

## **Studies on Color in Residential Architecture for the Elderly**

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### **ABSTRACT**

It is a well-known fact that ageing involves biological changes, among them certain physical and sensory impairments such as the alteration of colour perception. Of all existing strategies on architectural communication, the use of colour deserves special consideration as an architectural factor for providing adequate visual comfort. In this sense, in communal living environments such as care homes, a positive and coherent relationship between the resident and the new environment must be established, providing the residents a legible built environment adapted to their needs.

The aim of this paper is to present several theoretical-practical studies based on the application of colour in architecture for the elderly. This paper is related to the National Research Project titled "Modifications of the Visual Comfort in Residential Centres to Improve the Quality of Life for the Elderly", that is funded by the Ministry of Economy and Competitiveness (2016-2019). The project, seeks to have a deeper knowledge about the relation between architecture and health.

To this end, this study reviews the current situation and recent research material in color perception in architecture for the elderly, focusing on color as a design factor capable of improving perception of the visual environment and promoting visual accessibility.

**KEYWORDS:** Color, Elderly, Architecture

### **INTRODUCTION**

In the architectural design of interior spaces for promoting health and well-being such as senior living facilities, color is considered one of the most useful tools for modifying the characteristics of space [2]. Throughout history, many experts have studied how the visual perception undergoes changes as we age [9]. In addition, numerous investigations have verified that color is capable of influencing decision-making in humans [3]. In this sense, unlike what happens in such buildings as restaurants, hotels, shopping malls or museums, living in centers dedicated to caring for the elderly, like hospitals and nursing homes, is often associated with negative feelings or connotations [10]. As is well-known, there are various biological changes that begin with aging, including impaired motor skills, cognitive skills and perception [1-3]. Specifically, people living in facilities for the elderly usually have certain psychological difficulties, such as feeling sadness at the loss of family members and a loss of control within their living spaces [10,11]. Along these same lines, physical impediments to moving around is among the most complicated aspects of adapting to new surroundings [7]. To eliminate this loss of control within an inhabited space, it is important to understand how users are affected by the surrounding environment. Built environment must also provide the older person with information in order to make it a legible environment[4], the "person and environment inter-related through architectural communication" obtained by way of how the space is designed, its visual formalization (Fig. 1) [5]. For this reason, applying color properly in senior living facilities should focus on finding a way of positively stimulating and improving visual perception of

space [3], with an adequate scientific basis, thus ensuring residents will assimilate perceptual actions susceptible to the aging process and the sensory losses that often develop.

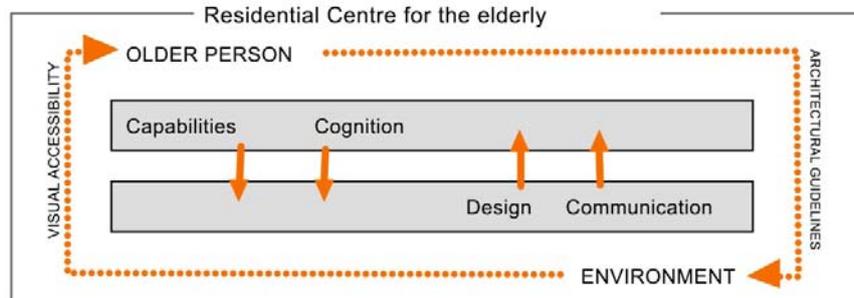


Figure 1: Analysis of the PERSON-ENVIRONMENT relationship in a senior citizen living facility from the perspective of communication and architectural design. Developed by the authors

## METHOD

We take for granted the words of the doctor and researcher Helle Wijk (2016), who defines four design factors to be considered influential on an elderly person, and thanks to which color as an architectural tool might greatly improve the interpretation and reading of an interior space: Code, Attention and reference points, Recognition and Aesthetic. This article examines these factors for improving the interior design of spaces and provides examples of architecture that justify them.

## RESULTS AND DISCUSSION

Difficulties in adapting to new and usually communal living spaces for people with age-related sensory changes gives rise to the need for including elements designed specifically for such reasons. [4]. This graphic information about the context must be carried out appropriately to ensure the architectural space is perceived correctly and used when attempted to understand the space.

1. CODE: Recent research confirms the importance of differentiating spaces through materiality and color. For example, the experimental study conducted by Lee (2010) on a group of participants between 66 and 82 years of age demonstrates how a single healthcare center designed in two completely different ways can completely change the sense of direction: on the one hand, a white, mono-color environment with no reference points causes confusion among participants, who are unsure how to find their way. On the other hand, the same space that has been designed in a reasoned and thought-out way in terms of how material and color are applied to different areas produces very different results: participants demonstrate they can orient themselves better and make their way to their destination with greater confidence [10]. Of particular interest is the research conducted by Head and Isom (2010), who sought to characterize how aging affects one's navigational skills inside buildings, bearing in mind the influence of differentiating pathways by color or, in its absence, by the walls of a certain route. It shows again how this color coding of pathways enhances mobility and orientation [7]. One way color might be used to make a space more clearly visible might be to mark off zones with a color coding system. By color-coding zones, sectioned-off areas of a building can be simplified so that its different areas can be more easily and intuitively differentiated (Fig. 2.A).

2. ATTENTION AND REFERENCE POINTS: Visual attention is the selective response of the eye achieved through a cognitive process that facilitates detection of specific stimuli in a particular environment [1]. Studies show that older people have increased difficulties perceiving information in their surrounding environment [6] though the odds of detection are more favorable when there is an element with a high degree of visual attention.

In the scientific study carried out by Spence et al. (2006) in which participants observed a sequence of both color and grayscale images to be studied beforehand in order to be able to later recognize each scene, they found that participants better recognized the scenes shown in color. That is, color improves the recognition of scenes and

therefore plays a significant role in the processes of both encoding and recognition [12]. This result therefore indicates that chromatic information is linked to the visual representation of the scene in the recognition of space. This chromatic visual attraction can be generated through visibility, shape, marks and/or size. People correlate these spatial landmarks if they are visible and different, that is, differentiable (Fig. 2.B).

3. RECOGNITION: The yellowing of the lens that comes with aging leads to a color variation between the object observed and the back of the retina [13]. As a result, there is a loss in color contrast. People over 60 tend to need higher levels of both achromatic and chromatic contrast, especially at low spatial frequencies [13]. For example, the combination of colors in the white and yellow ranges is perceived as being very similar [8], and the combinations in the blue-green, dark blue-black and brown-purple ranges become the most confusing [8,13].

As such, Wijk et al. (1999) spent many years carrying out specific tests and interviews with a large number of people over the age of 79 to focus their study on color discrimination, naming and preferences of elderly people. Those authors discuss the importance of color discrimination for recognizing elements and spaces through the proper use of color combinations. In their conclusions, they point out that to achieve good contrast, it is essential to take into account the differences in brightness and chromaticity [15], and not only differences in tone. The importance of using differences in color contrast between the figure and its background [15] in order to improve recognition and definition of visual information transmitted through space (Fig. 2.C).

4. AESTHETICS: All these indications for design based on scientific studies show us that it is necessary to adapt the space to the sensory changes that come with aging to foster a more independent life and a specific kind of visual comfort. The study by Karatza (1995) stresses the importance of using both color contrasts and color coding and referencing to aide in identifying objects and spaces; in addition, it also emphasizes consciously designing the chromatic scene to define a more attractive space [9]. For this reason, the planned aesthetic must not be forgotten for achieving a design that is both accessible as well as suggestive.

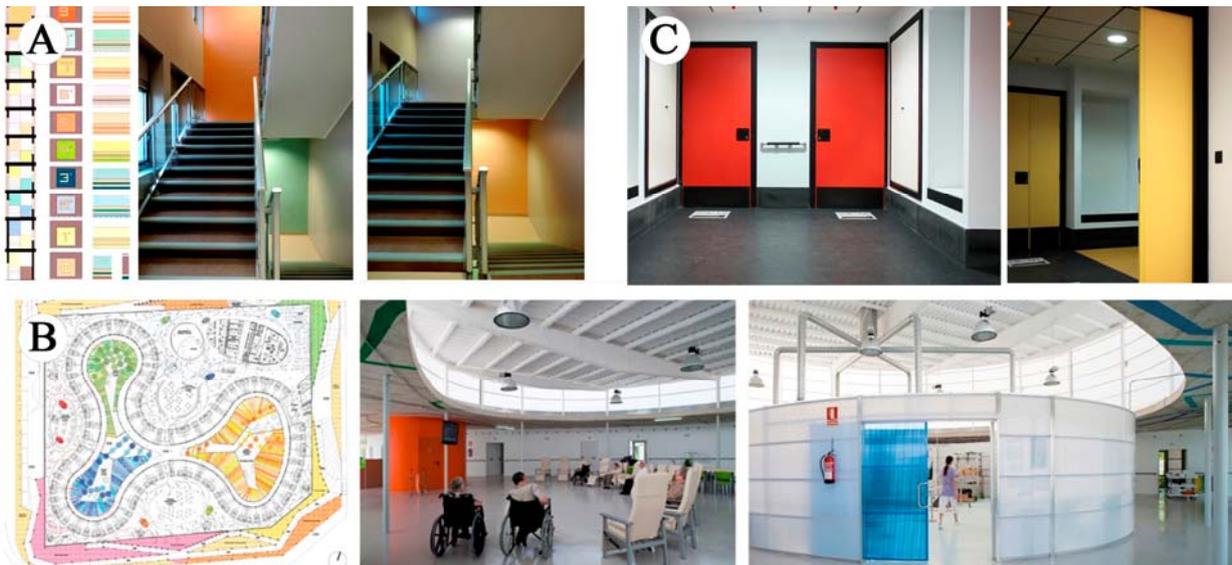


Figure 2: A: Sant'Andrea hospital. Color orientation by floor. Architect D. de Biase. Source *Colore architettura e città*, 2013. B: Santa Rita Geriatric Center, Menorca. 2009. Architect M. Ocaña. Photo: M. de Guzmán. Space joined by attention points using color. C: Senior Citizen Living Facility, Madrid. 2010. GEED Architects. Photo: A. Prados. Recognizing elements, rooms or specific floors. Source B and C: [www.plataformaarquitectura.cl](http://www.plataformaarquitectura.cl)

## CONCLUSION

This article states the use of color as an element of importance for achieving a goal through its link to spatial function, and how it might be used to support elderly as a necessary part in their visual process and perception. The architect and designer undertake the complex task of tailoring their work to meet the civil duty of adapting the architecture and design to meet the needs of members of society with certain visual problems, like the elderly, in order to achieve a universal design that might be extrapolated to all citizens.

This paper is related to the first phase of the National Research Project whose aim is to study the relation between color environments and the elderly, considering color as an architectural factor that is necessary in order to facilitate their self-sufficiency and to promote wellbeing to the older people with certain common visual impairments [16]. It is a field of knowledge that investigates not only the improvement of the quality of buildings but the effects of architecture on the visual comfort of older people. It should be noted that evidence-based research is proposed in a second phase, based on several visits to care homes and focus group arrangements with residents aged 70-90 years, as well as test development and lab work with older people aged 70-80 years in Biomechanical Institute of Valencia. As a result, chromatic guidelines in order to obtain specific adapted solutions are proposed, by adapting different types of spaces for the elderly through chromatic solutions. And, as the last phase, a real intervention is planned in a residential centre for the elderly, located in Fontilles Foundation (Alicante).

### ACKNOWLEDGEMENTS

This work is supported by the Research State Agency and the European Regional Development Fund (AEI/FEDER, UE) titled "Modifications of the Visual Comfort in Residential Centres to Improve the Quality of Life for the Elderly", that involves a multidisciplinary team composed of architects, engineers, sociologists, psychologists, among others, of Polytechnic University of Valencia and University of Valencia, Spain.

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