Housing and Society
Vol. 15, No. 3, 1988

A Research Note on:

PERCEPTION OF LIGHT AND COLOR BY THE ELDERLY IN THE INSTITUTIONAL ENVIRONMENT

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ABSTRACT

Use of light and color are critical elements in providing distinct environmental information for the institutionalized elderly. Changes in the visual system cause altered perception of interior architecture. A sense of control and maneuverability on the part of the resident will be enhanced by the design of distinct visual messages in the surroundings. Light levels, glare, contrast and color may be manipulated to enhance and clarify environmental information and positively affect behavioral patterns.

INTRODUCTION

The institutionalized elderly are particularly vulnerable to confusion caused by misunderstood visual cues in the surrounding environment. According to Bayles and Kaszniak (1987, p. 252), "...a large portion of the exponential losses in acuity that accompany aging appear to be accounted for by changes in the visual nervous system." Because residents of an institution should experience a sense of control and an ability to maneuver within an environment, clear visual information is essential. Manipulation of light and color in interior spaces is an effective method in providing clear environmental cues for elderly individuals living in long-term care facilities.

PHYSICAL CHANGES IN THE EYE

During the normal aging process, a number of physical changes take place in the human eye. An increase in the thickness of the lens results in a corresponding loss of flexibility (Kenney, 1982). The lens yellows and becomes more opaque (Dye, 1983). The pupil of the eye becomes smaller, with a decreased range of dilation. Retinal nerve fibers deteriorate and coordination of muscle structures is impaired (Nuckolls, 1976). The aging eye is also subject to disorders such as cataracts, glaucoma, macular degeneration, and diabetic retinopathy (Kline and Schieber, 1985). These conditions compound existing visual problems and significantly impair perception of the visual environment.

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RESPONSE TO LIGHT AND COLOR

Physical changes in the visual nervous system dramatically affect the eye's response to light and an individual's perception of the luminous environment. The most noticeable changes are probably the loss of visual acuity (the ability to see at far ranges) and the development of presbyopia (the inability to focus at near distances). Both problems are associated with the loss of flexibility of the lens of the eye (Dye, 1983). The clouding of the lens and decrease in pupil size contribute to a decrease of approximately two-thirds in the level of light striking the retina. The visual threshold, or minimum quantity of light needed for seeing, increases accordingly. By age 60, the process of visual adaptation from light to dark slows and becomes less effective (Kenney, 1982).

The older eye is more vulnerable to glare, both direct and reflected (Beck and Meyer, 1982). The thickened lens distributes intense light throughout the retina in unpredictable patterns, producing a heightened "dazzle" effect (Kenney, 1982). Reflections from eyeglasses caused by harsh light may compound the problem (Nuckolls, 1976). Changes in posture result in a lowered horizon line, often affecting perceived glare as the elderly individual confronts light sources designed to correspond to the height of a normal young adult (Beck and Meyer, 1982).

Perception of color also changes as the eye ages. Hues are perceived one-fifth less keenly by an elderly individual than by a normal young adult. It often becomes more difficult to differentiate between values of subdued colors (Beck and Meyer, 1982). At the same time, the yellowed lens of the eye tends to filter out shorter wavelengths of light, negatively affecting perception of blues and violets (Dye, 1983).

RECOMMENDATIONS FOR LIGHTING AND COLOR

A common design practice is to provide three times as much light for an elderly individual as for a normal young adult (Marcu, 1983). However, great care must be taken to avoid the direct or reflected glare often caused by providing higher light levels (Aranyi and Goldman, 1980). The highly reflective surfaces found in many institutional facilities compound this problem. To avoid glare, materials with low reflectivity should be utilized for flooring and wall coverings (Raschko, 1982). The need for sunlight is well-documented. Window treatments should be utilized to control admittance of intense light that may cause visual hazards or optical illusions (Carpman, Grant, and Simmons, 1986).

Ceiling layout and fixtures should be designed to conceal light sources (e.g., indirect lighting). When direct lighting is unavoidable, the light source should be hidden from view of the occupants (Carpman et al., 1986). Because warm colors are more readily perceived by the aging eye, incandescent or color-corrected light sources are advised.

Selection of light levels throughout an institution should be carefully considered. Uniform lightning is often provided to avoid confusion as a result of elderly residents' poor visual adaptations. However, such lighting creates a monotonous visual environment in which no visual cues are emphasized by varying light levels. Different spaces should be lighted according to task needs with accent lighting for important cues and areas of interest (Lam, 1977). Varying light levels would also serve to warn the resident of danger zones and to guide the individual through an interior space. Care should be taken to control abruptness of changes in illumination levels (Nuckolls, 1976).

Transitional areas between spaces of high and low illumination levels are critical. Entrances and exits of lobbies, living areas, and rooms adjoining outside areas should be illuminated to lessen the necessity for rapid visual adaptation when moving from one area to another. Such lighting is necessary for safety as well as for visual comfort (Koncelik, 1979).

Warm colors, particularly within the yellow range of the spectrum, are more easily perceived by the older eye (Aranyi and Goldman, 1980). Saturated hues are recommended for use in interior spaces. Such hues make it easier to see visual messages within the environment (Beck and Meyer, 1982). Visual acuity is affected by light levels and the contrast between objects and their background (Dye, 1983). Actual color selection is not as important as judicious use of contrast in value intensity to emphasize important environmental information. Level changes should be clearly delineated by contrast with background surfaces, as should mobility aids such as handrails (Beck and Meyer, 1982). Other informational cues, such as individual doors and room numbers, should also be emphasized. Furniture that contrasts with flooring material should be selected to enable elderly residents to better see obstacles and hazards (Aranyi and Goldman, 1980).

CONCLUSION

Light and color are key elements in the design of institutional spaces. They help clarify important environmental informational cues for elderly residents. These cues are essential to the successful functioning and sense of competency of an aging individual in an institutional housing environment. Specific design concerns are light levels, glare, color, and levels of contrast as utilized within the space. Careful control and manipulation of these elements greatly enhance perception and, thus, positively affect behavior patterns by increasing the elderly resident's ability to maneuver and interact with others.

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