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NATURE IN SPACES FOR OLDER PEOPLE: A BIOPHILIC APPROACH, IN THE WORLD

LA NATURALEZA EN LOS ESPACIOS PARA EL ADULTO MAYOR: UN ENFOQUE BIOFÍLICO, EN EL MUNDO

A NATUREZA EM ESPAÇOS PARA IDOSOS: UMA ABORDAGEM BIOFÍLICA, NO MUNDO

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RESUMEN

El propósito del estudio es conocer cómo la biofilia puede condicionar el diseño de espacios arquitectónicos del adulto mayor. La investigación es descriptiva, cualitativa y no experimental, se utilizó la revisión documental de antecedentes teóricos y arquitectónicos para precisar el tema de estudio, el comportamiento de la variable e identificar criterios arquitectónicos. Se analizaron cinco casos de la realidad empírica para validar los criterios y obtener lineamientos de diseño. Asimismo, uno de los resultados obtenidos en los cinco casos fue el lineamiento de generar terrazas y espacios exteriores naturales transitables que crean integración con el área libre y éstos conecten con el entorno natural, un lineamiento aplicado en un 100 por ciento de los casos estudiados. Se concluye que, la biofilia condiciona el diseño de espacios del adulto mayor al generar una relación fluida entre interior/exterior mediante espacios abiertos y semiabiertos, que incluyan la naturaleza y promuevan la interacción social de los ancianos.

Palabras clave
biofilia, naturaleza, adultos mayores, teoría biofílica

ABSTRACT

The study aims to find out how biophilia can condition the design of architectural spaces for older people. The research is descriptive, qualitative, and non-experimental, using a documentary review of the theoretical and architectural background to specify the subject of study, the behavior of the variable, and to identify architectural criteria. Five cases of empirical reality were analyzed to validate the criteria and obtain design guidelines. Similarly, one of the results obtained in the five cases became the guideline to generate terraces and natural, walkable outdoor spaces that create integration with open areas and connect with the natural environment, a guideline applied in 100% of the cases studied. It is concluded that biophilia conditions the design of spaces for older people by generating a fluid indoor/outdoor relationship through open and semi-open spaces, which includes nature and promotes social interaction among older people.

Keywords
biophilia, nature, older people, biophilic theory

RESUMO

O objetivo do estudo é descobrir como a biofilia pode condicionar o projeto de espaços arquitetônicos para idosos. A pesquisa é descritiva, qualitativa e não-experimental. Uma revisão documental de antecedentes teóricos e arquitetônicos foi utilizada para definir o objeto de estudo, o comportamento da variável e identificar critérios arquitetônicos. Cinco casos de realidade empírica foram analisados para validar os critérios e obter diretrizes de projeto. Da mesma forma, um dos resultados obtidos nos cinco casos foi a diretriz de criar terraços e espaços externos naturais e transitáveis que permitam a integração com a área aberta e a conexão com o ambiente natural, diretriz aplicada em 100% dos casos estudados. Conclui-se que a biofilia condiciona o projeto de espaços para idosos ao gerar uma relação fluida entre o interior e o exterior por meio de espaços abertos e semiabertos que incluem a natureza e promovem a interação social dos idosos.

Palavras-chave:
biofilia, natureza, idosos, teoria biofílica

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INTRODUCTION

Biophilia connects the natural environment with human beings, seeking a direct and indirect connection between them, allowing the well-being of all individuals to coexist and create a more balanced environment (Trevisam & Silva, 2024). Similarly, biophilia responds to different natural stimuli through contact with urban nature, demonstrating the social, physiological, and even emotional benefits and that this urban nature manifests itself through direct or indirect contact (Villalpando & Bustos, 2023). It is known that biophilic design constitutes an essential contribution to architecture. It links the characteristics of built environments and natural elements through biophilic patterns grouped into three dimensions: Nature in Space, Natural Analogies, and the Nature of Space. The biophilic theory of nature in space refers to the direct, physical, and ephemeral presence of natural elements in a place (Gareca, 2022), which is the most relevant dimension in this study.

On the other hand, the rapid pace of aging in countries has been rising, with the need for facilities and spaces for older adults to improve their functionality, well-being, and social insertion effectively (Araya et al., 2018). Globally, the increase in the older population highlights the importance of having facilities that offer adequate solutions to improve this group's quality of life and provide spaces in the following areas: physical, emotional, economic, educational, and social (Barahona, 2020). Recreational spaces for older people are not always suitable or safe in these facilities, so it is necessary to create areas where activities can be carried out that can generate physical, emotional, and social well-being in this older adult population (Quispe, 2023).

Similarly, there is a need to incorporate biophilia in the spaces of older adults for their benefit since, at present, the spaces where they perform their daily activities are not looking for an appropriate solution and are deficient in their infrastructure and the correct use of spaces (Lorenzo, 2020). The case studies selected from the research, Biophilic cities, green spaces, and quality of life in the metropolitan area of San Luis Potosí, Mexico, have shown that contact with nature has a positive impact on health and well-being and that older adults have an innate inclination towards natural spaces, to take advantage of the great benefits they offer (Moreno & Sánchez, 2018). In addition, applying biophilic principles in architectural spaces for older adults improves their quality of life, safety, and emotional comfort by allowing them to interact socially through diverse activities in built environments with a biophilic architecture design (Failoc & Ojeda, 2022).

Older people have great difficulties staying active due to physical conditions or limitations. It has been shown that incorporating nature into spaces

Figure 1. Principles of biophilic theory of nature in space. Source: Prepared by the authors adapted from Medina et at. (2023)

is very important for older people's physical and psychological well-being. Integrating natural elements into architectural design improves the conditions of habitability, mobility, and balance (Torrontegui, 2020). As people age, their health tends to decline, and they are more prone to diseases, reduced mobility, and even disorders. Biophilic patterns bring benefits to people, particularly older adults. Integrating the biophilic design shows improvements and benefits in the quality of life of this older population, who are usually the most physically and mentally vulnerable (Mari Tamil et al., 2023).

This research seeks to determine how architectural design can incorporate nature into spaces to

Figure 2. Theoretical and architectural background. Source: Preparation by the authors.

encourage socialization and offer emotional support to older adults, promoting their participation in the community, with nature, and among themselves. It has been studied that biophilia improves spaces through the connection between the built and the natural, which generates positive influences and benefits in environments, which in turn provides greater well-being and comfort, especially for older adults (Medina et al., 2023). Biophilic design contributes directly and indirectly to improving the quality of life in residential environments, such as comfort, accessibility, and relationships, generating an active interest in and development of biophilic design (Lee & Park, 2022).

Figure 3. Theoretical and architectural background. Source: Preparation by the authors.

DISCOVERING THE BIOPHILIC THEORY OF NATURE IN SPACE

Biophilic theory is based on the idea that humans feel an innate connection with nature. One of its dimensions is nature in space, which aims to link the built with the natural environment. This dimension seeks to reinforce the integration of the outdoor environment with the built interior spaces, which considers incorporating natural elements in the spaces to promote well-being, foster skills, and increase productivity. Biophilic theory is composed of three key principles: volumetric composition and nature, open spaces and the relationship with the natural environment, and finally, natural elements and architecture (Figure 1).

METHODOLOGY

The study is descriptive in terms of its depth, defining the behavior of the variable biophilia. It is also classified as qualitative due to the condition of the data, which was focused on obtaining non-quantifiable information based on observation. In addition, it is considered non-experimental since the variable is not manipulated but is mainly based on the observation of the behavior of biophilia in empirical case analyses.

Therefore, the study is structured in three research phases. The first begins with a documentary review of the theoretical and architectural background material to specify the topic of study and the biophilia variable. Research and scientific articles were used to search for the theoretical background, which generally addresses the research topic. This theoretical background review was needed to understand everything related to biophilia and how it is linked to older adults (Figure 2).

On the other hand, the architectural background information addresses the research topic in a specific way, including research and scientific articles. Similarly, this documentary review of the architectural background contributes to the research on how biophilia can be integrated into an architectural design for older adults (see Figure 3).

During the process, a list of databases and official search engines of Universidad Privada del Norte, such as EBSCO and Google Academic, and documents in indexed journals (Web of Science, Scopus, and Scielo) (Figure 2 and Figure 3) was prepared. The study of these documents yields architectural criteria grouped into three study categories: Volumetric Composition, Spatial Typology, and Architectural Details.

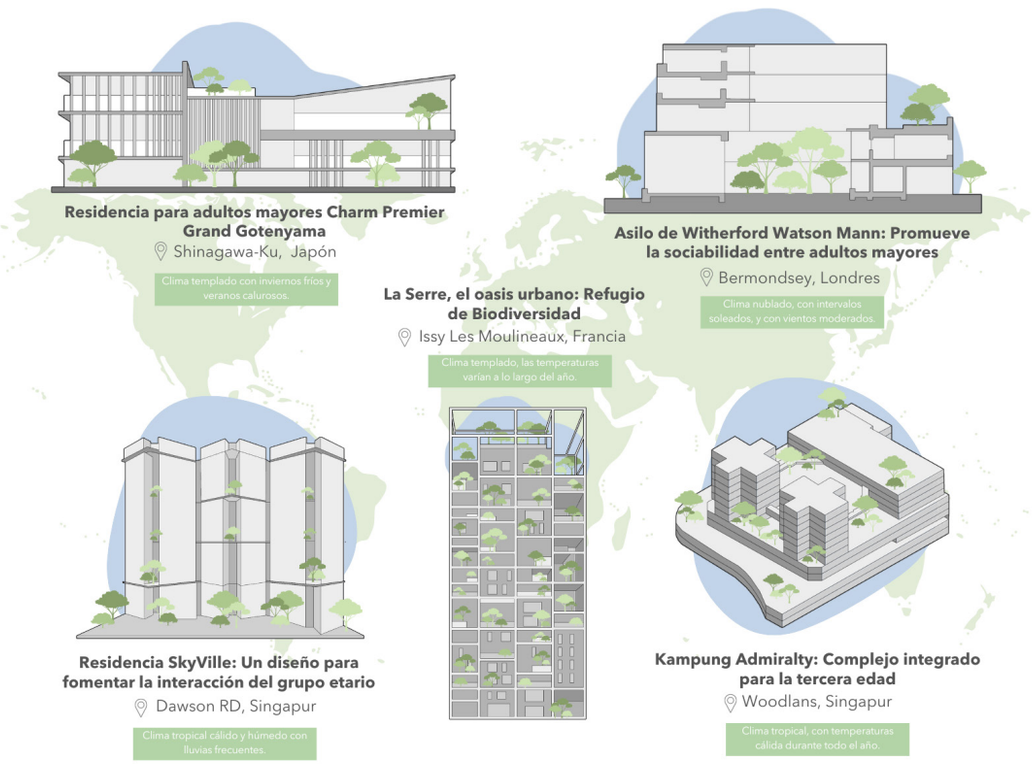

Figure 4. Architectural cases in the international field. Source: Preparation by the authors.

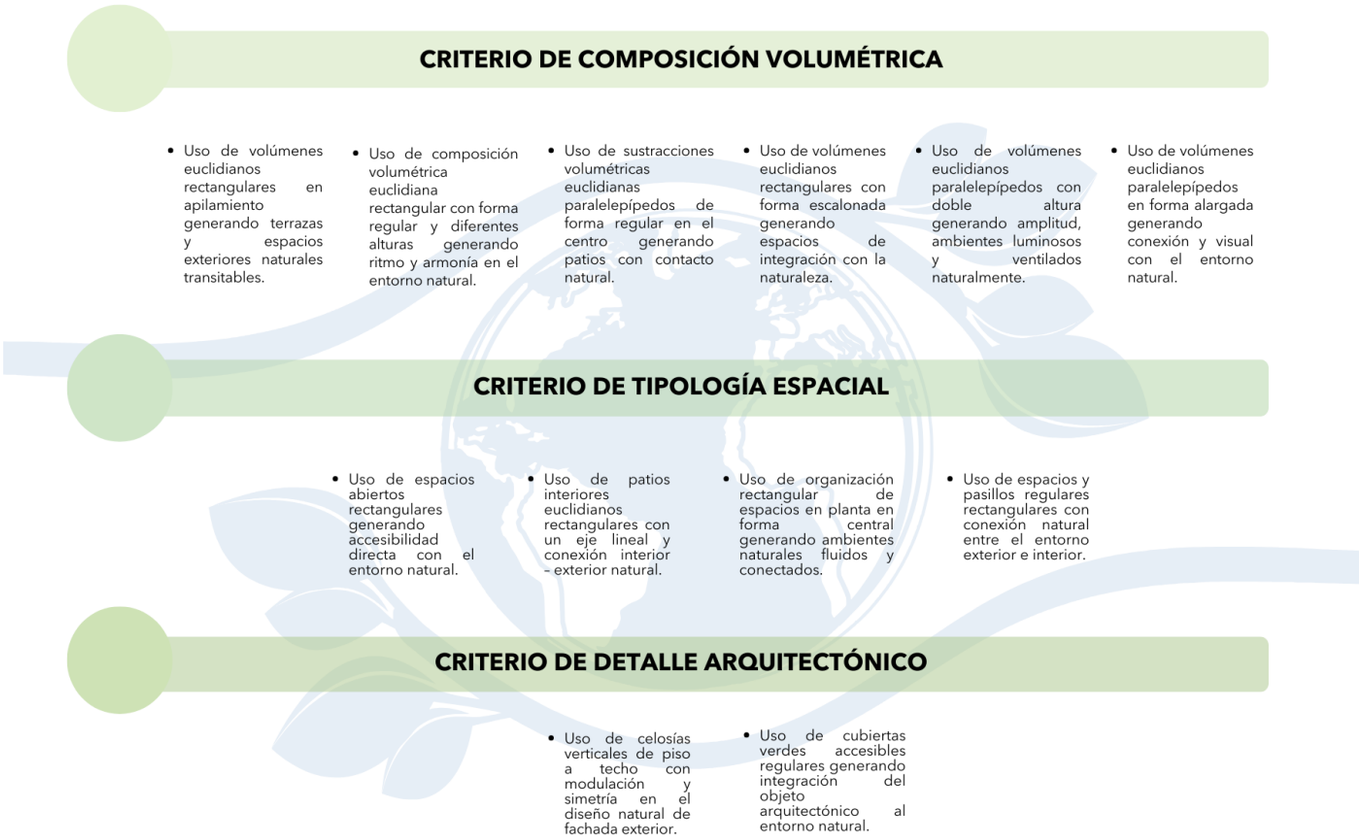

Figure 5. Architectural criteria. Source: Preparation by the authors based on the bibliography.

Subsequently, a finite sample was selected, which comprised five empirical cases. These contained the architectural criteria previously identified in the studied background information, as seen in Figure 5. The cases were chosen to identify and validate the architectural criteria analyzed in the three study categories. These cases were selected because they are homogeneous, relevant, representative, and are also part of an international scope (Figure 4). Each architectural case was modeled with the SketchUp Pro software.

Finally, in the third phase, the results obtained in the analysis of architectural cases are described qualitatively and graphically. This confirms the application of architectural criteria in the empirical reality that impacts the space and thus becomes architectural design guidelines distributed among the three study categories (Table 1).

RESULTS AND DISCUSSION

Five previously presented international architectural cases were studied and analyzed to demonstrate the relationship between architectural spaces intended for older people and nature. Data collection and analysis were carried out in each case, which will be presented using initial descriptive language and explanatory graphics.

1. CASE N°1: CHARM PREMIER GRAND GOTENYAMA SENIOR RESIDENCE

Designed by the Nikken Housing System Ltd architects in 2022 on an area of 4,397m^2 (Abdel, 2023), it is a senior residence intertwined in the city, located on a green street in the center of Tokyo, Japan. It has a sizeable double-height lobby that floods the space with light and has the strategic interaction of the outdoor and indoor levels with a feeling of openness and continuity, creating a fluid route. The spaces are lit and ventilated naturally, which creates the perfect connection with the outside world and reduces environmental impact.

Indeed, the Nursing Home integrates biophilic principles into its design, connecting residents with the urban environment and the natural landscape of Tokyo, which favors their social skills. Garcia et al. (2018) state that environmental adaptation strategies promote active and social aging.

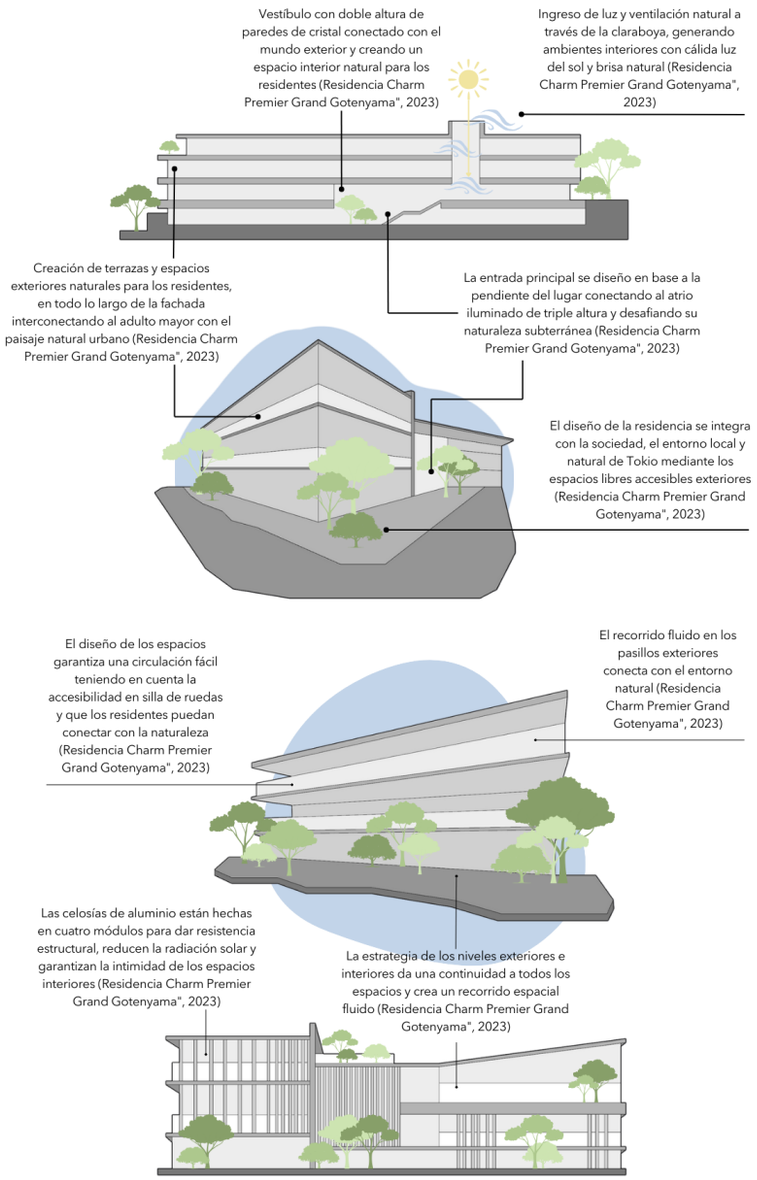

Figure 6. Graph of Case N° 01. Source: Preparation by the authors.

According to this, it is understood that, although environmental factors influence the abilities of older adults, biophilic design links indoor spaces with the outdoor natural environment, allowing older adults to actively participate and avoid isolation, which favors their social skills (Figure 6).

2. CASE N°02: KAMPUNG ADMIRALTY: INTEGRATED COMPLEX FOR OLDER ADULTS

Designed by WOHA architects, with a total area of 32,331.60m^2 (Castro, 2018), it has a height limit of 45m in the Woodlands neighborhood in the northern region of Singapore. It is considered a vertical village, which connects nature with people. The apartments have design principles with natural ventilation and optimal daylight; the central green area is presented in a staggered way with accessible and walkable ceilings; in addition, the daylight comes from the perimeter windows and the central courtyard it has.

The complex in Woodlands, Singapore, meets the needs of older adults through a community park that integrates biophilia, promoting social and active interaction. Fadda and Cortés (2019) indicate that the urban habitat and social spaces provide favorable conditions for this age group. According to this, it is inferred that it is necessary to create socialization spaces and integrate a biophilic

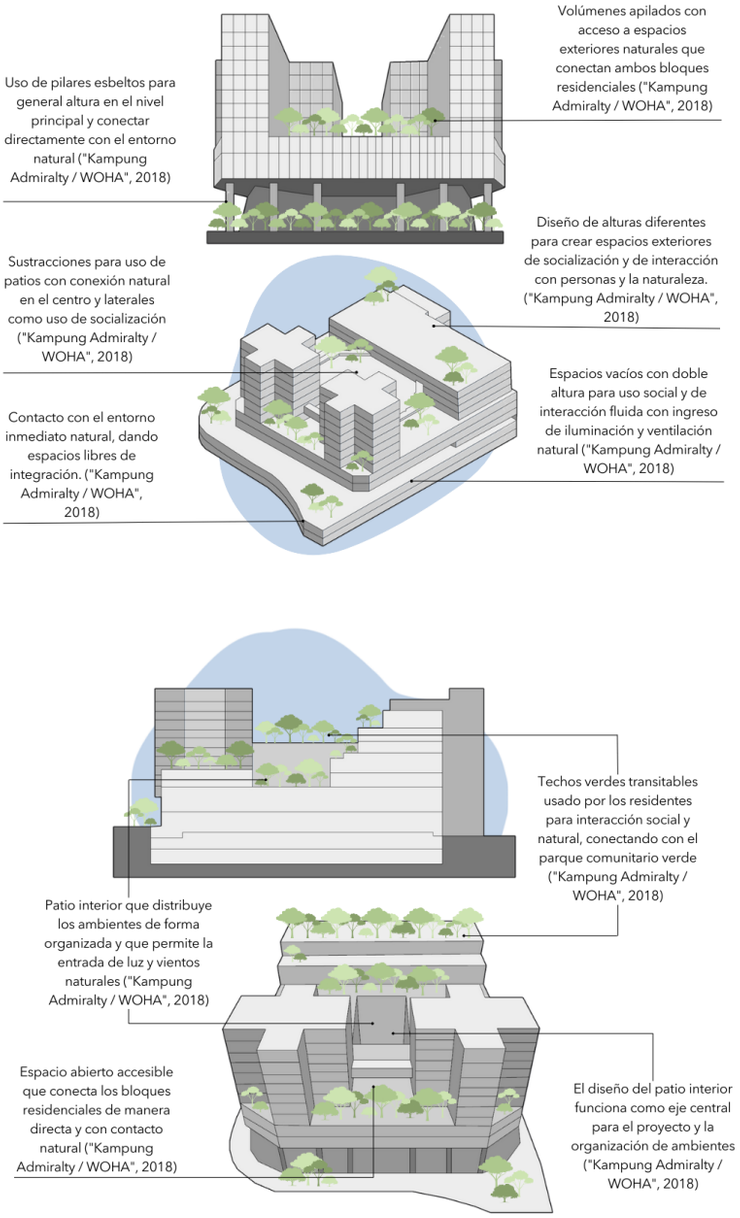

Figure 7. Graph - Case N° 02. Source: Preparation by the authors.

design, allowing residents to connect with nature and themselves, improving their social skills (Figure 7).

3. CASE N°03: SKYVILLE RESIDENCE: A DESIGN TO ENCOURAGE THE AGE GROUP'S INTERACTION

Designed by WOHA architects, with an area of 29,392m^2 (ArchDaily, 2016), located on Dawson Rd, Singapore, the project is open; all common areas are open to the public and situated in a mixed-height housing area. It presents a square located along a linear park. Also, the design offers three floorplan variations for each unit size; the designs are flexible and based on open spaces of columns and beams. All rooms are naturally lit and ventilated due to the open design.

The project is designed to encourage social interaction through a biophilic design, which gives residents free access to the different common spaces and areas open to the public. Osorio and Salinas (2016) point out that generating spaces allows participation and social involvement for older people. According to this, it follows that creating spaces is not enough to promote social skills but that intertwining these spaces with natural elements connects people in a way that encourages social participation (Figure 8).

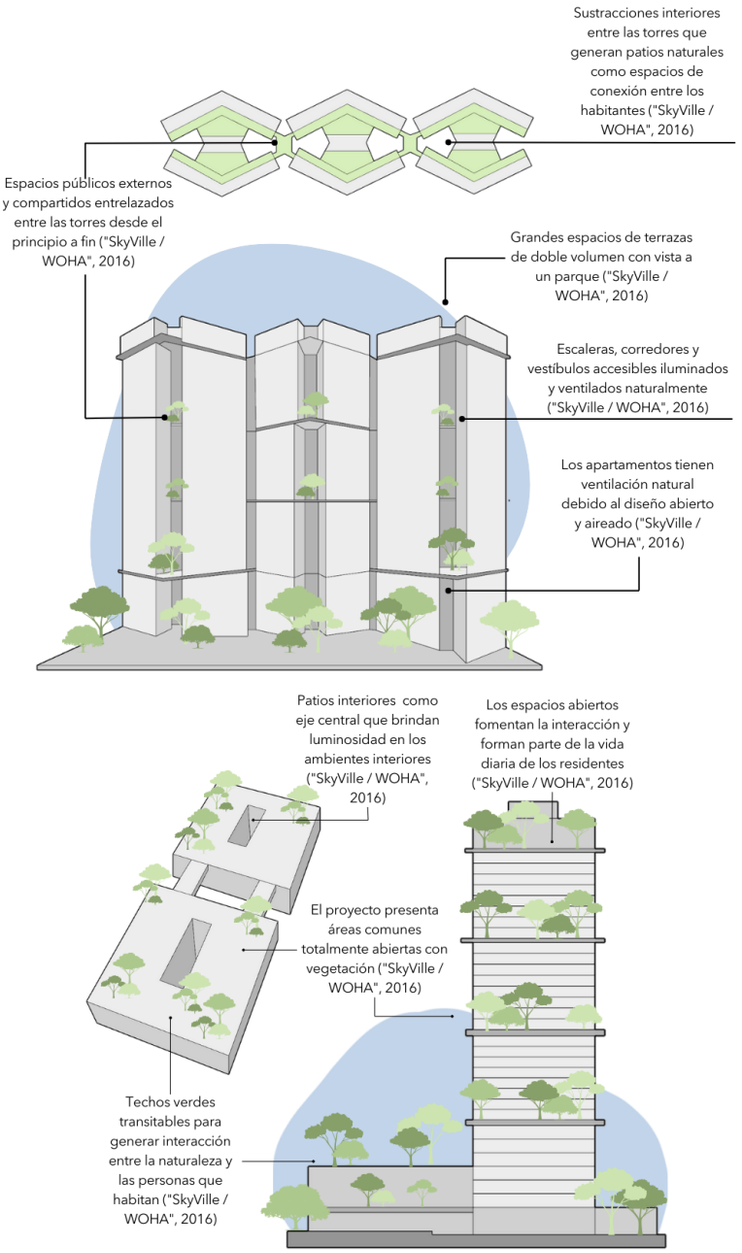

Figure 8. Graph - Case N° 03. Source: Preparation by the authors.

4. CASE N°04: LA SERRE, THE URBAN OASIS: REFUGE OF BIODIVERSITY

Designed by MVRDV in collaboration with the architect Alice Tricom in 2023, it is located in Issy Les Moulineaux, France. It has 3,000 m^2 of open area (Fakharany, 2023). The residential project has 190 units distributed over 22 floors, 30% of which are for social housing. The project integrates nature into the urban environment, establishing a biodiversity refuge where nature stands out as a central feature. It also provides a wide shared path encouraging people to use the green space and socialize.

The project incorporates abundant vegetation and integrates biophilia with the building's architecture to encourage the residents' social activities. Albuquerque et al. (2023) point out that urban planning creates an elder-environment connection, favoring their social and community ties. According to this, it is inferred that planning the city helps not only with social skills but also that the implementation of biophilia promotes the participation of older adults (Figure 9).

5. CASE N°05: WITHERFORD WATSON MANN NURSING HOME: PROMOTES SOCIABILITY AMONG OLDER ADULTS

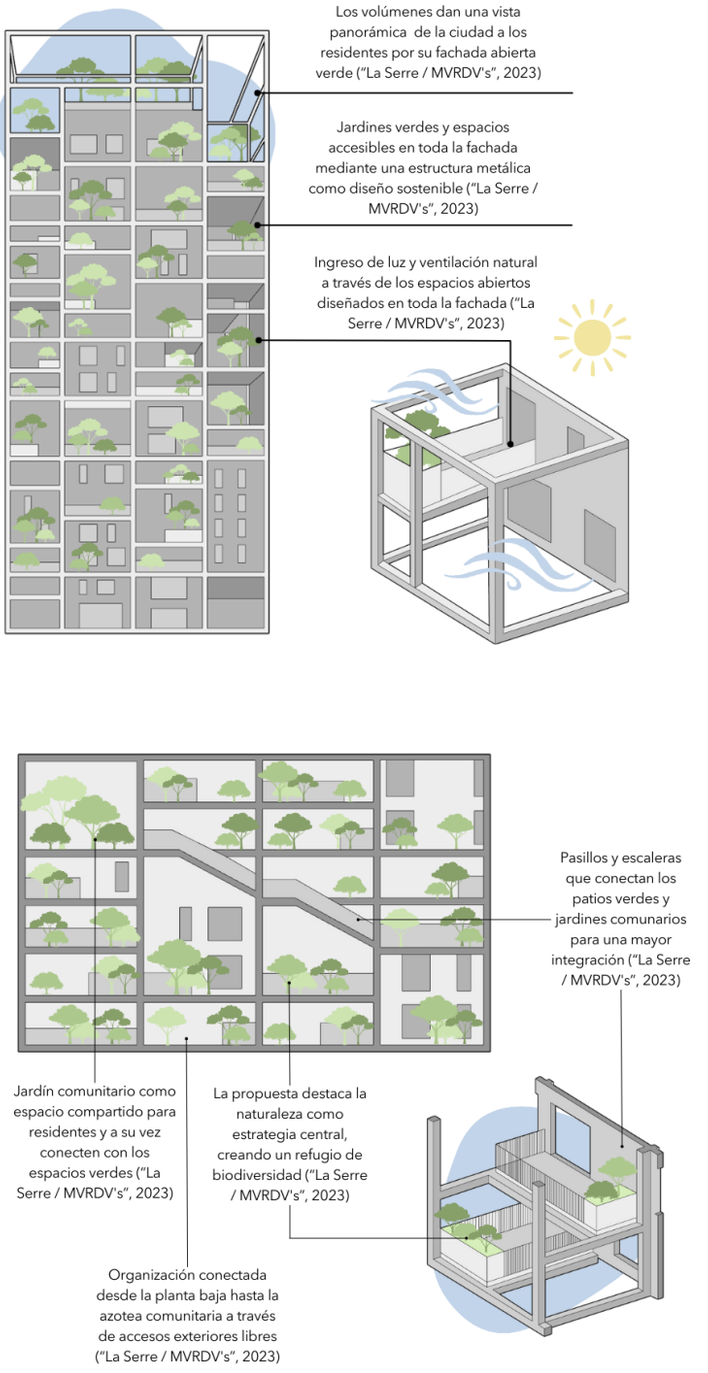

Figure 9. Graph - Case N° 04. Source: Preparation by the authors.

Designed by architects from Witherford Watson Mann Architects, located in Bermondsey, London, with an area of 6,152m² (Santos, 2016), it is an accommodation for about 90 residents. The project has five floors and a prominent elevation of two glazed levels. A central courtyard connects the residence; the project delivers an abundance of green, spacious neighboring landscape views, and nature integrates with the traditional natural environment through its exterior design and materials.

The project is an urban building that is active, open, and in direct contact with the natural exterior. It is where older adults interact and socialize in spaces designed with biophilic elements that were applied to create environments with green encounters. Pinilla Cárdenas et al. (2021) indicate that infrastructures oriented to the care and well-

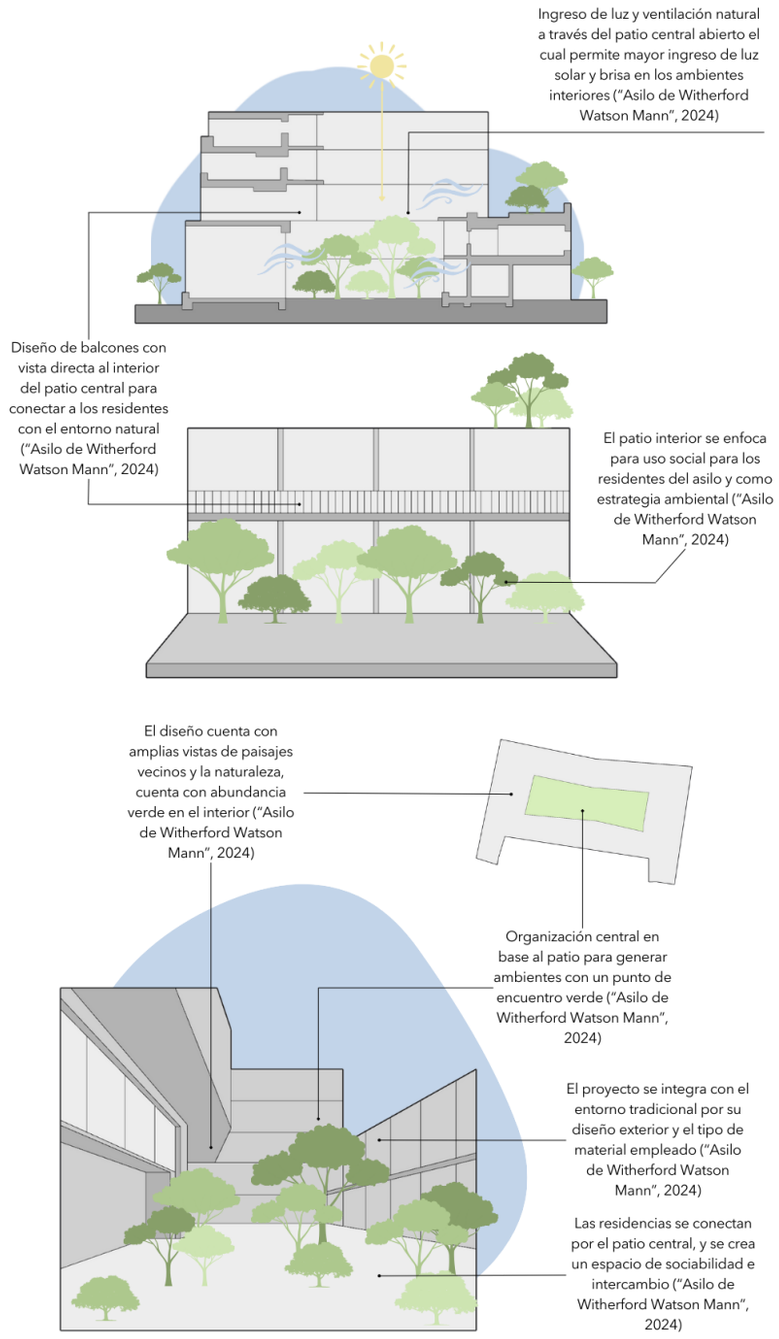

Figure 10. Graph - Case N° 05. Source: Preparation by the authors.

being of older people improve their social skills. According to this, creating lounges does not thoroughly encourage the participation of this age group, but rather, integrating natural elements into these infrastructures promotes their social activities (Figure 10).

In fact, the design with biophilic principles reinforces social integration, as the connection with nature encourages the participation of older adults inside and outside the built spaces, as found in the five case studies analyzed. However, Araya et al. (2018) point out that the unique contact between older people significantly impacts social insertion within these spaces, where their participation is generated. According to this, it can be inferred that although social contact between older people is important, it is not enough to encourage their social skills. Applying the biophilic principles in architectural design is necessary, as it creates an environment that

Table 1. Final guidelines. Source: Preparation by the authors.

Guidelines	Results	Percentage
Guidelines of volumetric composition		
Parallelepiped Euclidean volumes with double height generate spacious, luminous, and naturally ventilated environments to create comfortable interior spaces. These spaces present vertical amplitude inside, taking advantage of daylight and air circulation, which provides fresh and better-lit spaces due to the higher height used.	Cases N° 1, 2, 3, 4, 5	100%
The use of rectangular Euclidean volumetric composition with regular shapes and different heights generates rhythm and harmony in the natural environment and provides a volumetric pattern that integrates the natural environment. The composite heights in the volumetric design create a variation of lights and shadows, giving the design flexibility and functionality.	Cases N° 2	20%
The use of rectangular Euclidean volumes in stacking generates terraces and walkable natural outdoor spaces that integrate with the open area. The spaces also connect with the natural environment, providing users with accessible outdoor social environments as rest and recreation areas.	Cases N° 1, 2, 3, 4, 5	100%
The use of parallelepiped Euclidean volumes in an elongated shape creates a visual connection with the natural environment, integrating it into the natural landscape and creating interior spaces that take advantage of the entrance of light and natural breeze through the elongated facade. This improves the environment and gives them a panoramic view of the outside.	Cases N° 1, 3, 4	60%
The use of rectangular Euclidean volumes with a stepped shape creates functional spaces that integrate with nature. The shape used in the design links the natural environment through accessible spaces that allow social interaction with other people and the surrounding nature.	Cases N° 2	20%
Use of Euclidean parallelepiped volumetric subtractions of a regular shape in the center that creates courtyards with natural contact to integrate the spaces with nature, and that these are functional around the courtyards that act as a central meeting point that connects with the other spaces.	Cases N° 2, 3, 5	60%
Guidelines of Spatial Typology		
The use of rectangular open spaces that allow direct access to the natural environment provides social integration. Open spaces and their fluid access to nature directly connect people and the surrounding green environment.	Cases N° 2, 3, 5	60%
The use of regular rectangular spaces and corridors with a natural connection between the outdoor and indoor environment creates functional environments and provides a relationship with nature. Paths with natural, direct visuals also allow fluidity between indoor and outdoor spaces.	Cases N° 1, 3, 4, 5	80%
The use of rectangular Euclidean interior courtyards with a linear axis and natural indoor-outdoor connection creates functional and accessible spaces through the orderly distribution of the environments, resulting in better use of said spaces and incorporating nature.	Cases N° 2, 3, 5	60%
A rectangular organization of spaces on the floor centrally generates fluid and connected natural environments. These are interconnected with each other, so users have better accessibility to all spaces, and functional environments are given a greater connection with the natural environment.	Cases N° 1, 4, 5	60%
Architectural detail guidelines		
Regular accessible green roofs integrate the architectural object with the natural environment, allowing them to be used as social recreation spaces that provide environmental well-being and relate to nature, resulting in higher-transited spaces.	Cases N° 2, 3, 4	60%
The use of vertical floor-to-ceiling lattices with modulation and symmetry in the natural design of the exterior facade gives a natural approach and functions as a solar control. This provides privacy to the indoor environments, shading, and wind circulation. In addition to serving as a structure, the facade also organizes it.	Cases N° 1	20%

Table 2. Spatial/biophilic qualities. Source: Preparation by the authors.

Spatial/biophilic qualities	Case N° 1 Charm Premier Grand Gotenyama Senior Residence	Case N° 2 Kampung Admiralty: Integrated complex for older people	Case N° 3 Skyville Residence: A design to promote the integration of the age group	Case N° 4 La Serre, the Urban Oasis: Biodiversity Refuge	Case N°5 Witherford Watson Mann Nursing Home: Promotes sociability among older adults
Integration of vegetation	X	X	X	X	X
Access to daylight	X	X	X	X	X
Natural social spaces	X	X	X	X	X
Use of sustainable materials	X	X			X
Connection with the natural environment	X	X	X	X	X

facilitates interaction and stimulates participation. Applying the integration of natural elements and the connection with the external environment are essential principles to promote the social skills of older people.

Finally, the results obtained from twelve theoretical architectural design guidelines are presented in Table 1 of the final guidelines, organized by categories: guidelines of volumetric composition, spatial typology, and architectural detail. They also indicate in which architectural cases these guidelines are found; in addition to displaying a percentage that indicates how many of all the analyzed cases use the guideline, a comparison analysis of the five studied cases of spatial/biophilic qualities was also performed, where the cases that have or do not have such a quality are seen (Table 2).

CONCLUSIONS

Finally, the study shows that the relationship between biophilia and architectural spaces for older adults is fundamental to promoting their social skills. Biophilia conditions architecture by incorporating natural elements in the architectural design that facilitate the connection between older people and the environment surrounding them. Biophilic spaces allow the adult population to interact with nature, which can contribute to their psychological and physical well-being. This interaction helps motivate social purpose since providing natural areas, terraces, and outdoor spaces provides opportunities for socialization and integration due to direct contact with the natural environment.

Similarly, biophilic elements can improve the life experience of older adults, which contributes to a socially active life; in addition, biophilic design in spaces can promote skill development and create areas where people enjoy activities within the architectural space, integrating and connecting with the nature present. This older population interacts in natural spaces, which motivates them to participate in activities due to the design of architectural spaces with biophilic patterns.

On the other hand, results demonstrated the connection between architectural spaces and nature, as seen in Table 2, which summarizes the guidelines identified in the analyzed cases. For example, one of the guidelines consists of generating terraces and walkable natural outdoor spaces that integrate the open area and connect with the natural environment; this guideline is present in the five cases studied. Another guideline refers to the spaces and corridors with a natural connection between the exterior and interior environment that provide functional environments related to nature. This guideline is observed in only four of the cases studied.

Biophilia contributes significantly to the quality of life of older adults since it allows them to interact simply with spaces with plants and green areas, thus promoting their social well-being. In addition, biophilia facilitates the connection between architectural spaces and nature since it creates social areas where older adults can actively socialize. The results also show that biophilia promotes the social relationships of older adults, which evidences their connection with the natural environment.

CONTRIBUTION OF AUTHORS CRediT

Conceptualization, H.V.E., A.L.L.C.H.; Data Curation, H.V.E., A.L.L.C.H.; Formal analysis, H.V.E., A.L.L.C.H.; Acquisition of financing, H.V.E., A.L.L.C.H.; Research, H.V.E., A.L.L.C.H.; Methodology, H.V.E., A.L.L.C.H. ; Project Management, H.V.E., A.L.L.C.H.; Resources, H.V.E., A.L.L.C.H.; Software, H.V.E., A.L.L.C.H.; Supervision, H.V.E., A.L.L.C.H.; Validation, H.V.E., A.L.L.C.H.; Visualization, H.V.E., A.L.L.C.H.; Writing – draft original, H.V.E., A.L.L.C.H.; Writing – revision and editing, H.V.E., A.L.L.C.H.

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