

This article reports on a postoccupancy evaluation of Creative Living, Inc., in Columbus, Ohio, which at the time of this study was the only HUD-sponsored apartments for quadriplegics (those paralyzed from the neck down). The article focuses on the environmental components of the Creative Living service delivery system from the perspective of the most important environment-behavior issue found: the desirability of designs that enable the physically limited individual to function as independently as possible.

DESIGN FOR INDEPENDENCE

Housing for the Severely Disabled

JANET E. REIZENSENSTEIN *MCP is Project Manager for patient and visitor participation in the design of the University of Michigan Replacement Hospital. She is a Ph.D. candidate in Sociology and Architecture at the University of Michigan. Her research interests include predesign programming, postoccupancy evaluation, spatial decision-making processes in organizations, and research utilization.*

EDWARD R. OSTRANDER *is a social psychologist who works with voiceless consumers to develop user responsive design. He sees the relationship between explicit programming and postoccupancy evaluation to be a route to design relevant to research. He is an Associate Professor in the Department of Designing and Environmental Analysis in the New York State College of Human Ecology at Cornell University.*

INTRODUCTION

This article describes a Post-Occupancy Evaluation of Creative Living, Inc., in Columbus, Ohio. At the time of the study, these were the only HUD-sponsored apartments for quadriplegics, those at least partially paralyzed from the neck down. The article focuses on the environmental component of the service delivery system from the perspective of the most important environment-behavior issue found in the study: the desirability of design that enables the physi-

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cally limited individual to function as independently as possible.

Brief descriptions of physical and emotional implications of quadriplegia and of the Creative Living organization and facilities will be presented first. These are followed by synopses of the processes by which the apartments were designed and evaluated. In the next section, a few specific spaces and design features are evaluated regarding their contribution to residents' sense of independence. Finally, there is a discussion of findings and brief conclusions.

PHYSICAL AND EMOTIONAL IMPLICATIONS OF QUADRIPLÉGIA

A quadriplegic is a person with paralysis of all four limbs. This condition results from injury of the spinal cord through accident or disease, and means that all sensory-motor control is lost below the point of injury. Its obvious effect is to render the person almost totally physically dependent. Less obvious, but probably more devastating is the resulting emotional stress.

There are various levels of cervical damage involved in quadriplegia and muscular control varies considerably both between levels and within any one level.¹ However, physical implications usually include confinement to a wheelchair (usually electric rather than manual); inability to transfer between points such as wheelchair and bed without assistance; weakened trunk and arm movement; partial or complete loss of hand movement, and partial or complete loss of bowel and bladder control. The quadriplegic cannot live alone and requires a degree of skilled medical supervision to sustain his/her health.²

Emotional implications are more difficult to enumerate. As one quadriplegic describes:

The quadriplegic is a thinking individual who has his own needs and desires but who must depend on someone else every minute of

Corporation, sponsored in part by the Architecture and Environmental Arts Program of the National Endowment for the Arts. The original report describes the Creative Living service delivery system which includes staff, physical environment, and policies. In addition, it describes the process of obtaining HUD support.

the day. . . . With time, you adjust to the physical disability and accept it as something which cannot change, but the most damning consequence is the constant emotional destruction resulting from dependence on others [Maxwell, 1971].³

CREATIVE LIVING, INC.

Creative Living, Inc., is a private, nonprofit organization which according to its literature was formed for the purpose of:

planning and implementing programs with and for persons, who, because of physical disabilities are in need of assistance in the form of adaptive living facilities; educational, vocational and social opportunities and meaningful leisure time activities.

A major function of the organization is to provide physically dependent but mentally independent individuals with suitable housing designed specifically to meet their needs.

The Creative Living apartments are located adjacent to the Ohio State University campus in Columbus, Ohio. This location was considered desirable for a number of reasons. Residents were likely to make visits to the Dodd Hall Rehabilitation Center (located directly across the street) and to hospital outpatient clinics. Students could be recruited to assist residents. In addition, vocational, educational, counseling, and leisure time activities were available in the university community.

The apartment complex contains 18 units (5 doubles, occupied singly at the time of the study, and 13 singles) in a square donut plan, arranged to face inward onto a landscaped courtyard.⁴ Unit entrances are located off this courtyard. Each unit contains a living area, kitchen, bedroom, and bath (see Figure 1). Exterior patios are screened from the street by stockade fences. The living units and common use areas are provided with covered connecting walks. An enclosed carport at one corner of the site facilitates access to specially equipped vans or cars.

A staff attendant is on call 24 hours a day to help residents with activities of daily living and to render assis-

tance in case of medical emergency. There is an electric call system located in the bedroom and bathroom of all units which is connected to a central system located in the staff attendant's office. Residents hire their own personal service attendants who assist them with morning and evening care such as food preparation, dressing, bathing, personal and home care.

Residents are mostly young (late teens or twenties) and male. To qualify for residency, a quadriplegic must require an assisted living environment and be employed or enrolled in an educational or vocational training program.

DESIGN PROCESS

The designer who planned the complex had personal experience with residential environments for handicapped people. He had the support of a local architectural firm and medical experts from the Ohio State Rehabilitation Hospital. In retrospect, this group made some assumptions which residents and staff evaluated as appropriate, such as (1) an apartment building for the severely disabled can be designed to make them feel as normal as possible and need not have an institutional appearance; and (2) esthetic issues and a pleasant living environment should not be sacrificed for the sake of economy. Unfortunately, some of their assumptions turned out to be less appropriate, such as (3) wheelchair quadriplegics have mobility patterns and needs similar to those of paraplegics; and (4) assisted living means that able-bodied people, rather than residents, will operate kitchen equipment. Implications of these design assumptions will be apparent in the section on evaluation of design details.

RESEARCH METHODOLOGY

The Post-Occupancy Evaluation of Creative Living, Inc., was both brief and intensive. Data were collected by three researchers using interviews, observation, photography, examination of archival documents, and an architect's "walk-through" in eight person days during the summer of 1976,

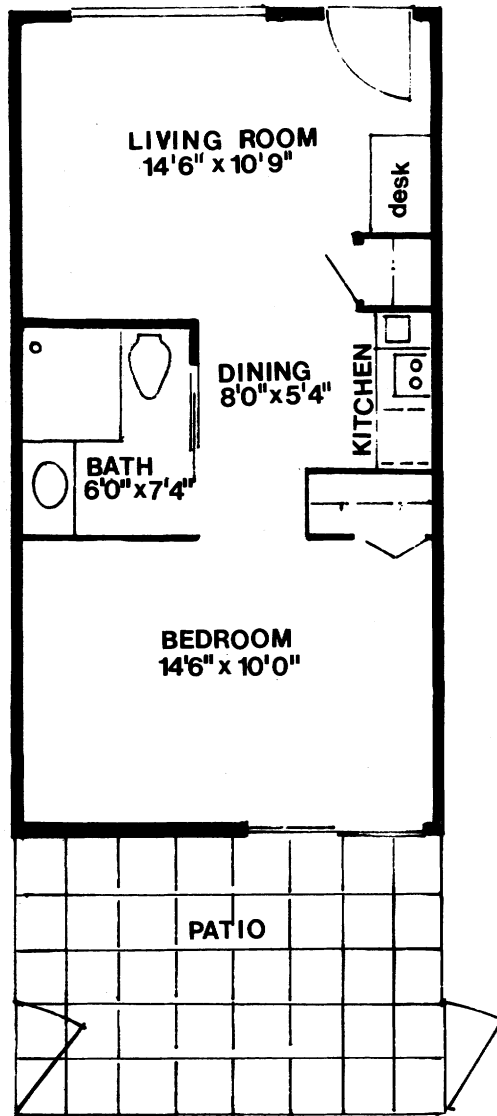


Figure 1: Floorplan of an apartment for one resident.

two years after the complex was occupied.⁵ Interviews were held with residents, staff, the architect of record, and HUD officials. Data were analyzed with regard to the match or mismatch between the existing environmental support system and an ideal or "better" system from the users' (residents and staff) points of view. This "better" system was one which enabled residents to control their environment as much as possible. The final report published by HUD includes general guidelines for planning and design of environments for the severely disabled.

CONCEPTUAL FRAMEWORK: DESIGN FOR INDEPENDENCE

For most quadriplegics, extreme physical limitations lead to almost total dependence on others to accomplish activities of daily living. As described above, this physical dependence is extremely psychologically debilitating. When sensitively designed, the physical environment can enable the handicapped individual to do various tasks without assistance,⁶ thus strengthening feelings of independence and self-worth. Conversely, inappropriately designed environments necessitate outside assistance and constantly remind the quadriplegic of his or her limitations. The physical environment of Creative Living, Inc. was evaluated considering the effects of design on the independence of users.⁷ This concept can be used in evaluating environments for any group whose sense of autonomy may be threatened by their physical or mental conditions including elderly, developmentally disabled, and mentally handicapped people.⁸ As one writer has noted, "It is obvious that a handicap, if it exists, is not caused so much by the disability as it is by the environment that fails to provide for it" (Morgan, 1976).

EVALUATION OF DESIGN FEATURES

In this section a few of the designed spaces and some of the equipment at the Creative Living complex are evaluated

for their contribution to the residents' sense of independence.⁹ However, since the extent of spinal cord damage and related muscular ability differ with each quadruplegic, the capabilities of each also vary widely. These variations can be attributed to the nature and location of injury, type of rehabilitation training, individual motivation, or past experience with equipment and prosthetic aids. For example, quadriplegics may be right or left handed either as a result of paralysis or in the traditional sense.

EMERGENCY CALL SYSTEM

Required Physical Capabilities:

Push pressure pad with body or other object, speak toward call box.

Rationale for Design Decision:

Since quadriplegics require assistance with many activities of daily living, and since medical emergencies may occur at any time, residents need to be able to reach a staff attendant at all times.

Analysis:

Although residents found the signal control in the bedroom easy to operate, some suggested that similar controls be located in all rooms of the unit. There is a call box in the bathroom, but the pull cord cannot be reached. In addition, there is no emergency power supply. Some residents felt extremely apprehensive about the possibility of a power failure.

Recommendations:

An emergency call system is the most crucial design feature since it can mean life or death for the residents. Every room should have a call box or some sort of connection with the staff attendant. There should also be an emergency power supply system so residents are not stranded in the event of a power failure.

SITE PLAN

Required Physical Capabilities:

Wheelchair mobility.

Rationale for Design Decision:

A barrier-free, grade-level plan was chosen since all residents would be in wheelchairs. The donut-shaped plan of units facing a courtyard was chosen to maximize a small site, to give residents privacy from the surrounding neighborhood and to provide an esthetically pleasing environment.

Analysis:

Although residents can easily move around the site, some see the arrangement of units facing onto a common courtyard as pleasant and safe, while others feel that this "easy surveillance" limits their privacy. The courtyard offers a grass and flowered area to look at (in spring and summer) and the bordering sidewalk is used for socializing. One complaint about the circulation flow is that several residents sitting in one place can effectively block the sidewalk for a resident who wishes to move past them. A positive feature is the provision of some secluded sidewalk areas.

Recommendations:

Identify desirable site characteristics and design accordingly. Important ones are: accessibility, shared outdoor space, privacy, security, protection from cold and wet weather.

UNIT FRONT DOORS

Required Physical Capabilities:

When entering: unlock door (put key in lock and turn), grasp and turn handle, push door into the apartment.

When exiting: open door from the inside, grasp and turn handle, pull door open, move outside, turn wheelchair and face door, pull door closed with rope or chain, lock door (put key in lock and turn), leave.

Rationale for Design Decision:

Cost limitations prohibited the purchasing of automatic doors.

Analysis:

Although many residents can get in the front door without assistance, most cannot reach the handle to pull the door closed behind them when going out. Most have some sort of rope or light chain extending across the door which enables them to close the door without assistance. The key locks cannot be used by most residents.

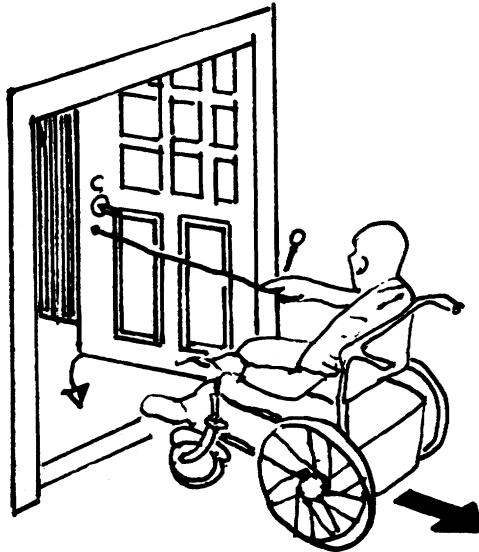


Figure 2: Most residents had some sort of rope or light chain extending across the door, which enabled them to close it without assistance.

Recommendations:

It is critical that residents be able to get out of their apartments unaided, in case of emergency, and it is desirable under normal circumstances for them to be able to get in alone. Locking devices should be such that residents who have limited finger control can operate them.

UNIT LAYOUT

Required Physical Capabilities:

Mastery of electric wheelchair.

Rationale for Design Decision:

Maximum use of limited space.

Analysis:

Although residents comment favorably on the layout of the larger apartments, the layout of the smaller units (see Fig. 1) is less favorably perceived since it allows someone to see through the apartment into the bedroom area, from the front window and door. Space configuration and door clearances permit residents to circulate fairly easily throughout their apartments.

The wall-hung table across from the kitchen sink in the small units creates a circulation barrier.

Recommendations:

Since severely handicapped people tend to be "exposed" more than others, privacy is especially important to them. In planning their apartment units, there should not be a clear line of sight between the front door and the bedroom or through the length of the unit. The bathroom entrance should not be visible from the living area since residents may be entering the bathroom undressed, in their shower chair.

LIVING ROOM DESK AND KITCHEN TABLE

Required Physical Capabilities:

Wheelchair mobility to get up to the work surface, arm extension to reach something on the work surface or to slide something over it.

Rationale for Design Decision:

Both surfaces were thought to be the appropriate height for manual wheelchairs which are slightly smaller than electric ones. The wall-hung kitchen table could be extended to act as an eating surface or could be folded against the wall to permit more circulation space.

Analysis:

Neither of these surfaces measures the 33"-34" which a person in an electric wheelchair needs for a comfortable fit. Many residents have a wooden tray attached to their wheelchair arms to provide a writing or eating surface and to help keep them upright. This lapboard makes use of these desks and tables impossible. The mechanism for collapsing the table cannot be operated by any of the residents.

Recommendations:

Table top height should be adjustable since wheelchairs differ in their dimensions. Since table tops are also used as accessible storage space, many such surfaces are desirable in the unit.

KITCHEN REFRIGERATOR

Required Physical Capabilities:

Move wheelchair alongside refrigerator, extend hand to grasp

edge of vacuum sealed door (no handle). Move arm back to open the door. Grasp and lift items in the door shelves. Lean forward to view and remove items from the top shelf. To open the freezer, a finger or hand must be inserted in the edge of the freezer compartment door and the door opened and held open.

Rationale for Design Decision:

The small apartment size bar-refrigerator holds sufficient food for one person and is wheelchair height. The size and shape fits the kitchen space allocations.

Analysis:

Handy cold food storage is a valued convenience. The location of the small refrigerator on the floor makes use of the bottom shelf difficult. The low position makes it hard to see into the unit or reach the shelves. It is difficult for residents to open, view and take items from the freezer.

Recommendations:

Select refrigerators with floor handles which can be used by residents. Position the refrigerator at eye level for someone in a wheelchair. Provide a lazy susan type shelf arrangement for access to items which would otherwise be placed at the rear of the shelf.

DISCUSSION

This Post-Occupancy Evaluation of Creative Living, Inc., was not without its limitations. The evaluation was a case study examining the apartments at a single point in time and was limited in the number of issues which could be addressed; thus the project represents neither all severely disabled people nor all related environment-behavior issues. However, this study is significant for two reasons. First, it demonstrates that the physical environment can contribute to physically handicapped people's sense of psychological independence. Second, it shows that Post-Occupancy Evaluations which are brief, intensive, and relatively inexpensive can provide useful information to the users and managers of the evaluated facility as well as to both research and design communities.

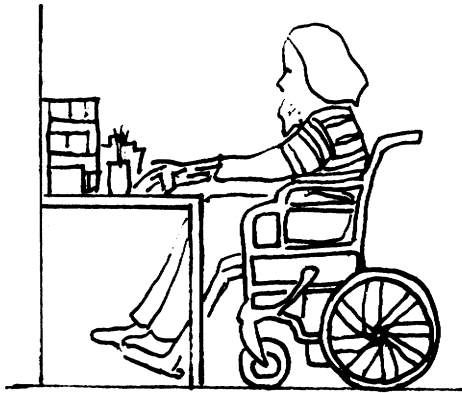


Figure 3: The living room desk was too short for a comfortable fit by residents in electric wheelchairs with lapboards.

The major question faced by most Post-Occupancy Evaluators is, "how appropriate is the physical environment (in its social context) for the needs of its users?" The first task is to define user needs, and the next is to measure appropriateness. Design that facilitates a sense of psychological independence was seen as the foremost user need in this study. Appropriateness was measured qualitatively rather than quantitatively. Questions were asked such as, "Can each resident operate/manipulate/maneuver in and around this design feature?" "How problematic is it if she or he cannot negotiate it?" Answers were provided in several ways.

One was a summary evaluation specifying the physical feature, resident evaluation (positive, negative, or mixed) and brief analysis. Second was a set of detailed evaluations of design features such as those presented above. A third way of presenting findings was a three-level ordering of design features measuring their contribution to a supportive environment. Considered most important were (in alphabetical order): automatic main door to building, emergency call system, environmental controls, kitchen and living room tables, patio doors, portable "on call" system, site location, site plan, storage space, unit front doors, and unit layout. In addition, specific design adaptations or changes were enu-

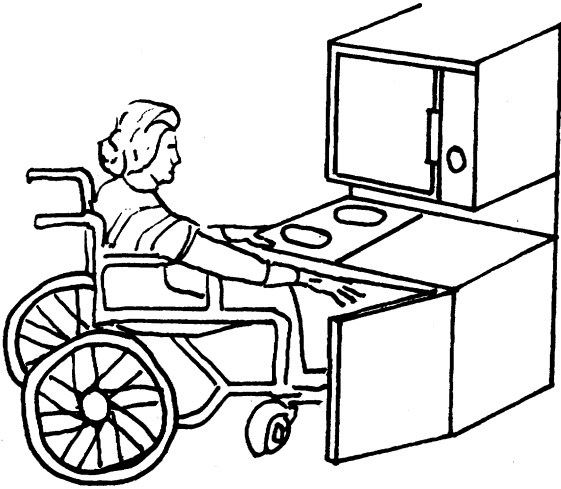


Figure 4: The location of the small refrigerator on the floor made its use difficult for quadriplegic residents.

merated and ordered according to priority.¹⁰ Recommendations include, for example, installation of a back-up emergency power supply for the intercom system and adaptation of kitchen and living room tables so that they can be set at different heights.

Finally, the complex was given an overall evaluation. For almost every resident of Creative Living, the living arrangements represent a greater opportunity for independence than they had previously, or than they might have otherwise. The apartment building and landscaping are comparable in style and quality to those found in many residential areas. Except for some custom adaptations to accommodate the residents' special needs, the apartments look like apartments anywhere. Thus, the designer and architect were successful in eliminating stigma which could have been associated with an atypical or institutional design.

However, some design decisions were made which turned out to be inappropriate. Many of these resulted from the original assumptions: e.g., the size and maneuverability differences between manual and motorized wheelchairs

were not well understood. Other design decisions evaluated as inappropriate resulted from a choice between issues such as medical monitoring and privacy. The point of Post-Occupancy Evaluations such as this one is to learn not to judge, and to use information gleaned from existing environments to make them and future ones better.

CONCLUSION

The Post-Occupancy Evaluation of Creative Living, Inc., provides specific feedback to that group as well as generating design guidelines for future environments for the severely disabled. The most important concept learned from this evaluation is that sensitively designed features at every scale from location and site plan to hardware and fixtures can strengthen what would otherwise be weak feelings of self-worth arising from physical limitations and dependence on others.

NOTES

1. That is, quadriplegics (also called "tetraplegics") who are classified as "C-5" (meaning that muscular control has been lost below the fifth cervical vertebrae) may not all have the same abilities. For example, some may be able to move their elbows and others may not.
2. Other important implications of quadriplegia, such as the financial and vocational, were beyond the scope of this study.
3. See also Caywood (1974).
4. Doubles are approximately 600 square feet and singles are 450 square feet. Facilities included are: electric range, refrigerator, garbage disposal, laundry room, gas heat, air conditioning, trash removal, interior and exterior maintenance, smoke detectors and sprinklers in all units, and emergency lights in the event of a power failure.
5. Leonard Olson was the third member of the research team.
6. Another implication of a "supportive" or "prosthetic" environment is that less intervention is required by able-bodied staff.
7. In the full report, the physical environment is regarded as one component of the total service delivery system.

8. However, for some groups, such as the developmentally disabled, the environment can provide a degree of challenge and stimulation for learning (Reizenstein and McBride, 1977). Unfortunately, for quadriplegics, environmental challenge seems to do nothing but frustrate them.

9. In addition to those presented here, the final report included evaluations of site location, main doors, lounge, laundry room, portable "on call" system, patio doors, environmental controls (thermostat, lights, windows), drapes and view, wall corner protectors, kitchen counter, kitchen stove, oven and sink, bathroom sink, bedroom size, medicine cabinet, shower, and storage space.

10. The original report also included suggestions for making the HUD process easier to negotiate.

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