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A Research Note on:

ENVIRONMENTAL DESIGN FACTORS AND ALZHEIMER'S DISEASE

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ABSTRACT

This paper is based on information obtained from a multi-method study organized to identify design factors affecting individuals with Alzheimer's Disease (AD). The findings suggest both limiting and facilitating factors that may help mitigate levels of confusion and disorientation. These factors include background elements, spatial arrangement and design of furniture components. Room plans are used to illustrate facilitating and limiting factors.

INTRODUCTION

Between 1900 and 1980, the United States population of individuals 65 years of age and older tripled. It is estimated that by the year 2000, this age group will represent approximately 22 percent of the population. The United States has an aging society and will continue to see a shift in the ratio of young to old in its population structure (Final Report: White House Conference on Aging, 1981).

Consistent with this increase in the elderly population is the number of individuals within this age group who suffer from varying degrees of dementing illnesses. One such illness is referred to as Alzheimer's Disease (AD). This disease is believed to be the fourth leading cause of death of Americans over age 65. Approximately 2–4 million elderly individuals are believed to suffer from dementia of the Alzheimer type in the United States (Select Committee on Aging, 1984). By definition, individuals suffering from this type of dementia experience memory loss, deteriorating ability to remember details, judgement and orientation impairment, and difficulty in verbal expression. Individuals diagnosed as having dementia of the Alzheimer's type generally continue on an irreversible, progressively degenerative course that results in total mental and physical disability (Hutton, 1987). Each condition has important consequences as designers, home-care professionals , planners and families modify the physical and social environment in an effort to manage the needs of this special group.

Despite the large number of older individuals who are affected by Alzheimer's or other dementing diseases, recent studies have not specifically addressed the environmental design requirements of this special group. Although recent U.S.

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government hearings and reports suggest that social and organizational characteristics of institutions may prevent or postpone the time in which an Alzheimer's patient becomes bedridden and needs skilled nursing care, there appears to be minimal recognition of the possible impact of housing environments on the functioning and well-being of these individuals (Select Committee on Aging, 1984; U.S. Department of Health and Human Services, 1984).

Considering that institutionalization costs of caring for Alzheimer's patients have been estimated at over $25 billion annually (Hutton, 1985), it seems expedient to prolong home care for as long as possible. Not only may this improve the quality of life for the Alzheimer patient, but it may alleviate the financial burden on the relatives of these individuals.

The purpose of this paper is to suggest design considerations for individuals who suffer cognitive impairment as the result of AD. The empirical research was jointly conducted with the Texas Tech University Alzheimer's Center and the Department of Merchandising, Environmental Design and Consumer Economics. The director and staff of the Center identified subjects appropriate for the study. The multi-method study was conducted in the home environments of individuals diagnosed as having dementia of the Alzheimer's type. The study focuses on identification of design criteria that would aid caregivers, health-care providers, facility designers and policy makers in better understanding the special needs of this group.

Twenty full-time caregivers of individuals with AD participated in the study. The caregivers interviewed included eight husbands, seven wives and five daughters. The 20 individuals diagnosed as having AD included eight males and 12 females. Seventy-one years was the average age of the patients in the study. The individuals with AD were unable to live alone, prepare meals or maintain self-care. Each individual with AD was a patient of the Texas Tech Alzheimer's Center, Texas Tech Health Sciences Center, Lubbock, Texas.

METHODS

The data for this study were collected in 1986 and 1987 in cooperation with the administration and staff of the Texas Tech Alzheimer's Center. The participants were selected by the attending neurologist who directs the Center. Twenty caregivers, who provided full-time care in the home environment for individuals diagnosed as having AD, were identified and contacted. Human subjects approval was granted by both the Texas Tech University Committee for the Protection of Human Subjects and Texas Tech University Health Sciences Center Institutional Review Board for the Protection of Human Subjects. The multi-method study included an environmental assessment, photographic documentation and personal interviews. Instruments used to collect the data were developed by the researchers.

Interviews held with each caregiver included open-ended questions. Questions were designed to collect data relative to design changes and modifications employed by the caregiver to provide a safer environment for the individual with AD. In addition, an environmental assessment was conducted in each living unit. The assessment included interior living spaces used by individuals with AD. Assessment was designed to systemically record interior elements through both written and photographic documentation. Multi-methods were chosen to reduce bias and to answer the following questions relative to the environmental needs of these individuals: 1) What are the most important design considerations for this special group, and 2) How can housing and design specialists better address the environmental concerns relative to health, welfare and safety as it applies to living

environments for individuals with AD?

The caregivers were asked to respond to open-ended questions regarding changes made in the environment to better meet the needs of the individual with AD. In addition, they were asked to make recommendations regarding design needs of these individuals. Based on the findings from interviews, environmental assessments and photographs, the researchers identified a number of both limiting and facilitating factors that directly affect the quality of life for the individual with AD.

Primary areas of concentration for research were the living areas, bedrooms, kitchens and baths. The analysis focused on elements affecting the health, welfare, and safety of the individual with AD, including factors that may affect levels of confusion and disorientation. The space-planning, furniture components and background elements of each area were evaluated to assess their impact on the individual with AD. The investigators identified factors likely to contribute to physical and psychological well-being . Unfortunately, most individuals who are caring for AD patients are at a stage in the life cycle that limits ability, both physically and economically, to make structural modifications in their home environment. Therefore, simple adjustments such as rearrangement of furniture and accessories may contribute to the health and safety of the individual with AD and assist the caregiver in care/management activities.

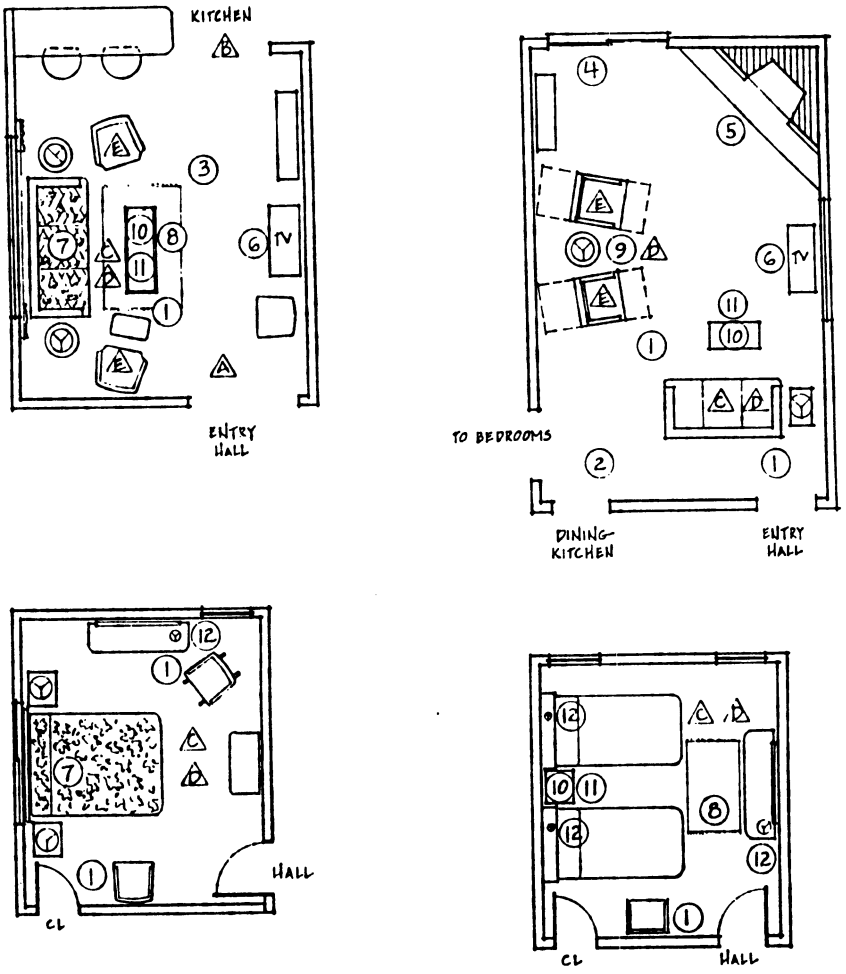
RESULTS AND DISCUSSION

Figures 1-4 illustrate typical residential floor plans as identified by the investigators. While Figures 1 and 2 indicate typical plans of bedroom areas of individuals with AD, Figures 3 and 4 graphically illustrate representative arrangements of common living areas occupied by individuals with AD. Floor plans are not drawn to scale. Each illustration is keyed to Tables 1 and 2.

Tables 1 and 2 reflect facilitating and limiting factors revealed by analysis of the space-planning and interior components of the different groups. Factors facilitating independent behavior, enhancing perception and contributing to general sense of well-being are listed in Table 1. Factors are keyed to floor plans (see Figures 1-4) with letters A-E. The potential impact of each factor on the individual with AD is listed. Table 2 focuses on the limiting factors that may have a negative effect on individuals with AD. These factors are keyed to each floor plan (see Figures 1-4) by use of the numbers 1-12. The effects of each factor are also listed.

In addition to the data illustrated by the figures and shown in the tables, a number of additional factors relating to background elements are identified. These factors include spatial perception that is enhanced by use of adequate value contrast between furniture, walls and flooring. Problems with glare reduce the quality of spatial perception, increasing disorientation and sometimes negatively affecting physical balance of the individual. Elements resulting in glare include exposed windows or light sources as well as highly reflective surfaces. Highly patterned surfaces have a similar negative impact. Poor general lighting and poor light distribution compound difficulties with visual perception and spatial orientation. Personal possessions are found to contribute to a general sense of

FIGURES 1-4: TYPICAL FLOOR PLANS



Lower Left - Figure 1. Bedroom Example 1.

Lower Right - Figure 2. Bedroom Example 2.

Upper Left - Figure 3. Living Area Example 1.

Upper Right - Figure 4. Living Area Example 2.

Table 1. Facilitating factors affecting individuals with AD

KEY	FACILITATING FACTOR	EFFECT ON INDIVIDUAL
A.	Furniture components placed on periphery of room for clear circulation paths	Improves orientation; reduces confusion; promotes security and well-being
B	Direct access to adjacent areas	Reduces spatial disorientation
C	Well-constructed, sturdy furniture components	Enhances balance and stability; promotes safety and well-being
D	Highly visible furniture components	Promotes physical safety; reduces confusion
E	Large, enveloping seating components	Enhances sense of security and well-being

psychological well-being, although numerous small accessories in the space are sometimes reported to contribute to confusion.

Living Areas

Some residential units include both formal and informal living areas. Other residential units are designed with a common living space. When a choice exists, the family elected to utilize the informal living area. Activities in this space are varied and include television viewing, conversing, and casual dining. Substantial amounts of time are spent in this space by both the caregivers and the individuals with AD. Results of interviews and observations reveal that televisions are on during most of the waking hours.

Caregivers report that television programs sometimes contributed to confusion, frustration and distress due to subject matter (e.g. violence). The majority of the caregivers indicate that the individual with AD did prefer a particular piece of furniture, generally a sofa or large chair that provided a "sheltering" effect.

The data suggest that many elements of the living areas are supportive of security and physical safety of the individual with AD. Well-constructed furniture components enhance a sense of security and aid balance in rising and sitting. Value contrast between floors, walls, and furnishings were normally adequate to facilitate spatial perception. Other factors that negatively affect the behavior and competence level of the individual with AD include arrangements of furniture components, circulation paths and interior lighting.

Bedrooms

In the bedroom, principal activities engaged in by individuals with AD include sleeping, resting and dressing. In several instances, the individuals are capable of making their beds. The data suggest that physical features in the bedrooms may

permit individuals with AD to function more safely with increased security and

Table 2. Limiting factors affecting individuals with AD

KEY	LIMITING FACTORS	EFFECT ON INDIVIDUAL
1	Furniture components interfere with access	Impedes autonomy; creates barriers
2	Multiple entrances into living space	Contributes to disorientation and confusion
3	Circulation path interrupts living activities	Contributes to confusion
4	Sliding glass door	Impedes physical safety; contributes to disorientation
5	Fireplace	Impedes physical safety; may create optical illusion
6	Glare caused by improper placement of television	Contributes to confusion, disorientation, and visual discomfort
7	Highly patterned surfaces	Contributes to confusion and disorientation
8	Area rugs	Impedes balance and stability
9	Technically complex reclining chairs	Contributes to confusion, imbalance, and disorientation
10	Low, small or poorly balanced tables	Increases safety risks
11	Sharp edges or corners on furniture components	Impedes physical safety and well-being
12	Poorly balanced or lightweight portable lamps	Increases safety risks

enhanced competence levels. These conditions include accessibility to the bed, selection of structurally solid furniture and use of contrasting surfaces (e.g. wall/floor). Identified factors that compromise safety are inadequate lighting and inaccessibility to bathrooms.

Kitchen and Bath

The investigation determined that the most complex areas for individuals with AD are the kitchen and bath areas. Most of the individuals with AD who were

participants in this study spend little time in the kitchen and are not allowed to attempt food preparation because of safety considerations (e.g. hot range-top heating elements). In both spaces, the individuals' sense of competence was reduced by high reflectivity, lack of contrast between significant elements (e.g. between bath fixtures and bathroom walls), and complex and potentially dangerous control elements (e.g. water-temperature controls).

CONCLUSION

Major themes of the White House Conference on Aging in the United States and the 1982 United Nations World Conference on Aging held in Vienna, Austria were economic well-being, housing requirements, health needs, and improved quality of life for aged individuals (Final report-1981 White House Conference on Aging, 1981). In addition, the Older Americans Act of 1965 specifically states that the elderly population in the United States is entitled to suitable housing designed for their special needs (United States Code, 1965; Office of Policy Development and Research, 1979). If these needs are to be addressed in a conceptual framework, increased emphasis must be placed on specific environmental design requirements of subgroups within the aged population, such as individuals suffering form the degenerative effects of Alzheimer's disease (AD)>

REFERENCES

Final Report: 1981 White Conference on Aging. (1981). (Volume 2). Washington, D.C.: U.S. Government Printing Office.

Hutton, J. T. (1987). Alzheimer's disease: Evolving clincal concepts and management strategies. *Comprehensive Therapy, 13 (9),* 55-64.

Hutton, J. T. (1985, Nov. 14). Prof testifies risk of Alzheimer's disease growing. *The University Daily, 61 (53),* Texas Tech University, Lubbock Texas, p. 1.

Office of Policy Development and Research. (1979). *Housing for the Elderly and Handicapped* (HUD-DDR-301). Washington, D.C.: U.S. Government Printing Office.

Select Committee on Aging. (1984). *Alzheimer's disease.* (Joint Hearing before the Subcommittee on Health and Long-Term Care of the 98th Congress). Washington, D.C.: U.S. Government Printing Office.

United States Code. (1965). (89th Congress-First Session, Volume 1, Laws Legislative History). St. Paul, MN: West Publishing.

U.S. Department of Health and Human Services. (1984, September). *Alzheimer's disease: Report of the Secretary's Task Force on Alzheimer's disease.* Washington, D.C.: U.S. Government Printing Office.