

## **ALZHEIMER'S DISEASE: THE COLOR ISSUE**

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### **Abstract**

*This study systematically investigated the effects of interior color relative to behavior of individuals diagnosed with Alzheimer's disease (AD). The research site was a group-living area in an Alzheimer's Care Unit (ACU) within an intermediate care facility. The experimental, multi-method study utilized photo-documentation, systematic observations, annotated diagrams, and checklists to record resident behaviors. Preliminary findings suggest the interior color has behavioral implications for AD patients. Nevertheless, additional data are required for substantiation and greater applicability.*

### **Introduction**

The relationship between human behavior and color within the physical environment is complex and affected by innumerable variables. Color, however, may assume particular importance when considering effects upon individuals diagnosed as having Alzheimer's disease (AD). Persons experiencing cognitive and motor failures associated with the disease are particularly vulnerable to the effects of environmental conditions upon self-perceived competence and behavior (Shroyer, Hutton and Anderson, 1987).

Cognitive impairment of any kind, including AD, is a primary health problem of older persons in the United States (Aging America, 1985-1986). The number of cases of AD in the United States is estimated to be between 2 and 3.5 million (Hamill and Buell, 1982; Select Committee on Aging, 1986), and the incidence of the disease is expected to increase as the general population ages, unless a cause or cure is identified. AD is age-related; risk increases from 2 to 3 percent in the 60s age group and 17 to 30 percent in the 80s age group (Mortimer and Hutton, 1985).

AD is defined as a condition resulting from a degenerative process involving the brain. Four basic stages are identified, beginning with forgetfulness and disorientation in new surroundings and progressing through such symptoms as purposeless overactivity, disorientation in physical space and time, and total dependency and inability to communicate (Ware and Carper, 1982). According to Hutton (1987), the average length of AD is ten years, although this figure varies among individuals.

The need for research evaluating the influence of the environment upon individuals with AD and exploring behavior at different stages of the disease is recognized (Select Committee on Aging, 1985; U.S. Congress, 1987). Special care units are being retrofitted to many facilities in the United States in an effort to adequately accommodate the special needs of this group. The value of surroundings and social settings that support declining cognition, sensory incapacity, and decreased motor skills has been identified as an important behavioral management tool for care and maintenance (Carey and Hansen, 1986; Lawton, 1970).

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There is a paucity of empirically based research to support intuitively based statements regarding the effects of color on human behavior. In addition, data which provide practical information and guidelines for environmental manipulation of color are noticeably lacking in the current literature. The overall objective of the study was to determine the effects of specific, interior color--when used in an institutional, group living area--on the behavior of individuals diagnosed with AD.

### **Methodology**

The research site was an Alzheimer's Care Unit (ACU) within the intermediate care facility of Levelland Nursing Home, Levelland, Texas. The facility housed 26 diagnosed AD residents. Researchers observed resident behaviors to determine observable behavioral changes in an existing small group space located in the ACU. During a specified period of time, wall color of the space was changed. Upon completion of observations, data were analyzed to identify behavioral changes during observation periods. The multi-method study used photo-documentation, systematic observation, annotated diagrams, and checklists to record behaviors. Specific measurable behaviors analyzed included physical activity/inactivity, social interactions, and catastrophic and negative reactions (e.g., screaming, violent acts). Each of these behaviors had been identified in previous studies as a major, measurable behavior associated with AD (Shroyer et al., 1987; Shroyer and Hutton, 1988; Shroyer, Hutton, Gentry, and Dobbs, 1989).

### **Subjects**

The population consisted of 26 persons residing in the ACU. Each individual had been diagnosed by a physician as having symptoms of Alzheimer's disease. The number of subjects was limited to six individuals. Through previous studies, researchers had determined that six individuals is the maximum number of subjects that one observer can systematically track in a single observation period (Shroyer et al., 1987; Shroyer and Hutton, 1988; Shroyer et al., 1989).

Key staff personnel were asked to identify six subjects for observation. These individuals were identified by staff to be "active" individuals who regularly used the experimental area. Appropriate agency and university forms regarding confidentiality and human-subjects clearance, as well as family authorizations, were completed prior to the initiation of the study.

Case histories of each individual were recorded. Ages of subjects ranged from 65 to 84. This study population was comprised of two men and four women.

### **Setting**

The study was limited to a single site: the ACU located within the Levelland Nursing Home. The group living area is located in the northeast corner of the ACU. Dimensions are 14'-0" (measured east-west) and 19'-8" (measured north-south). The living area opens on the south to an 8'-0" wide hallway leading to double doors which separate the ACU and the intermediate care unit. These doors are secured and may be opened by use of a coded lock system. Double doors on the southwest side of the living area lead to residents' bedrooms. This area is shown in Figure 1.

The north wall of the living area includes two large double-hung windows measuring 6'-9" (w) and 5'-6" (h). The window sill is located 1'-0" from the floor. On the east wall, a 3'-0" doorway leads into the activity room. The door has been removed, leaving a permanent three-foot opening. Reinforced safety glass spanning 3'-4" (w) by 3'-6" (h) permits visual access between the living area and activity room. The window treatment consists of one-inch, horizontal mini-blinds in a neutral hue. The mini-blinds throughout the study were maintained in a down, blades-open position. These features are shown in Figures 2 and 3.

The nurse's station is located behind an opening on the east wall adjacent to the ac-

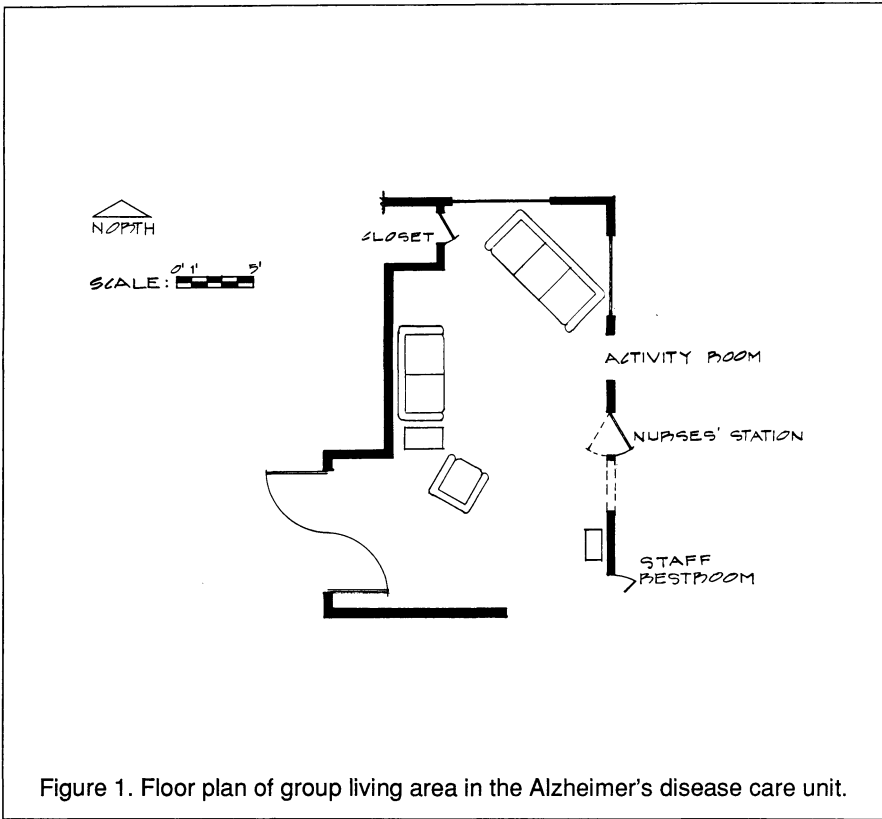


Figure 1. Floor plan of group living area in the Alzheimer's disease care unit.

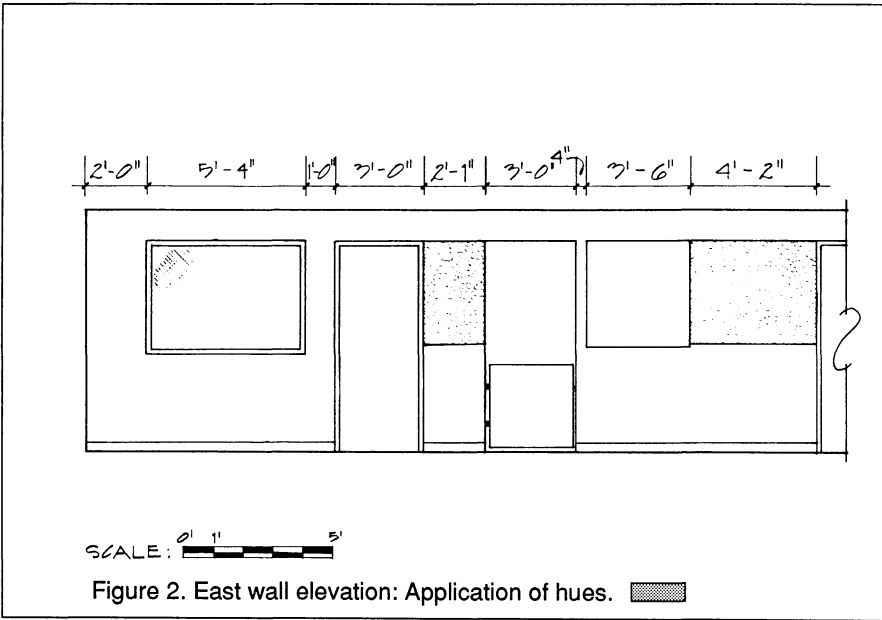

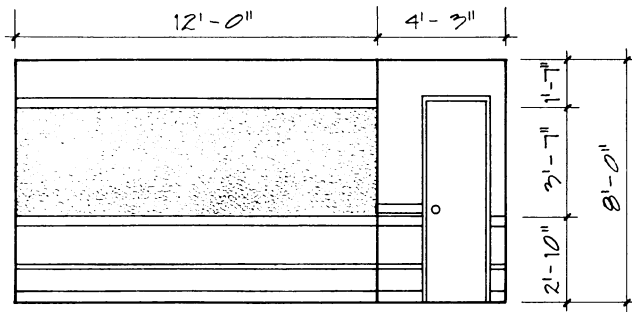

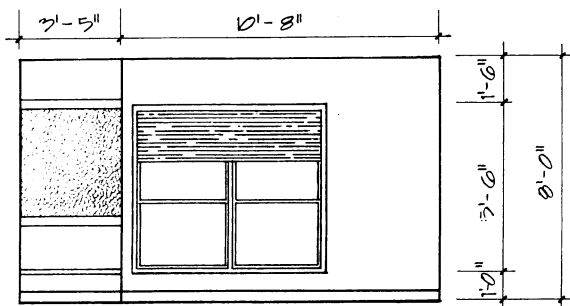


Figure 2. East wall elevation: Application of hues. 




SCALE: 0' 1' 5'

Figure 3. West wall elevation: Application of hues. 



SCALE: 0' 1' 5'

Figure 4. North wall elevation: Application of hues. 

tivity room. A swinging 3'-0" gate with a hook latch provides access to the nurse's station.

Furniture in the living area consists of a sofa, love-seat, a large, reclining chair, and one end table. Furniture style may be termed contemporary; it has simple lines and little ornamentation.

### **Data Collection**

The multi-method study used a number of data collection techniques. The research was structured as an experimental study conducted within a field setting. Methods used included

1. a systematic observation of behaviors during experimental interventions and baseline-data collection;
2. annotated diagrams for recording verbal traces;
3. interviews with staff members for interpretation of medical records and to document events; and
4. photo-documentation for recording physical traces.

Multiple research methods were necessary in order to gather sufficient data to understand the different aspects of the situation being studied and to contribute to the methodological rigor of the research (Patton, 1988; Zeisel, 1981).

Observation within a field setting enabled the researchers to fully observe the situation with all pertinent elements, relationships, and dynamics (Zeisel, 1981). The researchers were also trained to observe occurrences, relationships, and contexts that other individuals within the setting (e.g., staff members) might not notice or deem important (Patton, 1988). In this case, the researchers were nonparticipatory observers seated immediately outside the area under study, within visual and aural communication of the subjects and staff. A common concern regarding studies using observers is that their presence will affect the outcome of the study. Pretests have indicated that this is not an overriding concern with subjects with AD. The nature of the disease is such that the observer seems to be perceived by subjects to be a staff member of the facility.

### **Study Format**

The study was conducted in an experiment format with manipulation of the independent variables (selected hues) to determine resultant changes in the dependent variables (behaviors of residents in the special care unit). Selection of hues was based upon review of the literature (Faulkner, Nissen and Faulkner, 1986) and anecdotal reports regarding the effects of color on resident behaviors.

An instrument composed of checklists and rating scales was completed to document the frequencies of specified behaviors, posture, and gait of each subject during each observation period.

Annotated diagrams were maintained to document pertinent aspects of the experiments. These diagrams included recording actions and comments of subjects as well as the context in which the actions took place. Also, relationships observed between elements of the physical setting and specific actions or comments were recorded. Observers' insights and interpretations were transcribed on location at the time of observation.

Staff personnel were interviewed to document events occurring since the last observation period. Open-ended questions were asked regarding occurrences within the facility and specific behaviors exhibited by the subjects. In addition, staff members were asked to report medication changes since the last observation period for the six subjects.

Photographic documentation of the physical setting was maintained. The experimental site was photographed at the outset of each intervention with a 35mm camera. The original condition of the site was also recorded. Observations were also documented using a video camera to provide a record of the experiment.

Table 1. Frequencies of resident activities.

	Walking/Pacing			Sitting		
	Baseline	Warm	Cool	Baseline	Warm	Cool
Resident 1	1	6	3	1	10	7
Resident 2	0	2	4	0	11	5
Resident 3	1	18	9	1	11	7
Resident 4	1	4	5	0	6	6
Resident 5	NA	20	2	NA	12	6
Resident 6	1	7	6	1	2	3
Totals	4	57	29	3	52	34

NA=Resident not in space.

	Vocalizing			Catastrophic events		
	Baseline	Warm	Cool	Baseline	Warm	Cool
Resident 1	1	9	7	0	0	0
Resident 2	0	4	5	0	0	0
Resident 3	1	15	6	0	0	0
Resident 4	0	0	1	0	0	0
Resident 5	NA	9	1	NA	0	0
Resident 6	0	1	1	0	3*	0
Totals	2	38	21	0	3	0

NA=Resident not in space.

\* Shouting

1. Any major environmental change increased resident-activity levels. In most instances the residents being observed were more active (e.g., walking, talking) as compared to typical behavior observed during baseline conditions. There were a total of 234 observed activities during application of both red and blue wall covering compared to nine observed activities during baseline, data-collection periods.

2. Warm colors appeared to increase activity levels. Of the six residents observed in the study, five engaged in more walking/pacing activity and more vocalizing during the warm-hue intervention. There were 57 observations of walking/pacing activities when the red hue was exhibited on the wall as compared to 29 observations of walking/pacing when the blue hue was visible. There were 38 observations of vocalizing when red hue was exhibited on the wall as compared to 21 observations of vocalizing when the blue hue was visible. Incidents of negative outbursts (shouting) were observed during the warm-hue intervention only. (Table 1).

3. According to staff observations, the warm color could have detrimental effects over long periods of time. After one week under warm color conditions, residents became restless; conversely, residents generally remained calm under the cool environmental conditions.

### Summary and Conclusions

Intuitive assumptions and anecdotal notes suggest that elements of interior space may positively or negatively affect persons with AD. Although the findings are not conclusive, this preliminary study supports statements which link environmental color and behavior. Nevertheless, additional data are necessary to definitively state that a relationship exists between hue and behavior in Alzheimer Special Care Units. Empirically based evidence is important in order to establish specific design criteria that will support the special needs of this population.

The difficulty in identifying specific environmental effects highlights the importance of determining what elements present a threat to the health and safety of individuals with Alzheimer's disease. Analysis of the effects of selected hues on resident behaviors provides needed empirical data in the study of design factors in Alzheimer's Special Care Units. The findings of this study contribute to on-going, comprehensive evaluations by these researchers into the relationships between specific environmental design elements and behaviors of persons with AD.

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