Designing Dementia-Supportive Sensory Landscapes: Reframing Kurpark Burtscheid as Urban Health Infrastructure

1.Theme Definition

European societies are undergoing rapid population ageing and a marked increase in the number of people living with dementia (Alzheimer Europe, 2019; Alzheimer Europe, 2021). Dementia affects cognitive functioning, emotional regulation, spatial orientation and everyday autonomy. As a result, it creates increasing challenges not only for individuals and caregivers, but also for urban environments that were not designed with cognitive vulnerability in mind (World Health Organization, 2023). At the same time, ongoing processes of urban densification have resulted in limited and highly contested open spaces, particularly in inner-city areas where access to restorative outdoor environments is already constrained. Within international research and professional practice, sensory and therapeutic gardens are widely discussed as non-pharmacological interventions that may support wellbeing for older adults and people living with dementia (Gonzalez and Kirkevold, 2014; Uwajeh, Iyendo and Polay, 2019). Design-oriented and policy-based guidance emphasises that access to outdoor environments supports not only emotional wellbeing, but also autonomy, identity and everyday participation for people living with dementia, increasingly framing outdoor access as a component of inclusive community design rather than optional therapy (Housing LIN, 2019; Alzheimer's Australia, 2011). The therapeutic benefits of access to natural and multisensory outdoor environments are well documented in dementia care literature. However, such environments are predominantly conceived within institutional care settings such as nursing homes, hospitals and rehabilitation facilities (Vukovic and Mingaleva, 2023). This institutional focus reveals a critical disconnect. A substantial proportion of people in early and mid stages of dementia continue to live within urban communities and rely on public space as part of their daily routines. Yet the spatial implications of dementia are rarely addressed at the scale of urban infrastructure. Design guidance increasingly argues that access to outdoor space should be understood as a fundamental component of dementia-inclusive environments and citizenship, rather than as a therapeutic add-on (Pollock and Marshall, 2012; Housing LIN, 2019). The theme of this research therefore shifts attention from the sensory garden as an isolated therapeutic object towards sensory gardens as potential components of urban health infrastructure. These environments are understood as being embedded within compact city fabrics and shared public spaces. This research focuses on compact European urban contexts with ageing populations and limited outdoor space around healthcare and community facilities, where integrating dementia-supportive landscape strategies is particularly relevant.

2.Research Interest

The research seeks to develop design-relevant knowledge on how dementia-supportive spatial and sensory strategies can be integrated into publicly accessible urban parks. This knowledge will take the form of spatial mechanisms and design rules that can be communicated through diagrams, annotated plans and concise guidelines. While existing literature confirms that sensory environments can support wellbeing for people living with dementia, it provides limited guidance on how specific spatial configurations operate under conditions of openness, shared use and spatial constraint that characterise inner-city public parks. Many established design strategies rely on forms of spatial control such as enclosure, restricted access and behavioural regulation that are incompatible with public urban space. Rather than asking

whether sensory environments are beneficial in general, this research investigates how particular spatial and sensory design strategies function, adapt or fail when translated into a compact, publicly accessible urban context. The study focuses on circulation systems, spatial legibility, boundary conditions, sensory organisation, planting strategies and seating networks, and examines how these elements can support orientation, emotional comfort and everyday use without relying on institutional control or physical enclosure.The research is grounded in a site-specific design case: the redesign of Kurpark Burtscheid. As a centrally located public park with strong historical and health-related associations, embedded within a dense urban fabric and used by diverse user groups, the park provides a critical testing ground for translating dementia-supportive principles into everyday public space. Design is positioned not only as an outcome, but as a method of inquiry. Through structured design exploration informed by theory, proxy user profiles and comparative references, the study aims to generate insights that can be abstracted into portable design mechanisms applicable to other compact European cities.

2.1. Statement of factual problems

Across Europe, demographic ageing increasingly shapes urban populations, while the design of public open spaces continues to prioritise visual coherence, multifunctionality and openness with limited consideration of cognitive impairment or age-related sensory change. Dementia-related challenges such as disorientation, reduced confidence in independent movement and heightened sensitivity to environmental stimuli are therefore often unintentionally reinforced by conventional park layouts (Pollock & Marshall, 2012). In Aachen, demographic data indicate a growing proportion of older residents, with approximately one quarter of the population aged 60 years and above (City of Aachen, 2024). Burtscheid, a historic spa district with health-related functions and an ageing user profile, represents a particularly relevant urban context for examining dementia-supportive public space. Despite this context, parks such as Kurpark Burtscheid were not designed with cognitive vulnerability in mind. Research shows that environments lacking clear circulation hierarchies, predictable spatial sequences and intuitive safety cues can contribute to anxiety, disorientation and reduced outdoor engagement for people living with dementia (Pollock and Marshall, 2012; Wiener and Pazzaglia, 2021). At the same time, most available design guidance for dementia-supportive outdoor environments is derived from institutional settings, where enclosure and behavioural control are feasible.

This results in a dual gap:

1. A mismatch between the demographic reality of ageing urban populations and the spatial qualities of public parks.
2. A lack of design-relevant knowledge on how dementia-supportive principles operate under real urban constraints such as shared use, limited space, heritage considerations and unrestricted public access.

Kurpark Burtscheid exemplifies this challenge, offering a concrete context for investigating how dementia-supportive strategies can be embedded in open, shared environments without institutionalisation. The project responds to ethical and practical limits on empirical work with vulnerable groups by relying on literature, proxy personas and scenario-based testing rather than direct clinical evaluation.

2.2. Research Question

Under what spatial and sensory conditions can dementia-supportive design principles enhance orientation, emotional comfort and everyday use in a compact, publicly accessible urban park without relying on enclosure, supervision or behavioural control, and where do these principles reach their limits within shared public space?

2.3. Hypothesis

The research hypothesises that specific spatial and sensory configurations including legible looped circulation systems, differentiated sensory zoning, soft boundary conditions and dense seating networks can generate environmental affordances that support orientation, emotional comfort and confident everyday use for ageing people and people living with dementia in compact, shared urban parks. Rather than attributing effectiveness to therapeutic outcomes, the hypothesis assumes that dementia-supportive qualities emerge through spatial structure, perceptual cues and patterns of use. Safety and autonomy are understood as relational effects produced by spatial configuration rather than by enclosure or supervision. Evaluation of this hypothesis will be qualitative and design-based, using scenario walkthroughs from the perspective of proxy users, comparative analysis of alternative layouts and structured assessment against predefined spatial indicators.

3. Methodology

The study adopts a design-oriented research methodology, positioning spatial design as both an analytical framework and a generative research instrument. The research combines deductive reasoning, derived from literature on dementia, environmental psychology and sensory landscapes, with inductive design exploration grounded in a specific urban site. The aim is not statistical generalisation or clinical validation, but the production of explanatory knowledge that clarifies how spatial and sensory strategies may function within public urban contexts.

3.1. Case Study and Comparative References

The research is centred on an in-depth, site-specific investigation of Kurpark Burtscheid, which functions as the primary and singular design case. The park is a centrally located public green space embedded in a dense inner-city fabric and characterised by shared use, heritage value and regulatory constraints. These conditions make it a particularly relevant context for examining the integration of dementia-supportive design strategies into everyday urban environments. Selected European examples such as the Alnarp Rehabilitation Garden, the Hogeweyk dementia village, Emmauspark and German Sinnesgärten are referenced comparatively. These projects are not treated as parallel case studies, but as interpretive reference points that illustrate how dementia-supportive principles are commonly implemented in institutional or dedicated therapeutic settings. The comparative references serve to clarify which spatial mechanisms depend on controlled environments and which can be meaningfully translated into open, shared public parks such as Kurpark Burtscheid.

3.2. Deductive Framework and Measurable Environmental Indicators

Based on an interdisciplinary literature review spanning dementia care, environmental psychology, sensory landscape research and urban design, the study develops a deductive

analytical framework linking human needs to spatial and sensory conditions. To operationalise this framework, a set of measurable environmental indicators is defined:

- **Path and circulation metrics:** continuity of movement systems, number and complexity of decision points, visual connections between paths, destinations and landmarks
- **Legibility indicators:** presence and clarity of spatial nodes, visual permeability, recognisable wayfinding cues
- **Boundary and enclosure conditions:** soft boundary types such as planting, material change and level difference, degrees of permeability versus containment
- **Seating network:** seating density, spatial distribution, proximity to circulation routes and views, opportunities for passive social interaction
- **Sensory zoning:** distribution and intensity of olfactory, visual, tactile and auditory elements, transitions between sensory zones
- **Use-related outcomes:** observable patterns of independent movement, duration and frequency of stay, use of seating and informal social interaction

These indicators allow the research to systematically examine how spatial configuration mediates behaviour and experience, and to assess the extent to which safety and autonomy can be achieved through spatial design rather than physical enclosure.

3.3. Design Output and Fact-Related Theory

Rather than producing universal design prescriptions, the research develops contextually grounded design knowledge in the form of spatial scenarios for Kurpark Burtscheid. These scenarios articulate how human needs orientation, emotional comfort and autonomy interact with spatial conditions such as circulation, legibility, sensory character and seating within the specific context of a compact inner-city public park. The resulting knowledge takes the form of fact-related theory, expressed through object–context–relationship configurations that demonstrate how dementia-supportive design principles can be integrated into everyday public space without enclosure or institutionalisation. While grounded in Kurpark Burtscheid, these scenarios offer transferable conceptual frameworks for other dense European cities facing similar demographic and spatial challenges.

4. Analysis and Discussion

This section presents a detailed analysis of selected European case studies through the application of the deductively developed analytical framework. The analysis examines how spatial and sensory design strategies influence orientation, emotional comfort and patterns of everyday use for ageing people and people living with dementia. Rather than evaluating therapeutic outcomes in clinical terms, the discussion focuses on how design decisions structure experience and behaviour within real spatial contexts, particularly under compact urban conditions (De Jong and Van der Voordt, 2002).

4.1. Spatial Legibility and Circulation

Across all examined cases, spatial legibility emerges as a foundational condition for meaningful engagement with outdoor environments. Legibility refers to the clarity of spatial organisation, the predictability of movement and the ease with which users can anticipate

where paths lead. Research in environmental and cognitive psychology demonstrates that environments with clear structure, repetition and minimal decision points reduce cognitive load and support orientation for people living with dementia (Wiener and Pazzaglia, 2021). Looped or semi-looped circulation systems are consistently employed across the case studies, allowing continuous movement without dead ends. Design guidance identifies such circulation patterns as particularly supportive for people with dementia, as they minimise situations that require memory recall or complex wayfinding decisions (Alzheimer's Australia, 2011; Pollock and Marshall, 2012). Importantly, the analysis shows that circulation effectiveness is enhanced when paths are visually and experientially connected to familiar reference points such as planting, seating and activity areas. These findings support the interpretation that orientation is strongly shaped by environmental structure rather than cognitive capacity alone. Repetition, predictability and spatial rhythm enable users to develop embodied familiarity with the environment over time, reinforcing autonomy and confidence in movement (Wiener and Pazzaglia, 2021).

4.2. Boundaries, Safety and the Experience of Autonomy

Safety is a central concern in dementia-supportive environments, yet its spatial implementation has significant implications for autonomy and dignity. In many institutional settings, safety is achieved through physical enclosure, which can unintentionally reinforce feelings of restriction and loss of control (Pollock and Marshall, 2012). The analysed cases demonstrate alternative approaches in which safety is embedded within spatial structure rather than imposed through barriers. Soft boundary strategies including planting, material transitions, level changes and visual cues are used to communicate spatial limits intuitively. Design guidance emphasises that such perceptual boundaries support orientation and reduce risk while maintaining openness and familiarity (Housing LIN, 2019; Alzheimer's Australia, 2011). This approach is particularly relevant in urban contexts, where fencing and enclosure may conflict with principles of inclusivity and shared use. The analysis suggests that spatial legibility, visibility and continuity can function as safety mechanisms in themselves, challenging the assumption that dementia-supportive environments must be physically closed in order to be secure (Pollock and Marshall, 2012).

4.3. Sensory Organisation and Emotional Comfort

Multisensory stimulation has been widely associated with emotional wellbeing and engagement in dementia care (Gonzalez and Kirkevold, 2014). However, the analysis indicates that the organisation of sensory elements is as important as their presence. Across the case studies, sensory features are not distributed evenly but are selectively placed and structured into gradients of intensity. In research-based environments such as the Alnarp Rehabilitation Garden, sensory stimulation transitions from more active, socially oriented areas to quieter zones designed for retreat and restoration (Gonzalez and Kirkevold, 2014). Similar principles are evident in smaller gardens, where smell-oriented planting and tactile elements are concentrated along circulation routes and near seating areas. Design guidance cautions that unstructured sensory richness can lead to overstimulation and confusion, particularly for people with cognitive impairment (Alzheimer's Australia, 2011). These findings reinforce the hypothesis that structured multisensory zoning supports emotional comfort by enabling users to regulate their level of sensory engagement through movement and choice, rather than through imposed control.

4.4. Seating, Pause and Social Interaction

Seating plays a critical role in shaping patterns of use and social interaction in dementia-supportive outdoor environments. Literature highlights the importance of opportunities for passive social engagement, allowing people to be present among others without pressure to interact directly (Gonzalez and Kirkevold, 2014). Across the analysed cases, seating is integrated into circulation routes and positioned to maintain visual connection with paths, planting and shared activity areas. This configuration supports short pauses, observation and informal interaction, while also providing opportunities for rest. Design guidance identifies seating as a key element in supporting longer durations of outdoor use and reinforcing a sense of familiarity and comfort (Pollock and Marshall, 2012). In addition, seating functions as an orientational anchor. Repeated use of familiar resting points contributes to spatial memory and reinforces legibility, supporting confidence and independence in movement (Wiener and Pazzaglia, 2021).

4.5. Compactness and Urban Transferability

A central concern of this research is whether dementia-supportive sensory garden strategies can operate within compact urban contexts. The analysis demonstrates that meaningful sensory environments do not depend on large or secluded sites. Instead, clarity of layout, selective sensory placement and careful sequencing enable effective use within limited spatial footprints. Smaller gardens and urban-adjacent examples illustrate how dementia-supportive principles can be embedded within dense urban fabrics and shared public spaces. This aligns with broader arguments that dementia-inclusive environments should extend beyond institutional boundaries and become part of everyday urban infrastructure (Housing LIN, 2019; Vukovic and Mingaleva, 2023). These findings challenge the assumption that therapeutic landscapes require extensive land resources, suggesting instead that dementia-supportive design can be integrated into existing urban green networks.

4.6. Synthesis and Reflection

Taken together, the analysis supports the proposed hypothesis. Clear circulation systems, high spatial legibility, soft boundary strategies and structured multisensory zoning consistently contribute to orientation, emotional comfort and everyday use for ageing people and people living with dementia. At the same time, the findings highlight the importance of contextual adaptation, reinforcing the need for flexible, design-oriented frameworks rather than fixed solutions (De Jong and Van der Voordt, 2002). Rather than producing prescriptive design outcomes, the analysis demonstrates how design knowledge can be generated through the interaction of theory, case-study evidence and spatial interpretation. In this way, sensory gardens are positioned as adaptable components of urban health infrastructure capable of responding to the diverse conditions of compact cities.

5. Conclusion

This research demonstrates how dementia-supportive spatial and sensory principles can be translated into concrete design mechanisms within a centrally located, publicly accessible urban park under compact inner-city conditions. Through a design-oriented investigation of Kurpark Burtscheid in Aachen, the study moves beyond outcome-based discussions of sensory gardens and addresses the question of how dementia-supportive qualities can be spatially

produced without enclosure, supervision or institutional control. The core contribution of the research lies in the development of a design-based analytical framework that operationalises abstract concepts from dementia care and environmental psychology into specific spatial variables. By linking human needs such as orientation, emotional comfort and safe autonomy to designable elements including looped circulation systems, spatial legibility, soft boundary conditions, structured multisensory zoning and seating networks, the study makes these principles actionable within open, shared urban environments. Using design as a method of inquiry, the research generates mechanism-level knowledge through site-specific exploration rather than empirical clinical evaluation. The resulting spatial mechanisms and environmental indicators function as design heuristics that clarify how dementia-supportive environments can emerge through spatial configuration itself, rather than through therapeutic segregation or physical containment. While grounded in the specific context of Kurpark Burtscheid, the contribution extends beyond the individual site. The identified design mechanisms and evaluation indicators offer transferable guidance for designers and urban planners working in dense European cities facing similar demographic and spatial conditions. In this way, the research contributes a context-sensitive, design-oriented approach to advancing dementia-inclusive public space as part of health-oriented and socially inclusive urban development.

6. Abstract

European cities are increasingly shaped by population ageing and a growing number of people living with dementia, while urban densification constrains access to supportive public open spaces. Although sensory gardens are widely discussed within dementia care, they are predominantly developed in institutional settings, offering limited guidance for publicly accessible urban parks.

This research investigates how spatial and sensory design strategies such as circulation systems, spatial legibility, boundary conditions and sensory organisation can support orientation, emotional comfort and everyday use for ageing people and people living with dementia in compact urban contexts. Using the redesign of Kurpark Burtscheid in Aachen as a site-specific design case, the study adopts a design-oriented methodology combining deductive theoretical analysis with inductive design exploration and qualitative scenario-based evaluation.

By reframing sensory landscapes as components of urban health infrastructure rather than isolated therapeutic amenities, the research contributes design-relevant knowledge on spatial mechanisms and design guidelines for integrating dementia-supportive strategies into shared public environments in compact European cities.

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