Enhancing awareness in interior design education: A life-centred approach to designing for ageing-in-place

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Abstract

By 2025, the number of older persons globally will surpass the number of young individuals (World Health Organization 2022). Research consistently highlights the preference for ageing in a familiar home environment, enabling the elderly to remain in their homes and avoid institutionalisation. In order to facilitate this, homes need to be adapted to cater to the changing physical and emotional needs of the elderly. Design professionals responsible for these adaptations are typically trained to address the functional requirements of the built environment. However, they may overlook the importance of a life-centred approach, which prioritises the long-term well-being of the users. This research aims to emphasise the interconnections between individuals and their environment, extending beyond the boundaries of the home.

A scoping review was conducted using a method that encompassed both conceptual and empirical literature on ageing-in-place (Pham et al. 2014). The keywords employed included ageing, housing, ageing-in-place, well-being, architecture, and home modification. The review primarily focused on peer-reviewed papers published between 2012 and 2022, with select seminal works beyond this time frame. In order to ensure interdisciplinary insights, literature from various academic disciplines was sourced.

The research delved into six themes to broaden the life-centred design approach for design educators and professionals. These themes encompassed: 1) physical well-being, 2) psychological well-being, 3) social engagement, 4) spatial/built structure, 5. the broader context of the neighbourhood, and the integration of 5) home technologies and AI. By considering these themes, new pathways for design professionals can be formulated, extending beyond the conventional approach of solely addressing compliance with disability or modification standards.

The proposed life-centred approach aims to sensitise design educators and students to the needs of future ageing populations. It offers design professionals a multidisciplinary body of knowledge that accommodates a holistic view of the challenges encountered during the process of 'ageing-in-place'. This work provides valuable insights for design students, architects, interior designers, and researchers. Furthermore, it identifies knowledge gaps that can be explored further, with the intention of impacting a broad range of stakeholders.

Keywords: Ageing, ageing-in-place, home modification, housing, well-being.

Introduction

The World Health Organization globally recognises ageing as a challenge (World Health Organization 2007) and "ageing-in-place" has emerged as a response to older individuals' desire to remain in familiar environments (De Decker et al. 2013; Iwarsson, Sixsmith & Wahl 2005). In this context, designers play a critical role in supporting the well-being of older individuals (Stevens, Petermans & Vanrie 2019; Harper 2013). Traditional research on residential environments for older individuals focuses on physical accessibility but overlooks psychological well-being (Wiles et al. 2012). Authors have identified that addressing the complex challenges of ageing requires interdisciplinary approaches and collaborative research to develop comprehensive design solutions (van der Elst 2022; Woolrych et al. 2020; Granbom et al. 2014).

Similarly, this trend is also noticed in Africa where significant growth in the proportion of older individuals is also becoming evident (Pillay & Maharaj 2013). Despite this, the interior design curriculum in South Africa pays little attention to inclusive design for ageing populations. Further research is needed to provide students and practitioners with a relevant conceptual framework for designing spaces that meet older adults' specific needs (Frochen & Pynoos 2017; Chrysikou, Rabnett & Tziraki 2016). In this paper, we explore literature in the field and identify challenges and needs for policy and developmental shifts, in addressing knowledge gaps in the field, and in turn in the design curriculum.

Method

For this review, a scoping method as described by (Pham et al. 2014) was employed. *The research question guiding this review was: How does current interdisciplinary literature inform a conceptual framework to sensitise design students and practitioners to a holistic view of ageing-in-place?* A comprehensive search using academic databases and platforms such as Google Scholar, EBSCOhost, PubMed, ResearchGate, Academia.edu, Elsevier ScienceDirect, Sage Open, and Social Science was undertaken. The search keywords included ageing, housing, ageing-in-place, well-being, architecture, and home modification. The keywords "institutionalisation" or "institutionalised" were specifically excluded as we focused attention on ageing-in-place. The search resulted in 150 peer-reviewed articles identified as potentially relevant to the study.

To further refine the selection, only articles published after 2012 in English were included. This process resulted in 58 highly relevant articles that describe approaches beyond the traditional focus on compliance with disability/modification standards or functional aspects of space. Seminal works were also included (Chaudbury & Oswald 2019; Iwarsson et al. 2005; Lawton 2001).

The selected articles, including a master's dissertation (Shiran 2019) and a doctoral thesis (Smetcoren 2015), were reviewed and analysed. The articles included in this review draw on interdisciplinary knowledge from environmental gerontology (Bigonnesse et al. 2014), Environmental Psychology (Raymond et al.. 2023), Health Sciences (Sixsmith et al. 2014), architecture and urban planning (Gilroy 2018), Urban Sociology (van Hoof et al. 2001), Environmental Studies (van der Elst 2022), Health and Social Sciences (Iwarsson et al. 2005) Occupational Therapy (Aplin et al. 2013). and Interior Design (Govender & Dr Potter 2021; Johansson & Björklund 2015; Jivraj et al. 2014; Aplin, De Jonge & Gustafsson 2013).

The open-source software Lateral.io helped identify keywords from each source, as indicated in Figure 1, which is included below. By highlighting these keywords, we were able to sort the data and identify the six broad themes that are used to discuss the findings of the literature review. The multi-

disciplinary literature revealed three broad themes: 1) physical well-being, 2) psychological well-being, and 3) social engagement. The architectural and design literature contributed to identifying the remaining three themes: 4) spatial/built structure, the 5) broader context of the neighbourhood, and 6. Home technologies/AI home integration.
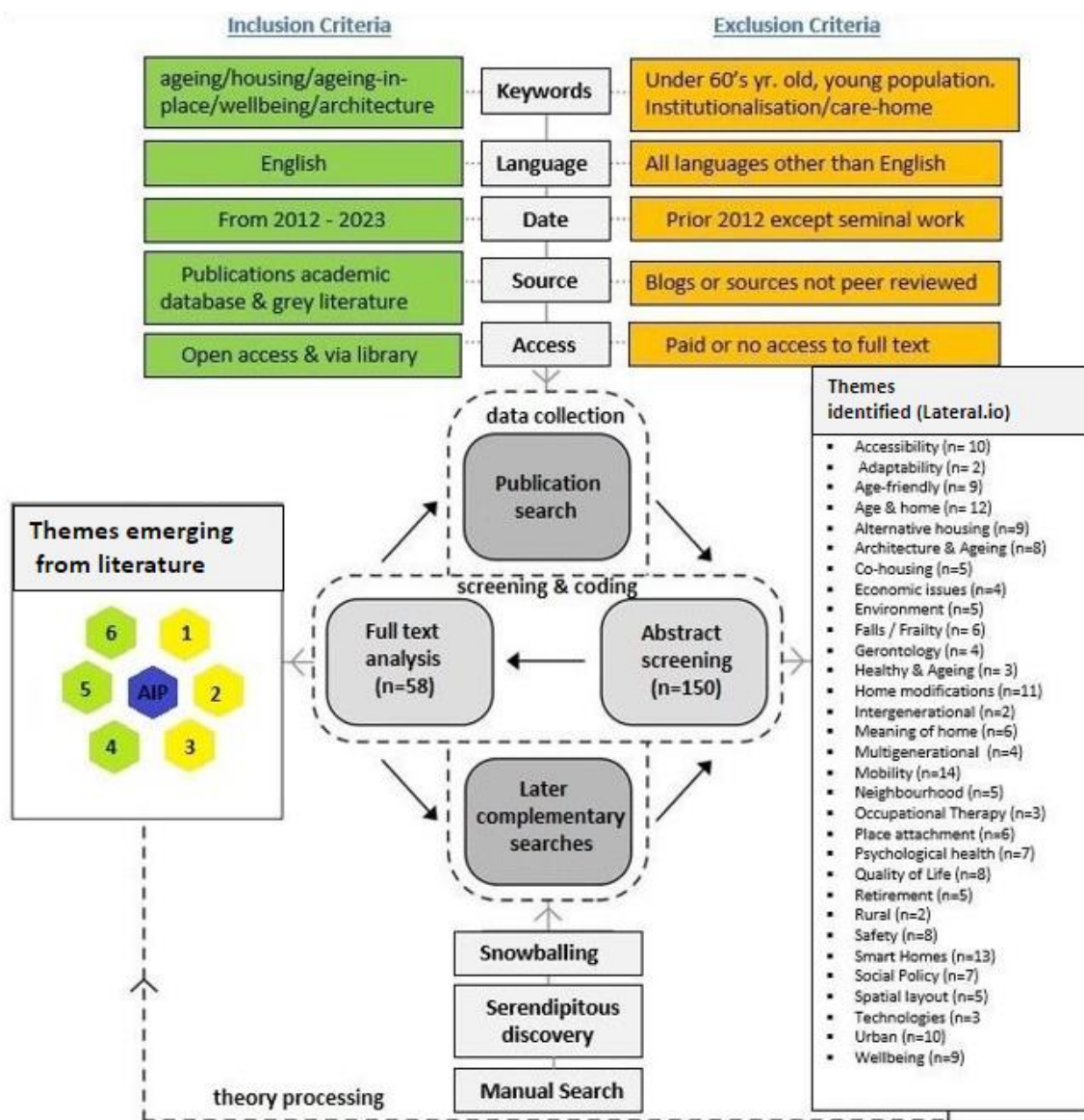

Figure 1: Overview of the literature review method (Authors 2023)

Theory

The theoretical Framework of Person-Environment Processes in Later Life, proposed by Chaudhury and Oswald (2019), is used for understanding the complex interplay between individuals and their environment in later adulthood (Figure 2). The framework is grounded in Lawton's (2001) Human Ecology Model, which emphasises the interrelatedness of different environmental factors such as the natural environment, human-constructed environment, and human-behavioural environment that impact individuals' quality of life.
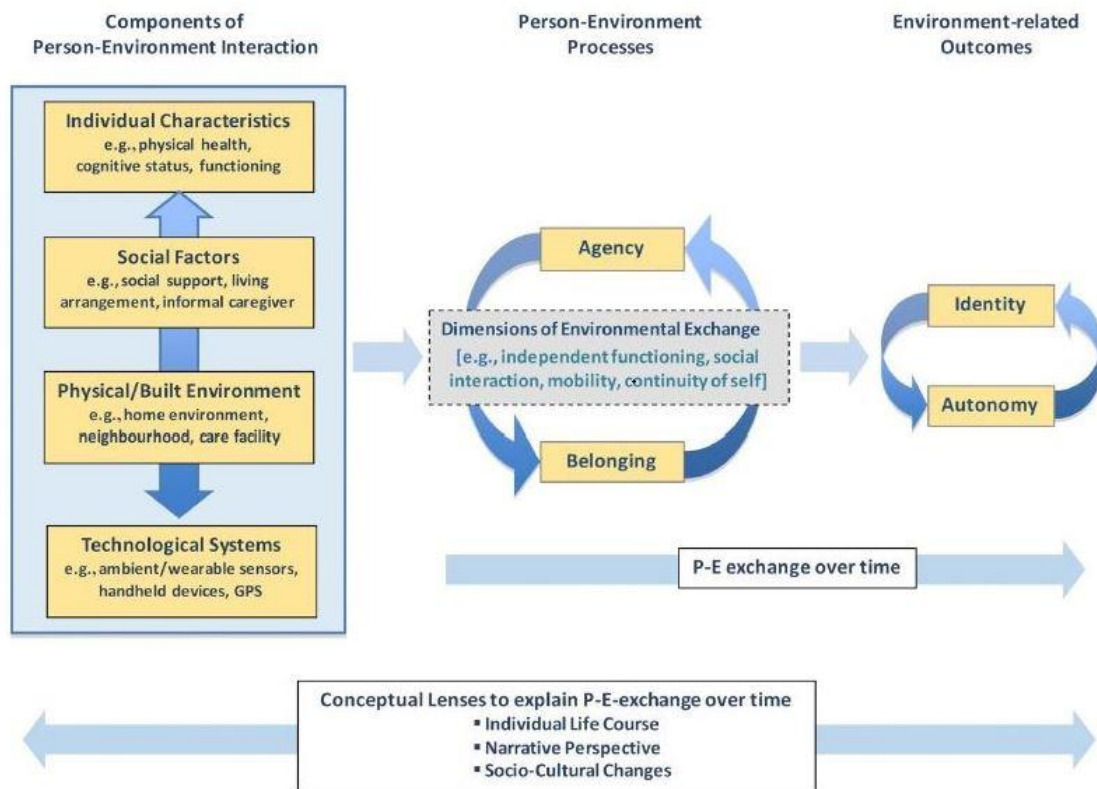
Figure 2: Person-environment exchange (Chaudhury & Oswald 2019)

The six identified themes from the literature offer a starting point for a conceptual framework towards designing for ageing in place. The literature from architecture and interior design are indicated in green and the interdisciplinary fields of sociology, gerontology, and environmental psychology are shown in yellow. The person-environment relationships change over time, and therefore, we have tried to include this changing interrelatedness using the grey arrows in the conceptual framework included in Figure 3 below.
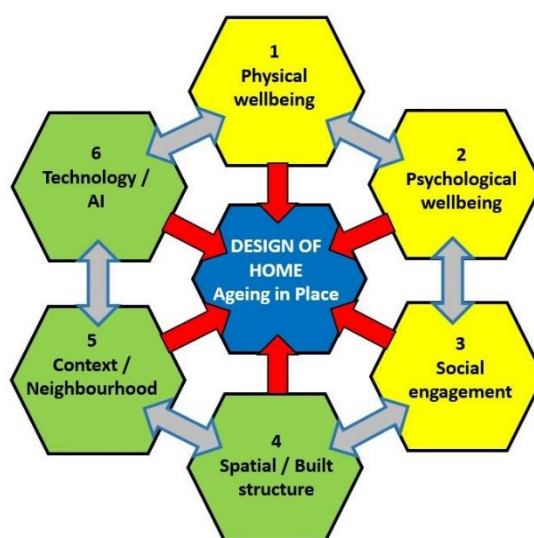

Figure 3: Towards a conceptual framework for designing for ageing in place (Authors 2023)

Findings

In this section, we provide an overview of the interdisciplinary literature reviewed according to the themes identified, although we have tried to avoid repetition, the findings are interrelated and there are overlaps in the findings across disciplines.

Physical well-being

A person's age relates to various lenses, such as chronological age, biological factors, and cognitive aspects. Assessing age-related issues is challenging due to the diversity within the elderly population, and the perception of "youth" or "ageing" is shaped by specific contexts. The heterogeneity within the target groups should be the primary consideration in the design process (Stevens, Petermans & Vanrie 2019).

The notion of home holds increasing significance for well-being in old age. Health deterioration occurs gradually between the age of sixty and eighty, known as the third age and becomes more extensive thereafter, in the fourth age (Jivraj et al. 2014). With declining physical and emotional abilities, older adults become more reliant on external assistance for daily tasks and may find themselves physically and mentally at the margins of being able to remain in their homes (Almevall et al. 2022).

The World Health Organization advocates for a life-course approach that promotes the concept of active-ageing by empowering elderly individuals and including them as an active collective in society (World Health Organization 2007). Daily activities encouraging movement are essential in helping older adults retain functional abilities. This is where architecture and interior design can play an important role in enabling the postponement of institutionalisation (Crews 2022; Bosch-Farré et al. 2020; García Lantarón 2016).

Carr et al. (2013) stress the importance of embracing the philosophy of universal design as a society where individuals can equally thrive regardless of ability or age (Figure 4, theme 1). Homes should embrace universal design principles, which automatically cater to ageing needs, yet private dwellings often lack mandatory accessibility regulations for older adults. Enhancing functional and physical health requires prioritising physical safety by assessing housing environments and actively learning how to shape and adapt the home environment for the health and safety of older adults (Frochen & Pynoos 2017). Concepts such as Lifetime Homes and Lifetime Neighbourhoods aim to improve the safety and accessibility of living spaces (Harper 2013).

The integration of health support devices and equipment in homes can be viewed negatively by some older adults, as these adaptations may compromise the home's aesthetics. Introducing features like grab bars can change how individuals feel about their homes and themselves. Occupational therapists and designers involved in home modifications should be aware of the significance of these aspects for clients and how they may impact their willingness to accept recommendations (Aplin, De Jonge & Gustafsson 2013). In order to introduce health aids that enhance physical functioning within the home in a non-invasive and subtle manner, designers need an understanding of the psychological well-being and identity of the elderly occupants.

Psychological well-being

The older adults' psychological and emotional well-being in-home interventions seldom receive consideration when spatial planning, functionality, and regulatory standards take precedence. However, "home" encompasses more than physical spaces, including the occupant's consciousness and self-awareness. A space becomes a place when individuals feel attached to it and imbue it meaningfully (Granbom et al. 2014). In the pursuit of remaking their homes, older adults seek to attach

meaning and enhance the feeling of belonging. The meaning of a place is an intermediate link between its physical quality and the strength of the emotional bond with it (Shiran 2019).

Personalising living spaces is important in enhancing place attachment. Assisting in enhancing place attachment through interior design facilitates the transition of older adults to new living environments. Personalisation establishes a positive relationship with one's home, reflecting personal dynamics, life events, values, tastes, memories, and more (Lies, Kang & Sample 2017).

As individuals age, the desire for autonomy and control over their environment becomes increasingly important. Lawton's work on "control centres" refers to favoured places within the home where older individuals maximise feelings of autonomy and control (Smetcoren 2015).

Factors contributing to the quality of life include social well-being, sense of belonging, participation in social activities, family or friendship networks, mental and psychological well-being, emotional health, self-esteem, and life acceptance (Vanleerberghe et al. 2017). In the process of adaptation or relocation, older individuals undergo a "remaking" of their homes, which can become increasingly challenging with age. Designers working in interdisciplinary teams are central to facilitating this process (Rowles, Perkinson & Barney 2016).

Ageing in place offers emotional and physical benefits; however, challenges associated with advanced age may make it difficult. Downsizing becomes necessary when individuals can no longer manage home modifications and maintenance. Alternative options, such as intergenerational households or communal arrangements, can support and alleviate isolation (Martin, Long & Kessler 2019).

Emotional and psychological well-being relates to social engagement. Developing an Active Ageing Framework within smart city initiatives promotes opportunities for older adults to continue participating in various aspects of life (del Barrio et al. 2018). By personalising spaces, enhancing place attachment, promoting autonomy, and fostering social engagement, interdisciplinary design teams create environments that support older adults' emotional and psychological well-being (Figure 4, theme 2).

Social engagement

The theme of "place" is more prominent in literature, with social networks recognised as significant factors in ageing in place (Pani-Harreman et al. 2021). Gardner discusses a "natural neighbourhood network" that considers proximity to neighbours, relationships with services, and chance encounters with strangers, all impacting well-being and social connectedness (Gardner 2011). Social contacts and relationships with neighbours strengthen social ties and support, contributing to the well-being of older individuals (Bigonnesse, Beaulieu & Garon 2014). Having guests, particularly family and grandchildren, is vital for the well-being of older people (Lies, Kang & Sample 2017), influencing their decision to age in place.

The social aspect of home design is essential for meeting the relational needs of older adults, including connections to family, community, animals, and personal belongings. The Quality of Life Manual (World Health Organization 2012) underscores the importance of companionship, love, and support in intimate relationships, encompassing the ability to love, be loved, and engage in emotional and physical intimacy. Achieving a balance between interior spaces that support intimacy and spaces that encourage social interaction becomes crucial.

The loss of a life partner can lead to feelings of isolation and loneliness, potentially triggering a need to relocate to a retirement home for safety and social interaction. A home can serve as either a "social

hub" or a "place of confinement" depending on the individual's circumstances (Almevall et al. 2022). Living expenses, maintenance costs, taxes, and levies can impact the affordability of living at home, potentially leading to confinement (Luciano et al. 2020). Severe functional dependency and the need for 24-hour care may ultimately influence the decision not to age at home (Iecovich 2014).

Beyond the traditional options of ageing in place or moving to a retirement home, there is a growing need for alternative forms of housing. The literature suggests other options, such as dividing one's home or finding "better alternatives" within the existing neighbourhood while promoting intergenerational social engagement (Shiran 2019; Arrigoitia, West & Peace 2018; Smetcoren 2015; Bigonnesse, Beaulieu & Garon 2014; De Decker et al. 2013). Design strategies are being sought to promote social interaction, foster intergenerational relationships, and create a home environment that enhances social engagement for older adults while supporting a sense of belonging and companionship.

Spatial/Built structure

Spatial requirements and built structures are essential considerations in architectural and interior design. Designers explore spatial organisation, design principles, and elements within the built environment. Included are aspects such as space planning, functional requirements, ergonomics, building materials, construction techniques, and the relationship between form and function. The built environment significantly impacts older people's behavioural and emotional functioning, affecting their health, well-being, and independence (Carnemolla 2018).

A home's spatial planning and the built structure play a crucial role in accommodating the ageing needs of elderly individuals. Designers should consider their ageing clients' health and physical abilities, including their sensory capabilities, temperature sensitivity, the fragility of the skin, visual and auditory impairments, and reduced sense of taste (Crews 2022). The design response needs to respond to the specific needs of elderly individuals, considering their physical limitations and sensory changes and how these may change over time.

Ageing in place should cater to a diverse range of clients with diverse cultural, social, religious, and financial requirements. The workforce is ageing and retiring later, resulting in a more generationally diverse population. Therefore, collective solutions cannot capture individual needs effectively. The need for alternative housing options beyond ageing in place or moving to a care home has emerged, including living independently, sheltered housing, kangaroo housing (accommodating two or more generations), and collective housing (Smetcoren 2015). These options cater to the varied preferences and circumstances of older individuals (Figure 4).
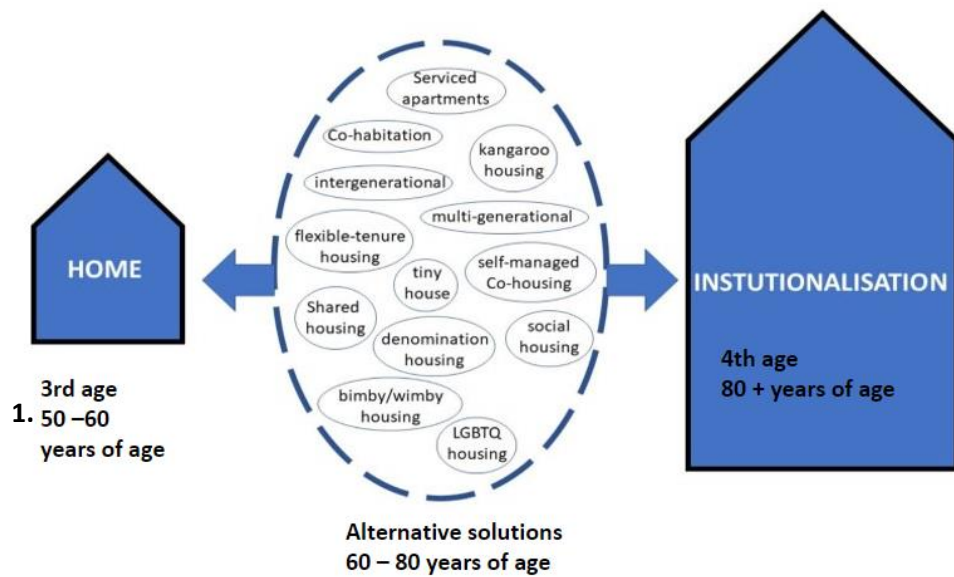
Figure 4: The need for alternative housing models (Authors 2023)

Multiple housing solutions, policies, programmes, and initiatives have emerged to support older adults' desire to age in place and meet their support needs (Greenfield 2012). However, ageing in place is not the best option for everyone. Some widowed, divorced, or never-married older individuals may prefer alternative housing options that provide a sense of community and social connection (Smetcoren 2015). Educating elders about their housing options and making alternative living arrangements more attractive can encourage them to consider novel solutions beyond ageing-in-place (Orfield 2013).

Adaptive and circular refurbishment scenarios can make existing housing suitable for ageing-in-place and align with the principles of adaptive reuse and sustainability. These interventions consider the specific obstacles and opportunities of everyone, such as their need for partial assistance, physical disabilities, income levels, and ownership or tenancy status (Montacchini, Tedesco & Savio 2022). Designing independent living spaces within a larger home allows for a multi-generational living while providing communal spaces that promote social relationships while maintaining freedom and intimacy (Gerards, De Ridder & De Bleeckere 2015). Flexible design principles that respond to social needs and economic feasibility can cater to younger and older populations (Malik & Mikolajczak 2019).

Designing homes that are responsive to the needs of older individuals can involve considering the concept of "lifetime homes" or "accessible for all" regulations, which ensure that homes can accommodate various life stages and accessibility needs (Smetcoren 2015). Universal design principles that focus on inclusivity and designing for all generations are essential in creating homes that enhance occupational performance and meet the needs of older individuals (Shin 2018). An educational process incorporating design research and the perceptual experiences of older residents can be valuable in understanding their needs and preferences (Stevens at. al. 2019).

Overall, a home's design, spatial planning and built environment should meet the specific ageing needs of elderly individuals, including considerations for accessibility, adaptability, sensory experiences, social connectivity, and the diverse requirements of the ageing population. Providing a range of housing options that are well connected to social services and the community is essential for promoting the well-being and satisfaction of older individuals (WHO, n.d.).

Context/neighbourhood

When creating buildings and urban developments, designers analyse and respond to the surrounding context. Factors considered are site analysis, urban planning, cultural and historical context, sustainability, landscaping, and the influence of the built environment on the neighbourhood. Contact with nature plays a positive role in human well-being, supporting the importance of the neighbourhood context (Onay & Minucciani 2018).

When older people are ageing in place, the neighbourhood or the setting around their home supports their needs. The connection to the broader environment and the sense of belonging and enjoyment in a place are crucial factors that influence older individuals' quality of life and well-being (Vitman Schorr & Khalaila 2018). Access to nature is a predictor of well-being for older adults. Green spaces and other features such as housing quality, a sense of safety, and neighbourhood amenities contribute to a higher quality of life and can foster community attachment and enhance the sense of belonging. The proximity and frequency of use of green spaces are related to an individual's attachment to their neighbourhood, in addition, shared green spaces encourage social bonding between neighbours and contribute to a positive social setting (Shiran 2019).

Housing within the context of the broader neighbourhood is a collective consideration. Improving the quality of people's homes alone may only be effective if similar improvements occur in the neighbourhood. Accessibility and social cohesion are crucial factors influencing how older people experience their neighbourhoods (WHO, n.d.). For older adults with impaired senses or mobility, the built environment can significantly impact their vulnerability. Enhancements such as pedestrian accommodations, longer-timed crosswalks, smooth curb cuts, sturdy handles and railings, covered bus stop shelters, and well-designed transportation stops can improve the safety and accessibility of the neighbourhood (Finlay, Gaugler & Kane 2020).

Perceived accessibility and connection to place are positively associated with the quality of life of older individuals (Vitman Schorr & Khalaila 2018). As people age, their residential mobility tends to decrease, and they develop a stronger attachment and sense of belonging to their community (Iecovich 2014). Carefully selecting locations with clean environments, little noise, low crime rates, and good transportation connections can contribute to a supportive neighbourhood for older adults. The proximity of critical businesses such as doctors' offices, pharmacies, and social service agencies, as well as well-designed open spaces for physical activity, is important (Shin 2018).

The location of where people live and the ability of the environment to support their needs are critical considerations for public health and public policy (Yen & Anderson 2012). Forward planning and policies should aim to create age-friendly environments that support older individuals' social, physical, and emotional well-being. By considering these elements in the design and planning of neighbourhoods, policymakers and designers can create environments that promote older adults' well-being and social engagement.

Technology/AI

Integrating innovative home technologies and AI has recently gained attention. The literature explores home automation, Internet of Things (IoT) applications, AI-driven building management systems, energy efficiency, user experience, and technology integration into the design process. In an intelligent home, modification, customisation, minimal life interference, and extensible technologies to accommodate the ageing process are fundamental requirements (Ma, Guerra-Santin & Mohammadi 2022).

Smart home integration for ageing in place is an important area of exploration. Key considerations include ease of use, acceptance by older adults, privacy, and cost. The proposed framework encompasses interrelated aspects for a holistic design approach. AI, home integration, and IoT have the potential to support older adults in their homes, improving safety and independence, and providing personalised care.

Integrating AI and IoT technologies in smart homes can enable continuous and remote monitoring of patients, providing valuable health data for researchers and healthcare professionals (Engineer, Sternberg & Najafi 2018). These technologies can assist in the de-hospitalisation and homecare of elderly individuals, allowing them to independently conduct activities related to their primary needs (Borelli et al. 2019). In-home sensors can facilitate ageing-in-place by providing alerts and notifications for early intervention and enabling routine monitoring, reducing direct care costs in the community. These technologies can also improve decision-making and enhance community healthcare services by collecting longitudinal health data (van Kasteren et al. 2017).

Access to technology plays a crucial role in enabling older adults with decreased mobility or social isolation to participate actively in society (Carnemolla 2018). Innovative home technologies, such as in-home sensors, can improve safety and reduce fall risks by implementing universal design, optional fittings, co-creation design, and intelligent technology. Fall detection sensors and automatic alarms can be beneficial in detecting dangerous situations and calling for help (Ma, Guerra-Santin & Mohammadi 2022).

However, technology-based research must include ethical considerations. Informed consent and clear communication about the capabilities and limitations of these technologies are essential to address concerns and manage expectations (van Kasteren et al. 2017). Involving the relatives of elderly individuals in the process can help mitigate misunderstandings and improve acceptance of these technologies (van Kasteren et al. 2017).

One specific area where technology can benefit older adults is temperature control. Elderly individuals are sensitive to temperature fluctuations, impacting their mobility and hygiene practices. Home temperature sensors can help maintain a comfortable and safe environment by ensuring appropriate temperature levels (van Kasteren et al. 2017).

AI, intelligent home integration, and IoT technologies offer significant potential in supporting older adults in ageing in place. These technologies can enhance safety, promote independence, and provide personalised care and assistance. However, addressing patient compliance, privacy and security concerns, and cost is essential to ensure the successful implementation and acceptance of these technologies. Addressing cost considerations by finding ways to make these technologies more affordable will be crucial in ensuring their accessibility and benefits for older adults (Luciano et al. 2020). By balancing the benefits and potential drawbacks, AI and home technologies can improve older individuals' quality of life and well-being as they age.

Conclusion

In response to the research question: How does current interdisciplinary literature inform a conceptual framework to sensitise design students and practitioners to a holistic view of ageing-in-place? The literature reviewed indicates that transdisciplinary collaboration allows for an integrated approach to addressing the multifaceted challenges older individuals face, ensuring informed decisions and effective implementation of design approaches. Collaboration between professionals, policymakers, and older individuals is necessary to bridge the gap between expectations and actual

needs (Heatwole Shank & Cutchin 2016). Designers play a central role in understanding user needs and considering demographic, societal, residential, and well-being challenges (Crews 2022).

In exploring life-centred approaches to designing for ageing in place we propose a theoretical framework for architecture and interior design students and practitioners to use as a prompt. Our findings highlight the need to address the limitations and gaps in current housing solutions that consider cultural appropriateness, affordability, adequacy, safety and security, accessibility, and availability and how these can change over time for vulnerable elderly citizens.
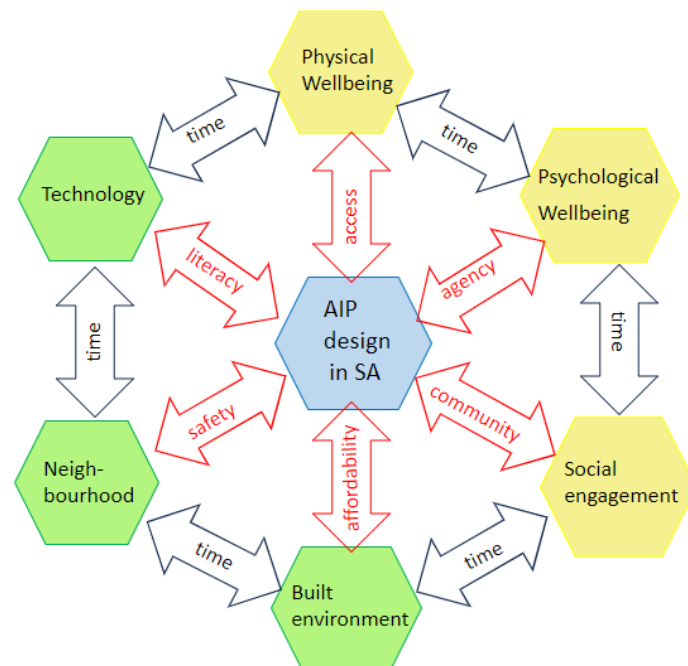

Figure 5. A South African approach to designing for ageing in place (Authors 2023)

The interrelatedness of the six key themes is central to the design of the home and the surrounding environment that supports ageing in place. Exploring alternative housing models while conducting in-depth research into South Africa's unique challenges, including transportation, poverty, security, and resource accessibility, is essential. The well-being and independence of older adults in the South African context must be safeguarded despite the hurdles posed by limited resources and inadequate infrastructure. The inclusion of stakeholders, including governmental policymakers, property developers, older people, and NGOs, is fundamental to successful design approaches.

Recommendations

Within the South African context, there is a need for up-to-date studies on ageing-in-place. By integrating age-friendly design principles into the South African Interior Design curriculum, we can improve usability and accessibility for diverse user groups. Continued research and collaboration are necessary to create supportive environments that enhance older individuals' well-being and quality of life (Crews 2022).

Incorporating inclusive design principles into the South African Interior Design curriculum is necessary as life expectancy increases. An experiential curriculum involving all economic sectors, including

governmental, private, and third-sector entities, is required for comprehensive education (Chrysikou, Rabnett & Tziraki 2016).

An effective way to cultivate student awareness of designing for diversity and inclusivity is through embodied, empathetic learning. Role-play activities using blindfolds, wheelchairs, and crutches, can enhance student empathy and deepen their understanding of the barriers faced by people with disabilities in the built environment (Rieger & Rolfe 2021).

It is essential to secure research funding and develop programmes that involve professionals from architecture, interior design, medicine, and planning, as well as incorporate the input of ageing individuals if a multidisciplinary collaboration approach intends to create a blended learning environment (Chrysikou, Rabnett & Tziraki 2016).

By integrating inclusive design principles into the South African Interior Design curriculum and embracing multidisciplinary approaches, we can effectively address the challenges of designing for ageing populations. These strategies enable design professionals to contribute to the creation of inclusive and age-friendly environments that prioritise the well-being and equality of all individuals, regardless of ability, or age, or geographical location (Carr et al. 2013).

Opportunities for further design research

- Exploring housing alternatives and raising awareness among older adults about available options.
- Practical and sustainable responses to budget constraints and the need for flexibility as needs change.
- Participatory design involving older adults and transdisciplinary research efforts with stakeholders to improve inclusivity and effectiveness of design approaches.
- Longitudinal studies incorporating pre and post-occupancy evaluations can provide valuable insights into the effectiveness of age-friendly design.

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