

Carlos L. Marcos *Editor*

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Editor
Carlos L. Marcos
University of Alicante
San Vicente del Raspeig, Alicante
Spain

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Design of Residential Centres for the Elderly and the Perception in Their Spaces

Ana Torres Barchino^(✉), Jorge Llopis Verdú, Juan Serra Lluch,
and Anna Delcampo Carda

Departamento de Expresión Gráfica Arquitectónica, Universitat Politècnica de
València, València, Spain
{atorresb, jllopis, juanserra, andelcar}@ega.upv.es

Abstract. This paper is part of the R+D+I Research Project recently approved by the MEC which is based on possible modifications in visual comfort on architectural spaces for improving the quality of life of the elderly (BIA2016-79308-R). In the project, a series of buildings in the Valencian Community that present various modifications for adapting them into geriatric institutions are studied and analysed. Two models have been selected, each of which presents a historical singularity (one, late nineteenth and the other, mid twentieth century) and architectural features located in very different environments. This study provides us information about some of the reforms carried out in their interior spaces to turn them into geriatric centres, as well as the conditions of habitability for such a vulnerable group. In the development of this document, different types of perceptive experiences of the users who live in these two spaces are analysed, after the field work in which the problems of adaptation and feeling of well-being permeate throughout. Proposals for improvements to visual accessibility and adaptation of the architectural space for senior citizens are proposed. Finally, we list some technological alternatives to know the type of stimuli in the built environment of senior citizens that might help to bring about improvements in this type of architecture.

Keywords: Perception · Visual accessibility · Design · Space
Geriatric architecture

1 Introduction

The project entitled “Modifications of the visual comfort in residential centres to improve the quality of life for the elderly—MODIFICA”, falls within the framework of the 2016 Call for I+D+i Projects—State Program for Research, Development and Innovation for the Challenges of Society. Made up of the group for Research on Colour in Architecture and Design at the Instituto de Restauración del Patrimonio at the Universitat Politècnica of Valencia, the project has carried out various studies and experiments on colour in heritage architecture, which has led to new lines of research opening up on the design of spaces, contemporary architecture and interior architecture.

The interest in this new project originated in response to the rising phenomenon of population aging (Abellán García and Pujol Rodríguez 2017), which, to keep up with

the resulting demand for residential-geriatric centres, calls for a kind of architecture that cannot be ignored. From out of this interest, we focus our research on the settings and environments that help the well-being of people who permanently live in, and share, common spaces. Residences and centres for dependent elderly people are today one of the most pressing social demands in communities throughout the world. Specifically, caring for the elderly requires a kind of architecture that address the real needs, where activities are carried out for helping not only those with cognitive impairment, but also with activities that bring about a sense of well-being and social interaction.

One of the objectives of the research carried out on other projects by the research group for Colour in Architecture and Design is to establish guidelines for the chromatic characterization of different types of architectural spaces meant for use by the elderly, for the purpose of creating a habitat specifically adapted to their physical (mobility and accessibility) and sensory (ergonomics) needs, while also meeting their psychological satisfaction.

To meet this objective, the study of the environment and interior spaces in residential centres entails a series of studies on the perception of light and the effect of size or proportion. Effects that, when the architectural design is developed in an objective and planned-out way, can improve the quality of life for elderly residents thanks to their specifically visual comfort. For this reason, the design of architectural spaces meant to be shared by elderly residents is worthy of reflection from a scientific, technical and sociological study.

This work is therefore cross-disciplinary, with involvement of architects and professors from the School of Architecture at the Universitat Politècnica de València; sociologists from the Department of Social Sciences and psychologists from the Department of Psychology at the University of Valencia, engineers and technicians from the Institute of Biomechanics of Valencia, and the assistance of technical specialists at collaborating centres and companies. During the three years that this project will last, concrete architectural solutions are to be drawn up that will improve existing spaces in residences for the elderly.

This project began in 2017 with the theoretical-documentary and scientific study for background knowledge about the relationship between the subject and the inhabited space as it relates to their physical and sensory characteristics, in order to determine some immediate needs with regard to ergonomics and visual deficiencies, information that is currently fragmented and lacking an overall compendium. This initial analysis of bibliographic and documentary content will serve as a foundation for proceeding to the second phase of the research.

The method used to begin this project includes in its first stage the study of residential centres for health, history, evolution and current state. To this end, bibliographic collections and documentation on residential architecture for the elderly is of primary concern, to gain knowledge about these kinds of architectures globally and by country. Likewise, the study and analysis of ergonomics and the habitat of the elderly, the analysis of typologies of existing residential accommodations of a temporary or permanent nature, so far to date, both in new buildings and rehabilitated buildings, and an analysis of their strengths and weaknesses.

In short, in this first stage of the project, we present a few examples of buildings restructured into geriatric centres from among the various types analysed in the

Valencian Community, with a focus on the perception of their spaces and an exploration of some interesting aspects of their design.

1.1 Background Studies on Residential Models

A series of residential centres in the Valencian Community have been identified, the architectural characteristics of which were not intended for this purpose. From among the over 20 centres studied, two buildings have been selected that, due to their diversity, help to understand the urgent need for having places in which to live and share in a community when we reach an advanced age and dependency.

Therefore, depending on the communities and cities, there proliferates a series of buildings adapted for old age, ranging from public and private centres to social housing with a wide variety of architecture. We are not talking about the most current kind of architecture, such as Cohousing (Durrett 2015), but rather a kind of architecture that has been renovated and reconstructed for the new use and for people with certain limitations.

For this reason, there are certain imbalances in the perception of space among dependent people or those with limitations, which do not allow them to control the place nor the space in which they habitually move about and perform activities in these kinds of transformed architecture.

The two models presented below are examples of this; both can be analysed as models of large-scale geriatric centres, where there are different spaces for the daily life of long-term dependent elderly people.

1.2 The Old Palacio de los Martínez de Raga

Built in neoclassic style in 1885, it was reformed in 1996 by the architect Cristina Grau (1946–1997) and is considered one of the emblematic buildings of the city of Valencia. Known as the Palace or Home of the Marquis González de Quirós. The building was the ancestral home of Francisco Martínez de Raga y Faus. In 1885 it was inherited by Luis Vallier y García Alesón, Lapeyre y Pardo de Rivadeneira, first Marquis de González de Quirós. It was occupied by a School (the Teresian Institute), which acquired it in 1953. It is currently a residence for the elderly. It is composed of a ground floor, semi-basement, mezzanine and two floors; the main one with Ionic balconies and pilasters (Fig. 1). Inside there is a neoclassical staircase with marble steps and a stone basket arch, leftover from the old house (Taberner Pastor et al. 2007).

All that has been conserved of the original building is the main facade (Fig. 2), the architect Cristina Grau chose a neutral solution based on prismatic volumes, with a series of even openings, the spacing of which is interrupted only where it meets a large interior glass wall that lets in the northern light and features an old garden, also preserved (Taberner Pastor et al. 2007). It has only been possible to take photographs of the building in its current state, the interior spaces and facade. The information and documentation about this palace has yet to be reviewed.

It is important to our analysis the considerable lack of light in the group of rooms. However, its worthy location in the centre of the neighbourhood makes it easy for residents to socialize with nearby family and surroundings.



Fig. 1. Old Palacio de los Martínez de Raga, Valencia. El Carmen neighbourhood, year of construction 1885. Location and current state



Fig. 2. Current facade of the Old Palacio de los Martínez de Raga, Valencia

As has been seen, in the interior spaces it features good living conditions, but lacks good perception of space due to the lighting and lack of contrasts on surfaces, which makes orientation difficult for both workers and users (Fig. 3).



Fig. 3. Inside the old Palacio de los Martínez de Raga Current state, main hall and hallway

1.3 Residence of El Pinar en el Grao de Castellón

The second model is located in the area called El Pinar en el Grao de Castellón, which leads directly to the seafront promenade built in 1959 by the architect Vicente Vives Llorca and was intended as a Summer Residence for the National Transport Union (Fig. 4).

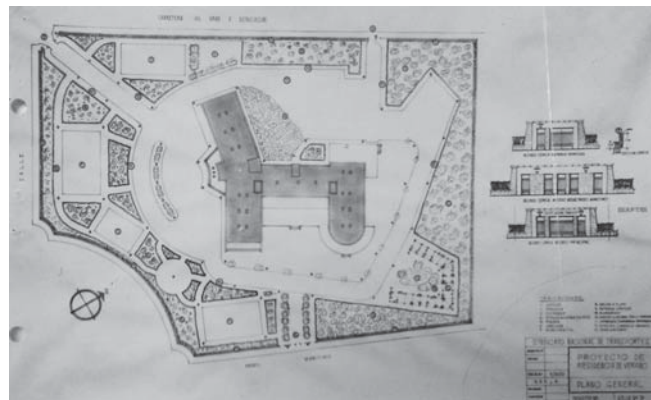


Fig. 4. El Pinar de Castellón Residence. 1959. Site

In June 1988, this senior living centre was reformed, updated and extended in an overall rehabilitation project by Guillermo Monfort Salvador. It was in 1998 when the Head of the Technical Office of projects and works of the Ministry of Social Welfare, Amparo Benet García, reformed this centre to make it the current residential centre for elderly people “El Pinar” (Fig. 5).

This building has an unbeatable location compared to other large-sized centres from the same building period. The external volumetric shape of this building and its style with respect to other models of the time consists of a linear body oriented to the south,



Fig. 5. El Pinar de Castellón Residence. First floor. Original layout in the year 1959. Reformed layout in the year 1998. Developed by the author

in a very open V-shape, from whose vertex a central body extends, which joins a third area of the building, located to the North, perpendicular to the previous one.

Of all the features that can be seen in the ensemble, what is remarkable are the windows on their facades. This is where the natural light enters, filling the centre's expansive interiors (Fig. 6). Surrounded by a natural landscape, there is an extensive garden area with direct access to a fenced-in promenade leading to the sea.

Compared to the previous one, this kind of residence features greater natural lighting in all the rooms, hallways and bedrooms, which undoubtedly provides a feeling of comfort and well-being for users and workers. The perceptive experience of the residents observed during therapeutic activities is, as was appreciated, stimulating and comfortable. The large amount of natural light throughout the complex helped the emotional stability and therefore improved the quality of life.

On the other hand, certain materials on floors and walls frequently reflected light so the level of visual adaptation for older residents increased their slow stability within their visual field and perceptive block.



Fig. 6. Interior of El Pinar de Castellón Residence. Current state. Hallway

1.4 Perception and Design of Architectural Spaces

The main hypothesis supporting this research's argumentative basis is that many technicians, architects, designers and others are unaware or do not heed the fact that certain factors need to be taken into account when designing senior citizen residences, beyond the aesthetic and functional components.

If we start with the perceptual process of older people (age group from 70 years old and up), they show certain common vision difficulties (Okajima 2013) and more severe vision difficulties called “Low vision” such as: diabetes, leucoma, which cannot be corrected with glasses. Another visual problem, focusing: accommodation and glare (Yoshimoto et al. 2014) are the most common cause in aging. EB Goldstein stated that the ability to perceive depends on the environmental information that reaches the brain (Goldstein 1988). And in this sense, each person's perception is different, depending on the types of emotion and spatial understanding of the environment.

Likewise, in old age, there are risk factors associated with physical and psychological stability. A recent study indicates that not all people are equal in their ability to develop a spatial understanding of the environment (Münzer 2016) regardless of age or gender. It is evident that practice is effective when it comes to orienting oneself in an unknown place (Delcampo Carda et al. 2016b). Given that the first part of our research is theoretical studies, a search was begun for existing buildings whose characteristics were not those of geriatric architecture.

The latest psychology studies point out that sensations play an important role in improving the quality of life (Pérez Fuentes et al. 2015). Some indicators of psychological well-being include: self-acceptance, positive relationships with others, autonomy, life projects, personal growth, and control over one's surroundings. The latter is of great importance for designing habitable environments and, as a consequence, one's capacity for orientation.

In fact, the perception of depth, distance or the size of a room are aspects to keep in mind in this study, taking into account the poor mobility of the person with a medium-to-high level of dependence. “In real life, people actively move in their

environment, contemplating it when moving from one place to another” (Gibson, 1974).

Some technological alternatives aide a person to understand how they are oriented and recognize certain objects in space. Techniques such as:—Eye Tracking: a process that evaluates the point where the eye is looking and its movement in relation to the head given a series of stimuli. This process is carried out using technology based on eye tracking, that is, software that interprets and collects this information and graphically summarizes each participant’s visual performance.

- Galvanic Response and Skin Conductance: Technological measuring technique that interprets and collects the information generated by changes in the galvanic resistance and conductivity of the skin via sensors connected to different parts of the participant’s body.
- Virtual reality glasses or HMD: device worn like a helmet for viewing images generated by 3D design software. These images or videos are projected directly onto the retina, generating an effect of absolute immersion through virtual reality. The generated effect encompasses the entire field of vision of the participant, who interacts directly with the images shown, directly affecting the user’s cognitive stimulation.

2 Discussion

In short, the psychological comfort that users need can be achieved by acting at three different levels: the relationship of the rooms with outdoor spaces (patio, garden, etc.), environmental quality of these spaces (privacy, orientation, suitable materials) and adequate ergonomics in the design; relationship with life in the neighbourhood and visual integration between exterior and interior (Ribot and Thunnissen 2009). In accordance with these levels, we add one more that seems fundamental in the study of this type of environment: ergonomics and design of the visual environment, based on concepts of environmental psychology, that is: adaptation and improvement in an environment where difficulties arise in lighting conditions and where various types of activities are performed (Lillo Jover 2000). As we have seen, it is therefore necessary to have knowledge about the physical limitations of old age, since it is a stage in life when people are more vulnerable to changes as a result of a gradual reduction in their capacities (Delcampo Carda et al. 2016a).

The spaces in which they reside and their organization must adapt to the person in order to provide safety, independence and autonomy (Delcampo Carda and Torres Barchino 2016). In addition, it is understood that the quality of life in old age is linked to such determining factors as the well-being and psychological satisfaction of the environment in which they live (Galindo Galindo and Corraliza Rodríguez 1999), which also includes adequate health care and other aspects such as family or friends, and the presence of a way for encouraging personal development. To do this end, we must take into account not only the existing regulatory compliance based on minimum dimensions of spaces that make up geriatric centres, but we must also go further into

the characteristics of the residential centre under study: to know what design factors directly affect the resident's development and co-living conditions, the dimension of spaces as well as their lighting and colour characteristics by determining the elements that make them up, arranging them and taking into account all possible design factors that might interfere with the welfare and visual comfort of the elderly person.

In the specific case of senior living centres, it is thought that the users who live in the centre are not the ones who decide how to live there, that is, it is currently done by the workers of the centres and the elderly residents are treated as secondary actors, and are often not taken into account in the stylistic and functional decisions of said space, which is meant to be their home. Consequently, the imposed, non-personal space directly influences the elderly person. Enough data is being gathered to help interpret specific comfort needs for this group of people so the architecture might address it as much as it can.

3 Conclusions

To begin with, the working hypothesis that the residences where the elderly live are their usual residences and should therefore be their home, promoting and facilitating an optimal state of well-being. It is therefore necessary to enhance their stay through an optimally developed physical environment, where the resident is stimulated in a functional, perceptual and emotional way (Torres Barchino et al. [2017](#)).

The study in this work aims to raise awareness of the perceptual needs of dependent elderly people in specific residential centres. There is a need to communicate to professionals, architects, designers and building technicians the design guidelines prior to performing building work on historical buildings meant to be converted into centres for the elderly. Designing and modifying spaces of this type of architecture requires studying how an architecture for coexistence might improve the quality of life of the elderly. Further study and analysis of the activities that take place in this type of space is also needed to learn the different uses, with a focus on the cognitive improvement of users in this type of centres.

It is necessary to bear in mind that it is planned for a group of people with unique needs, people more vulnerable to change and not just for people with dependency or disabilities.

In the analysis, it has been studied and demonstrated how the determinants of the quality of life of the elderly are largely materialized in their respective habitat, with an analysis on how resources in the surroundings can act as compensating tools for the physical and mental deterioration that comes with old age by improving visual comfort, through stimulating the senses and encouraging the use of existing capacities.

This first stage of research and starting hypothesis has facilitated the development of a thorough scientific study for the future, which will be implemented in a methodological tool (orientation computer simulator) to aide in the training of the architect or designer for the purpose of generating positive stimuli through specific visual comfort for elderly people living in geriatric institutions.

The goal of which is so the technicians in charge of restoring or making improvements to geriatric centres will have guidelines on the proportions of spaces, with regard to orientation and composition, as well as for colour perception and lighting and a chart of architectural guidelines that have been studied, justified, demonstrated and proven, so that they can be applied in their work.

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Ana Torres Barchino Ph.D. in Fine Arts from the Polytechnic University of Valencia (2000) and Associate Professor since 2005. Her preferred field of research is the colour and design of architectural spaces. Member of the Colour Research Group in Architecture and Design. She lectures as part of the Master's in Restoration of Architectural Heritage and the Master's in Design Engineering at the UPV. She is currently leading the MINECO I+D+i Project on Chromatic Modifications in Residential Architecture. atorresb@ega.upv.es.

Jorge Llopis Verdú Ph.D. in Architecture from the Polytechnic University of Valencia (1997) and Full Professor at the University since 2000. His fields of research are the analysis of architectural graphics and the documentary analysis of heritage architecture. Member of the Colour Research Group at the Institute of Heritage Restoration at the UPV. Lecturer at the School of Architecture and as part of the Master's in Restoration of Architectural Heritage at the Polytechnic University of Valencia. jllopis@ega.upv.es.

Juan Serra Lluch Ph.D. in Architecture from the Polytechnic University of Valencia (2010) and Full Time Lecturer since 2011. Member of the Colour Research Group of the Institute of Heritage Restoration at the UPV. His preferred field of research is colour in modern and contemporary architecture. He is currently the main researcher in a project about colour strategies for the visual integration of architectures with visual impact on the landscape. juanserra@ega.upv.es.

Anna Delcampo Architect since 2011, Master in Architectural Heritage Conservation and Master in Training of Secondary Teachers. With the predoctoral grant VALi+d awarded by Generalitat. Currently she is under contract with UPV as researcher, while she is developing her doctorate within the Architectural Graphical Expression Department and the Color Research Group with which she collaborates. andelcar@ega.upv.es.