions for future uses and acceptance of the facility.

Two instruments were used for questioning the residents: the Family Space Attitudes Scale (FSA) (Melson, Inman, and Kemp, 1976), and the Personal Environment Scale (PES) (adapted from Moos, 1974). Both instruments had been tested previously for validity and reliability, with scores well within an acceptable range for this research.

The FSA is comprised of four subscales: present environmental stress, adaptations scale, environmental descriptors checklist (EDC), and present environmental specific stressors index (SSI). The FSA also includes demographic information.

The Present Environmental Stress Scale (PRESS) measures the respondents' perceptions of stress in their current housing in comparison with stress in their immediate, previous housing. Subjects respond to 16 items--eight negative, eight positive--on a five-point scale ranging from "much less stressful" to "much more stressful." Responses were coded from one to five for each interview and comparisons were made in regard to response over time as well as general indications of stress among the population.

The number and type of adaptations made were measured in the Adaptations Scale (AS). The adaptations listed include changes in lifestyle as well as changes made to the dwelling. In this study, the AS was adapted for the first interview to be interpreted as ad-

aptations which the subjects anticipated they would need to make. In the second interview, this scale was changed to reflect adaptations they had actually made. Responses were examined for quantity and type of change expected; quantity and type of change actually made; and differences between anticipated adaptations and actual adaptations. Frequencies and individual comparisons were used to accomplish these ends.

The Environmental Descriptors Checklist (EDC) consists of 12 terms--six positive, six negative--that might describe a person's feelings about his/her residential environment. The subject is instructed to check any and all terms which describe his/her feelings relevant to the living situation. In this study frequencies were examined for each descriptor.

Specific causes of stress are measured in the Specific Stress Index (SSI). On a scale ranging from "not stressful" to "very stressful" respondents react to 20 different items which often cause stress in the residential environment. Findings were analyzed for common causes of stress as well as changes in stressors over time. As this was a small case study, the specific t-test of paired samples between variables was used to test the relationship between time and chosen factors of stress and adaptation.

The PES was adapted from Moos' Family Environment Scale. This is a series of 90 true-false items which explore attitudes toward self, family, and environment. The wording of the questionnaire was changed to better measure the attitudes of persons living alone. The subscales in this questionnaire measure social climate in three general areas: (a) interpersonal relationships including cohesiveness, expressiveness, and conflict; (b) personal growth and development including orientations toward independence, achievement, intellectual/cultural, active/recreational, and moral/religious issues; and (c) systems maintenance including organization and control (Moos, 1975). Each of the 90 items is scored one point when it concurs with a response of high identification in accordance with the subscale in which it falls. Thus, a high subscale score indicates high identification with that subscale.

The builder-designer was initially interviewed while the building was in construction. An instrument consisting of open-ended questions constructed by the researchers was used. The interview was held in conjunction with a tour of the facilities and supplied not only factual but attitudinal information. After the builder-designer gave his permission to use the project for this research, the new residents were contacted for interviews.

The initial interviews with the new tenants were conducted within the first month of their move to Oakwood. Approximately seven months later, the residents were asked to complete the same questionnaire for a post-occupancy evaluation and were asked to supply some additional information.

Finally, the builder-designer was contacted again. In this meeting the researcher explored the builder's satisfaction with the project and his evaluation of the relative success or failure of specific factors. Tours of the facility at each point in time allowed the researchers to make a physical inspection of the building and apartment interiors.

Findings

The Facilities

Physical inspection was used to collect information about the facilities. The building was a two-story brick unit with a total of ten apartments including six, two-bedroom units and four, one-bedroom units. The style of the building was a rather "understated" Greek Revival, which appeared to blend in well with the surrounding homes and landscape.

Private garage spaces were provided behind the building, as was a large backyard. In addition, residents each had private deck spaces. A ramp on the side of the building provided accessibility to two apartments.

Neutral colors and earthtones were selected for interior elements of the apartments. Enough windows were included to provide an abundance of natural light, yet window treatments also allowed for control of that light.

Kitchens included modern appliances and medium oak cabinets. The kitchen plans were open to the living/dining area.

Bedrooms were adequate in size to accommodate any size bed or even two single beds. These rooms were located at the back of the building which seemed to provide more privacy, visually as well as acoustically.

The one-bedroom apartments were approximately 800-square feet. The two-bedroom units were about 1,000-square feet. Units were carpeted throughout except for kitchen and bathrooms where vinyl flooring was used.

The apartments were very comfortable and attractive as evaluated by the interviewer as well as the residents. Central heat and air conditioning were available and controlled separately by each resident. A ceiling fan was also included in the living area of each apartment.

A finished basement provided extra amenities for residents' use. A large activity room, television room, two bedrooms, and kitchen were all available for residents to use at any time. Extra storage was also provided in this area.

Design Priorities

In interviews with the builder, several factors stood out as priorities in designing these dwellings:

1. to provide services and facilities which increase the convenience and ease of everyday tasks, thus allowing residents to carry on with their established lifestyle.
2. to develop an environment which residents judge as safe and secure.
3. to create an attractive, comfortable place to live.
4. to provide a dwelling of which residents can be proud.

The designer-builder felt he accomplished these goals by incorporating facilities and services which would support independent living for the residents. Some of his insight came from his numerous years of experience in designing homes for older adults. Some of the ideas came from direct input from the prospective residents. He was willing to make small modifications to individual units such as inclusion of a pantry in one kitchen upon the request of the future tenant.

The designer-builder had a very positive feeling about this project. He felt he had read the needs of his clients well and had incorporated features which met those needs as much as possible.

Sample

The sample included three male and three female participants ranging in age from 70-75. Three of the participants were widowed; the other three were currently married. Another resident chose not to participate in the study. Length of current marital status ranged from 41 to 50 years.

The residents would be considered middle income by self reported income data. Three of the participants had been farmers and the other three had served in managerial and sales positions; their mean educational level was 10.6 years. Each of the participants had resided in at least three dwellings since marriage; hence, each had experienced the relocation process before moving to Oakwood Apartments. Although specific reasons for relocation varied from one resident to another, they all expressed concern over their inability to maintain their previous home because of size, location, and other variables. In all cases the decision to relocate had been a personal choice, not one which had been forced upon them.

Data Analysis

The amount of stress reported by residents was measured in part by the SSI. In the interview conducted at the time of relocation, only four factors were evaluated as causing any stress: limited storage space, inadequate soundproofing, design of the kitchen,

and inadequate lighting in the living room and the kitchen. Of these four, only the first two continued to cause stress--at the same or an increased level--at the time of the post-occupancy study.

Changes in means from the time of relocation to the time of the post-occupancy evaluation were shown in eight items of the SSI. Six items were associated with increased levels of stress: amount of living space, limited storage space, noise, type or color of flooring, inability to adequately regulate heat and/or ventilation, and lack of a private outdoor space. Only two items were associated with decreased levels of stress: design of the kitchen and lack of ceiling lights in living room and kitchen. See Table 1.

Table 1. Specific stressors index (SSI) for Oakwood Apartments: Means and standard deviations of individual perceptions (n=6).

Item	Mean at relocation	Standard deviation at relocation	Mean at post-occupancy	Standard deviation at post-occupancy
Rules & regulations	1.0000	.000	1.0000	.000
Amount of living space	1.0000	.000	1.5000	.837
Interfering neighbors	1.0000	.000	1.0000	.000
Limited storage space	1.3333	.516	1.5000	.548
No pets	1.0000	.000	1.0000	.000
Lack of privacy	1.0000	.000	1.0000	.000
Noise	1.0000	.000	1.3333	.516
Inadequate soundproofing	1.5000	.548	1.5000	.548
Kitchen counter space	1.0000	.000	1.0000	.000
Bath design	1.0000	.000	1.0000	.000
Lack of washer/dryer	1.0000	.000	1.0000	.000
Kitchen design	1.1667	.408	1.0000	.000
Flooring	1.0000	.000	1.1667	.408
Lighting	1.3333	.516	1.0000	.000
Heat/ventilation	1.0000	.000	1.1667	.408
Security	1.0000	.000	1.0000	.000
Electrical outlets	1.0000	.000	1.0000	.000
Plumbing	1.0000	.000	1.0000	.000
Outdoor space	1.0000	.000	1.1667	.408

Range: 1=not stressful, 4=very stressful

A summary of the means for the total SSI scores for both sets of interviews shows a mean of 24.1667 for the first interview and an increase to a mean of 25.000 for the post-occupancy interview. The t-test was used to test the significance of this change. It was not significant ($p > .05$).

The results of the PRESS scale used in this study appear to coincide with the SSI measure of overall stress. These are shown in Table 2.

A change occurred in 8 of the 12 EDC adjectives. Scores for all six of the positive adjectives decreased after the seven-month occupancy period, while scores for two of the negative adjectives increased. The greatest change occurred in the adjective "Contented" in which the percentage of residents responding "yes" decreased from 100 to 50 percent over the seven-month occupancy period. T-tests showed none of the changes

Table 2. Present environmental stress scale (PRESS) for Oakwood Apartments: Means and standard deviations for individual items upon relocation and at post-occupancy evaluation (n=6).

Item	Mean at relocation	Standard deviation at relocation	Mean at post-occupancy	Standard deviation at post-occupancy
Pleasant*	3.6667	.816	3.3333	.816
Noisy	2.5000	1.049	3.3333	.516
Friendly*	3.5000	.548	3.0000	.000
Confining	3.1667	.753	2.8333	.753
Depressing	2.1667	.753	2.3333	.816
Homey*	3.3333	.516	3.1667	.408
Spacious*	2.3333	.516	2.5000	.548
Stressful	2.1667	.753	2.5000	.837
Well-designed*	3.5000	.548	3.1667	.408
Crowded	3.1667	.753	3.0000	.000
Comfortable*	3.5000	.548	3.1667	.408
Convenient*	3.5000	.548	3.5000	.548
Lacking privacy	2.6667	.516	3.0000	.632
Organized*	3.1667	.408	3.3333	.516
Impersonal	2.3333	.816	2.8333	.408
Dangerous	2.6667	.816	2.8333	.408

Range:1=much less stressful than former home, 5=much more stressful.

*=Positive adjective

to be significant ($p > .05$), however, it does alert the researchers to a situation which needs attention when a larger sample is used in a follow-up study. See Table 3.

Adaptations Scale scores changed in 12 of the 20 categories. Six scores reflected adaptations that were anticipated but not actually made by the residents. The anticipated adaptations included (a) rearranging furniture, (b) establishing house rules for grandchildren, (c) establishing standards for cleanliness, (d) inhibiting of affection, (e) respecting privacy needs, and (f) being security conscious. These are shown in Table 4.

Another six scores reflected completed adaptations which had not been expected.

Table 3. Environmental descriptors checklist (EDC) for Oakwood Apartments in percent (N=6).

Items	At re-location	At post-occupancy
Happy*	83	67
Hemmed in	0	17
Safe*	83	67
Powerless	0	0
Among friends*	67	50
Depressed	0	0
Resigned	0	17
Indifferent	0	0
Contented*	100	50
Crowded	0	0
Comfortable*	83	76
Aesthetically pleasing*	33	17

*=Positive adjective

The unexpected adaptations included (a) noise levels either decreased or ignored, (b) hobbies curtailed, (c) socialization increased, (d) addition of storage areas, and (e) participation in more activities away from the apartment. These are shown in Table 4.

A slight decrease in scores from the time of relocation to the time of the post-occupancy evaluation indicated more completed adaptations than originally expected by residents. T-tests were implemented to test the significance of these changes. No significant changes resulted from specific adaptations ($p > .05$).

Table 4. Adaptation scale for Oakwood Apartments: Means, standard deviations, and significance of change for individual items upon relocation and at time of post-occupancy evaluation (N=6.)

Item	Mean at relocation	Standard deviation at relocation	Mean at post-occupancy	Standard deviation at post-occupancy
Ignore noise	1.5000	.548	1.1667	.408
Less concern for maintenance	1.5000	.548	1.5000	.548
Decrease own noise level	1.3333	.516	1.1667	.408
Less entertaining	1.6667	.516	1.6667	.516
Get out more often	1.5000	.548	1.3333	.516
Rearrange furniture	1.6667	.516	1.8333	.408
House rules for grandchildren	1.5000	.548	1.6667	.516
Shop more often	2.0000	.000	2.0000	.000
Estab. standards for cleanliness	1.3333	.516	1.5000	.548
Curtail hobbies	2.0000	.000	1.8333	.408
Set up schedule	2.0000	.000	2.0000	.000
Assign household tasks	2.0000	.000	2.0000	.000
Inhibited in affection	1.8333	.000	2.0000	.000
Arguing more	2.0000	.000	2.0000	.000
Overnight guests less often	1.5000	.548	1.5000	.548
Respecting privacy needs	1.1667	.408	1.3333	.516
Security conscious	1.5000	.548	1.6667	.516
Redecorate	2.0000	.000	2.0000	.000
Add closets, etc.	2.0000	.000	1.8333	.408

Range: 1=no change anticipated or made, 2=change anticipated or made.

Discussion and Summary

Unlike previous research (Phillips and Gaylord, 1985; Gilly and Zeithaml, 1985), these findings indicate that the older adults in this study seemed to accept this housing alternative fairly readily. The positive attitude expressed at the time of relocation seemed to wane slightly though, which is a phenomena supported by other studies. This would indicate the need to study further the effects of time on residential satisfaction.

This particular builder-designer had been actively involved in providing housing for the independent, older adult for seven years previous to the start of this project. He also had 25 years of experience in general apartment construction and management. In that time he watched and listened to his tenants and benefited from their compliments and suggestions. The researchers believe the design decisions made by the builder-designer prior to the construction of Oakwood Apartments may have contributed to the low level of stress present in this residential complex. This observation relates to both the time

of relocation and after the seven-month interval. Previous work with the elderly and the ability to empathize with prospective residents were two factors that provided the builder the knowledge and foresight to create an environment which met the needs of the residents. This match between needs and features, emphasized by Brennan, Moos, and Lemke (1988), was the basis for design decisions.

In designing Oakwood Apartments, the builder implemented several techniques which may relate to the high levels of satisfaction expressed by residents:

1. Apartment units were designed to be very fuel-efficient through the use of solar heat and the inclusion of floor registers instead of ceiling vents. This not only reduced living expenses, but also made the units more comfortable.

2. Residents were given the option of painting, wallpapering, and choosing their own draperies. They were not forced to live with someone else's choices. With an increased feeling of control over their environments, residents may feel greater satisfaction and less stress. This conclusion is supported by findings from studies conducted by Schulz and Brenner (1977).

3. Recreational facilities were provided in the basement of the building. This area was used frequently by residents for exercise as well as socialization. This "neutral territory", as described by the builder, was instrumental in the formation of new friendships because it provided social opportunities for those who were inhibited by the idea of visiting in another person's apartment. Lawton (1975) suggested that new social opportunities may be important as the elderly may be experiencing the loss of a role in society.

4. Extra storage space was provided in the basement of the building as well as in garages. This provision eliminated the need to give things away that many elderly people face when they move to a smaller home.

5. Other facilities were also provided in the basement. A guest bedroom was provided for overnight visitors. A small kitchen was located downstairs for residents' use. This was often used for big family gatherings or informal social meetings. These facilities allow residents to continue entertaining and socializing in the manner to which they are accustomed, unhampered by lack of space or resources.

The builder managed and maintained the building himself. He provided some services that were also attractive to the residents.

1. Residents felt free to be away from their homes for extended periods because they were confident their homes would be safe and well maintained. All yard work and maintenance was handled by the staff.

2. A free van ride to the nearest large town was offered once a week by the staff. This allowed residents time to shop, eat lunch, and take care of other errands that were necessary. This service was very popular with the residents, particularly during the winter months when they did not want to drive themselves because of adverse road conditions.

Overall, the Oakwood project appeared to be a successful one. Through his excellent planning and the resulting design, the builder-designer was able to provide an environment which fit the needs of the residents very well. Future projects for the independent, older adult could benefit from this example of cooperation between the builder and the user.

Future research should focus on similar testing with larger groups. By doing this, one may be able to pinpoint specific factors which lead to stress in the environment as well as changes in attitude and stress levels over time.

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