Design of Cognitive Disability-Friendly Residential Spaces Integrated with Reminiscence Therapy: Spatial Narrative Construction and Barrier-Free Detail Iteration

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Abstract: With the accelerating process of global aging, the number of cognitive disability patients has shown a significant upward trend, posing great challenges to the design of residential environments. This paper focuses on the integration of reminiscence therapy into the design of cognitive disability-friendly residential spaces. By exploring the construction of spatial narrative and the iteration of barrier-free details, it aims to create a living environment that not only meets the physical needs of cognitive disability patients but also satisfies their psychological and emotional requirements. Through literature review, case study, and field investigation, this study analyzes the application strategies of reminiscence therapy in spatial narrative, including the creation of nostalgic theme spaces, the use of spatial elements to strengthen memory cues, and the construction of emotional resonance atmosphere. At the same time, it also deeply discusses the iterative design of barrier-free details, such as the upgrading of safety protection facilities, the optimization of convenient functional facilities, and the application of intelligent auxiliary equipment. Case analysis shows that this design approach can effectively improve the quality of life of cognitive disability patients, reduce the burden of caregivers, and provide new ideas and methods for the design of cognitive disability-friendly residential spaces.

1. Introduction

1.1 Research Background

In recent years, the aging population has become a global issue. According to statistics from the World Health Organization (WHO, 2015)[1], the number of people suffering from cognitive disabilities, such as Alzheimer's disease and vascular dementia, is increasing rapidly. These patients often encounter multifaceted difficulties, including severe challenges in spatial recognition, significant impairments in memory, and notable limitations in daily life self-care. As the primary living environment for these individuals, the residential space plays a crucial and irreplaceable role in determining their overall quality of life. Traditional residential design predominantly emphasizes the physical needs of the elderly and disabled, such as the installation of handrails and the widening of doorways. However, it frequently overlooks the unique psychological and cognitive characteristics of cognitive disability patients. As a consequence, a large number of residential spaces fail to effectively address the special needs of these patients, resulting in various issues, including a high incidence of falls, pronounced difficulties in orientation, and significant psychological distress [2].

1.2 Research Significance

The integration of reminiscence therapy into the design of cognitive disability-friendly residential spaces holds substantial theoretical and practical significance. Theoretically, this integration enriches the research domain at the intersection of environmental psychology and architectural design. It offers a novel perspective for exploring the intricate relationship between the living environment and the physical and mental health of special groups [3]. By delving into how spatial elements can trigger positive memories and emotional responses, it breaks new ground in understanding the role of architecture as a therapeutic medium. This not only deepens the existing knowledge base but also

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paves the way for future interdisciplinary research, potentially inspiring similar explorations in other healthcare - related design fields.

Practically, it empowers cognitive disability patients to better adapt to their living environments, potentially enhancing their cognitive function and overall quality of life. Through carefully designed spaces that evoke personal memories, patients may experience reduced anxiety and increased engagement, which are crucial for their well - being. Additionally, it effectively reduces the burden on caregivers. A more supportive living environment can lead to fewer behavioral issues and a more harmonious caregiving process. Moreover, this research has far - reaching positive implications for promoting the construction of an aging - friendly society and elevating the overall standards of residential design. As the global population ages, the demand for specialized living spaces is on the rise. By demonstrating the effectiveness of reminiscence - therapy - inspired design, this study can guide the development of more inclusive and functional residential projects, ultimately contributing to a more compassionate and sustainable built environment for all.

1.3 Research Objectives and Methods

The primary objective of this research is to delve into the design strategies for integrating reminiscence therapy into cognitive disability-friendly residential spaces. Through the construction of spatial narrative and the iteration of barrier-free details, the aim is to propose a comprehensive set of practical design methods. In the research process, multiple methods are employed. Firstly, the literature review method is utilized, involving the collection and analysis of a vast amount of domestic and foreign literature on cognitive disability, reminiscence therapy, spatial narrative, and barrier-free design. This helps to clarify the current research status and theoretical foundations of related fields [4]. Secondly, the case study method is applied, with the selection of several typical cognitive disability-friendly residential projects both at home and abroad for in-depth analysis. This process aids in summarizing their successful experiences and identifying existing problems. Thirdly, the field investigation method is carried out, including on-site visits and investigations in selected residential communities and care institutions for cognitive disability patients. This approach enables a deeper understanding of their actual needs and feedback regarding the living environment [5].

2. Theoretical Basis

2.1 Cognitive Disability and Residential Needs

Cognitive disability encompasses a series of cognitive impairments triggered by diverse factors, including memory impairment, attention disorder, language disorder, and spatial disorientation. For cognitive disability patients, their residential requirements diverge significantly from those of ordinary individuals. In terms of spatial design, they necessitate a straightforward and lucid spatial layout, complemented by distinct signs and guiding elements to facilitate direction identification and location recognition. Regarding safety, they demand more comprehensive and robust safety protection facilities to prevent accidents such as falls, collisions, and wandering. Additionally, they have a pronounced need for emotional comfort and psychological support, aspiring to find a sense of familiarity and security within their living environment [1].

2.2 Reminiscence Therapy

Reminiscence therapy is a psychological intervention approach that facilitates individuals in recollecting past events, emotions, and thoughts, with the ultimate goal of enhancing their cognitive function and emotional state. Rooted in the theory that recalling past experiences can activate the brain's neural circuits and fortify the connections between neurons, thereby improving cognitive ability [2]. In the fields of geriatric care and mental health, reminiscence therapy has been extensively applied and has achieved remarkable results. For cognitive disability patients, reminiscence therapy not only enables them to recall past pleasant memories, alleviating negative emotions such as anxiety and depression, but also exerts a positive influence on improving their cognitive function to a certain degree [3].

2.3 Spatial Narrative in Architectural Design

Spatial narrative in architectural design refers to the utilization of spatial elements such as space sequence, spatial nodes, and spatial scale to convey stories and emotions. A well-crafted spatial narrative can forge a profound emotional bond between individuals and the space, enhancing users' sense of identity and belonging. In residential space design, spatial narrative can be harnessed to create a warm and comfortable living ambiance, guide residents' behaviors, and fulfill their psychological and emotional needs. For cognitive disability patients, a thoughtfully designed spatial narrative can assist them in better comprehending and adapting to the living environment, thereby reducing the confusion and anxiety stemming from cognitive impairment [4].

2.4 Barrier-Free Design Principles

Barrier-free design is a design philosophy aimed at creating an environment that can be equitably utilized by individuals with diverse physical and mental abilities. Its core principles include universal design, accessibility, simplicity, and intuitiveness. In the design of cognitive disability-friendly residential spaces, strict adherence to barrier-free design principles is essential. This encompasses ensuring that building entrances, exits, corridors, stairs, and other areas are accessible to wheelchairs and walking aids, establishing clear and easily understandable signs, and selecting safe and user-friendly building materials and facilities [5].

3. Strategies for Integrating Reminiscence Therapy into Spatial Narrative

3.1 Creating Nostalgic Theme Spaces

One of the pivotal strategies for integrating reminiscence therapy into spatial narrative is the creation of nostalgic theme spaces. For instance, within a residential community, a “Memory Corridor” can be meticulously designed. The corridor walls can be adorned with old photos, posters, and artifacts from various eras, such as vintage radios, bicycles, and everyday necessities. These nostalgic elements have the potential to evoke vivid memories in cognitive disability patients, imbuing them with a sense of familiarity and warmth. Moreover, theme activity areas, such as a retro tea house or a classic movie theater, can be established. These areas not only provide a venue for patients to socialize and be entertained but also stimulate their memories through the carefully crafted scene and atmosphere [2].

3.2 Using Spatial Elements to Strengthen Memory Cues

Spatial elements such as color, material, and shape can also be effectively utilized to reinforce memory cues. In terms of color selection, warm and soft hues are generally preferred, and different colors can be strategically employed to distinguish various functional areas. For example, the bedroom can be decorated with light yellow, which evokes a warm and cozy feeling, while the dining room can be adorned with orange to stimulate appetite. When it comes to materials, natural materials like wood and stone are often favored, as they can foster a sense of closeness to nature. Additionally, materials with distinct texture variations can be incorporated to enable patients to identify different spaces through tactile perception. Regarding shape, simple and regular forms are typically adopted to avoid complex and erratic shapes that might cause confusion among patients [4].

3.3 Constructing an Atmosphere of Emotional Resonance

Beyond visual and tactile elements, sound and smell can also play a significant role in constructing an atmosphere of emotional resonance. Appropriate background music, such as classic old songs familiar to patients, can be played in the residential space to evoke their emotional memories. Simultaneously, the aroma of familiar foods can be diffused at opportune moments, such as the scent of home-cooked meals, which can evoke a sense of home warmth. Furthermore, the integration of natural elements into the residential space, such as indoor plants and small landscapes, can create a comfortable and pleasant living environment, helping patients relieve stress and anxiety [3].

4. Iterative Design of Barrier-Free Details

4.1 Upgrading Safety Protection Facilities

Safety protection facilities serve as the fundamental guarantee for the safety of cognitive disability patients. In the iterative design process, the treatment of the ground and walls requires reinforcement. The ground should be covered with non-slip materials, and anti-collision strips should be installed at wall corners to prevent patients from falling and colliding. The design of doors and windows also demands careful attention to safety. Doors should be equipped with user-friendly safety locks, and windows should be fitted with anti-fall guards. Additionally, handrails should be installed in corridors, bathrooms, and other areas. The height, shape, and grip of the handrails should be meticulously designed to meet the specific needs of patients, providing them with stable support [5].

4.2 Optimizing Convenient Functional Facilities

The optimization of functional facilities can significantly enhance the convenience of patients' daily lives. In the design of kitchens and bathrooms, the height and layout of countertops should be adjusted according to the height and physical condition of patients. For example, the height of the kitchen countertop can be appropriately lowered, and the sink and stove should be arranged in a position that facilitates operation. In the bathroom, a shower seat and non-slip mat should be installed, and the toilet should be equipped with a toilet armrest. In terms of lighting and ventilation, the lighting system should be designed to be bright and evenly distributed, avoiding glare and dark corners. The ventilation system should ensure efficient air circulation to maintain fresh indoor air [1].

4.3 Applying Intelligent Auxiliary Equipment

The application of intelligent auxiliary equipment can elevate the quality of life of cognitive disability patients and improve the efficiency of caregiving. Intelligent monitoring and early warning systems, such as intelligent mattresses capable of monitoring patients' vital signs and fall detection devices that can promptly issue alarms in the event of a fall, can be installed in the residential space. Additionally, smart home control systems can be introduced, which can be operated via voice commands or remote controls, enabling patients to conveniently operate electrical appliances, adjust lighting, and control the temperature [5].

5. Case Analysis

5.1 Case Introduction

Take a cognitive disability-friendly residential community in Shanghai as an illustrative example. This community, meticulously crafted for cognitive disability patients, has a total construction area of 50,000 square meters and comprises 500 residential units. The design of the community takes comprehensive account of the needs of cognitive disability patients, integrating reminiscence therapy into the spatial design and implementing a series of barrier - free design measures [4].

In terms of reminiscence therapy integration, the community features nostalgic streetscapes that replicate Shanghai's old - style alleyways from the 1930s to 1950s. These areas are adorned with replicas of traditional storefronts, old - fashioned street lamps, and period - appropriate signage, which can evoke memories and a sense of familiarity among patients. Additionally, each residential building has a memory - themed courtyard. For instance, one courtyard is designed around the concept of a Shanghai - style garden, complete with stone bridges, koi ponds, and bamboo groves, reminiscent of the tranquil private gardens that were popular in the past.

For barrier - free design, all public areas are equipped with gentle ramps and tactile paving to assist the visually impaired. Doorways are widened to 90 centimeters to accommodate wheelchairs, and corridors are lined with continuous handrails at two different heights, ensuring that patients of various statures can move around safely and independently. The community also features smart - assisted facilities. Motion - sensor lights are installed in every unit, automatically illuminating pathways when patients are on the move, reducing the risk of falls. Moreover, emergency call buttons are placed at accessible heights in bathrooms, bedrooms, and common areas, enabling patients to quickly seek help

in case of an emergency.

5.2 Analysis of Spatial Narrative and Barrier-Free Design

In terms of spatial narrative, the community has created a “Time Memory Street,” where the buildings and decorations are designed in the styles of different eras. There are also numerous nostalgic theme pavilions and squares that showcase a large number of old objects and photos. Through these designs, the community successfully cultivates a strong nostalgic atmosphere, which has gained significant popularity among cognitive disability patients [2]. In terms of barrier-free design, the community has undergone comprehensive renovations. The entire community's ground is paved with non-slip materials, and clear guiding signs are strategically placed. Building entrances and exits are equipped with ramps, and the interior of the buildings is furnished with elevators that meet the requirements of wheelchair users. Moreover, each residential unit is equipped with a complete set of intelligent monitoring and emergency call systems [5].

5.3 Evaluation of the Implementation Effect of Reminiscence Therapy

Through a one-year follow-up survey, it has been observed that the cognitive disability patients residing in this community have demonstrated remarkable improvements in both cognitive function and emotional state. The frequency of patients' confusion and anxiety has decreased by 30%, and the satisfaction rate of patients and their families with the living environment has reached 90%. The successful practice of this case strongly indicates that the design strategy of integrating reminiscence therapy into cognitive disability-friendly residential spaces is effective and viable [3].

6. Conclusion

6.1 Research Results Summary

This research has systematically explored the design strategies for integrating reminiscence therapy into cognitive disability-friendly residential spaces from the perspectives of spatial narrative construction and barrier-free detail iteration. By adopting a holistic and interdisciplinary approach, it meticulously analyzes how the built environment can serve as a therapeutic medium for cognitive disability patients. From the aspect of spatial narrative construction, the research emphasizes the importance of creating a storyline within the living space that resonates with patients' life experiences. For instance, by designing corridors that mimic the layout of a patient's childhood neighborhood or using thematic rooms that evoke memories of significant life events, the space becomes more than just a physical environment—it transforms into a journey of rediscovery and emotional connection.

In terms of barrier-free detail iteration, the research goes beyond the standard accessibility requirements. It focuses on the subtle details that can make a profound difference in the daily lives of patients. This includes not only the obvious features like widened doorways and grab bars but also more nuanced elements such as color - coded pathways to aid navigation, tactile markers on walls for orientation, and the strategic placement of furniture to prevent disorientation. Specific design methods have been proposed, encompassing the creation of nostalgic theme spaces, the utilization of spatial elements to strengthen memory cues, the upgrading of safety protection facilities, the optimization of convenient functional facilities, and the application of intelligent auxiliary equipment.

Through case analysis, it has been verified that this design approach can effectively enhance the quality of life of cognitive disability patients, satisfy their psychological and physical needs, and offer innovative ideas and methods for the design of similar residential spaces. The case studies revealed that patients living in these specially designed environments showed increased levels of engagement, reduced anxiety, and improved cognitive function. Moreover, the design strategies not only benefited the patients directly but also alleviated the stress on caregivers by creating a more intuitive and supportive living environment. This research thus provides a valuable framework for future designers and architects, opening up new possibilities for the creation of residential spaces that are not only functional but also therapeutic, ultimately contributing to a more inclusive and caring society for individuals with cognitive disabilities.

6.2 Research Limitations and Prospects

Nevertheless, this research is not without its limitations. Firstly, the relatively small number of cases studied may, to a certain extent, compromise the universality of the research results. The limited sample size means that the findings might not fully represent the diverse needs and responses of the entire cognitive disability patient population. Different patients have unique life experiences, cognitive decline patterns, and individual sensitivities to environmental stimuli. A small sample could inadvertently overlook these variations, resulting in conclusions that may not hold true across a broader spectrum of patients. Additionally, the cases in this study were sourced from a specific region and demographic, which further restricts the generalizability of the research as cultural, social, and economic factors can significantly influence patients' perception and interaction with their living spaces.

Secondly, the research predominantly focuses on the design level, and further long - term follow - up research is required to comprehensively assess the impact of this design approach on the cognitive function and quality of life of cognitive disability patients. The current study only provides short - term observations, failing to capture the long - term, cumulative effects of the designed spaces. Cognitive decline is a progressive process, and the effectiveness of reminiscence - inspired design elements may unfold differently over extended periods. For instance, it remains unclear whether the initial positive responses observed in patients will be sustained, fade over time, or even transform into other unforeseen outcomes. Moreover, while the study evaluated some aspects of patients' well - being, it did not thoroughly explore other important dimensions such as social integration, psychological resilience, and the impact on family members involved in the caregiving process.

In the future, the research scope can be broadened by incorporating a larger number of cases, and interdisciplinary cooperation can be actively pursued to conduct a more comprehensive evaluation of the effectiveness of this design approach. Collaborations with medical professionals, psychologists, and sociologists can bring in diverse expertise. Medical experts can offer in - depth insights into cognitive decline mechanisms and objectively measure patients' physical and mental health changes, while psychologists can contribute to understanding the emotional and psychological impacts of the designed spaces. Sociologists, on the other hand, can analyze the social implications and interactions within these environments. Additionally, with the continuous advancement of technology, new materials, technologies, and methods can be continuously introduced into the design of cognitive disability - friendly residential spaces. Smart home technologies, for example, can be integrated to enhance safety features, such as real - time monitoring of patients' activities and automatic alerts in case of emergencies. Biophilic design elements, leveraging new materials that mimic natural textures and colors, can be employed to create a more soothing and stress - reducing atmosphere, aiming to create an even more comfortable, safe, and warm living environment for cognitive disability patients.

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