Idealogy Journal Vol. 11 No. 1, 2026, pp 164-179
DOI: https://doi.org/10.24191/idealogy.v11i1.940
Section: Original Article

A Neurodivergent-Inclusive Restoration Park Design Framework: Integrating Environmental and Physical Design Attributes, Sensory Regulation and Spatial Sequencing

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Received: 20 February 2026; Accepted: 4 March 2026; Published: 1 April 2026

ABSTRACT

Making green spaces accessible to diverse user groups has become a mainstream objective in contemporary planning, design, and built environment However, existing restorative environment research predominantly focuses on neurotypical populations, while sensory and cognitive considerations relevant to neurodivergent users remain insufficiently addressed within park design practice. Although restorative environment theories, particularly Attention Restoration Theory (ART) and Stress Recovery Theory (SRT), explain psychological recovery in natural settings, their translation into architectural design remains limited in accommodating diverse sensory needs. Consequently, there remains a lack of an evidence-informed design framework translating restorative theory into practical neuro-inclusive park design strategies. This study aims to develop a neurodivergent-inclusive restorative park design framework by integrating environmental and physical design attributes, sensory regulation principles, and spatial sequencing strategies into a coherent architectural model. The framework was developed through an integrative research approach combining findings from a systematic literature review, observational analysis of restorative attributes within an urban park environment, and thematic synthesis of expert perspectives with their validation. The study proposes a multi-layered framework comprising nature-based and biophilic attributes, multisensory environmental regulation, graded spatial sequencing and environmental complexity, and sociality with user autonomy. The framework contributes an evidence-informed design approach that bridges restorative environment theory and neuro-inclusive environmental design, providing practical guidance for developing restorative park environments that support diverse cognitive and sensory needs.

Keywords: *Neurodivergent-inclusive design, Restorative parks, Environmental attributes, Sensory regulation, Neurodivergent users.*

1 INTRODUCTION

Green spaces such as public parks and urban recreational spaces have been recognized for their role in supporting cognitive restoration, mental well-being, and overall quality of urban life. Natural environments have been widely recognised for their restorative potential, offering opportunities for psychological recovery and attentional renewal (Zhang et al., 2024). A growing body of research demonstrates that exposure to natural environments can reduce stress, enhance emotional regulation,

and restore depleted attentional capacity, particularly within dense urban contexts where environmental stressors are prevalent (Kaplan & Kaplan, 1989; Stoltz & Grahn, 2021; Izana & Shobri, 2024). Restorative environment theories, particularly Attention Restoration Theory (ART) and Stress Recovery Theory (SRT), explain how natural environments support cognitive recovery and psychological well-being by allowing individuals to engage with environmental stimuli that require little directed mental effort (R.S. Ulrich et al., 2023). Hence, urban recreational parks are increasingly recognised not only as leisure spaces but also as environments that contribute to public health and well-being (Shobri et al., 2021). As awareness of neurodiversity population continues to expand, increasing attention has been directed towards how public environments can better accommodate diverse sensory and cognitive experiences. This shift highlights the need for design approaches that move beyond conventional notions of general accessibility towards environments capable of supporting varied patterns of perception, engagement, and restoration. This aligns with the goal of Sustainable Development Goal 3 (SDG 3): to ensure healthy lives and promote well-being for all ages (United Nations in Malaysia, 2025).

Early discussions on inclusive landscape design emphasised that public facilities, including parks and green spaces, should be designed to provide access for all diversity of society, reflecting the close relationship between a growing environmental quality and social equity (Selanon & Chuangchai, 2023). Current discussions on inclusive design acknowledge that accessibility extends beyond physical access but also include environmental comfort, usability, and the accommodation of diverse user needs within public environments (Ramli et al., 2023). Rather than functioning solely as recreational amenities, urban green spaces may therefore be understood as cognitive sanctuaries that mitigate mental fatigue and sensory overload. These considerations become particularly relevant for neurodivergent individuals, including those on the autism spectrum, who may experience either hyposensitivity or hypersensitivity to sensory input, and in some cases both simultaneously (Mostafa.M,2020). Hyposensitive individuals require more stimulation, such as physical movement or music, to engage and necessitate more dynamic situations for concentration. Certain individuals exhibit sensory neutrality, positioning themselves within a predictable middle range (Maćkowiak et al., 2025). Architects and designers must build environments that accommodate all individuals throughout this spectrum of sensitivities.

Such sensory variations shape spatial experience by shaping tolerance to environmental stimuli such as noise, crowd density, visual complexity, lighting conditions, spatial enclosure, and movement patterns. As a result, environments commonly perceived as restorative for neurotypical users may not necessarily provide equivalent restorative benefits for neurodivergent users. The restorative potential of park environments therefore cannot be assumed to be universal, highlighting the need for design approaches that incorporate sensory regulation, spatial choice, and graduated levels of environmental stimulation. In architectural practice, design elements such as space, volume, sequencing, colour, pattern and material can be manipulated to create environments that support varied neurodiverse users (Mostafa.M, 2020).

Landscape architects, architects and built environment professionals play an important role in responding to ongoing debates concerning the evolving role of urban green spaces and their capacity to accommodate increasingly diverse user needs. As expectations of inclusivity continue to evolve, there is a growing need to translate restorative environment knowledge into spatial and environmental strategies capable of supporting diverse cognitive and sensory experiences. Addressing this challenge requires a more integrated understanding of how environmental attributes, sensory experience, and spatial organisation interact to shape restorative outcomes within urban park environments.

1.1 Research Gap

Despite the expanding body of literature on restorative environments, significant gaps remain in translating restorative principles into inclusive spatial design practice. Designing for neurodiversity means creating environments that allow all occupants to find the right sensory settings to thrive. It requires considering concepts like environmental stimulation, social interaction, safety, predictability,

and cognitive load, while supporting refuge and autonomy. Existing studies have predominantly focused on the general population, with limited attention given to how environmental and physical design attributes influence sensory regulation, emotional comfort, and attentional restoration among into designing strategies for neurodivergent users (Finnigan, 2024). While restorative environment theories, particularly Attention Restoration Theory (ART) and Stress Reduction Theory (SRT), have been widely applied to explain psychological and physiological recovery in natural settings, their application has rarely been adapted to address the diverse sensory processing and cognitive characteristics associated with neurodivergent communities (Li et al., 2019). As a result, current restorative environment frameworks provide limited guidance for integrating sensory regulation, spatial sequencing, and user autonomy into coherent design strategies for urban recreational parks. This gap highlights the need for an evidence-informed framework that bridges restorative environment theory with environmental and physical design considerations capable of supporting inclusive restorative experiences.

In response to this gap, this study aims to develop a neurodivergent-inclusive restorative park design framework by integrating environmental and physical design attributes, sensory regulation principles, and spatial sequencing strategies derived from systematic literature synthesis, observational analysis of park environments, and expert validation findings. By synthesising insights from restorative environment theory, observational analysis, and expert perspectives, the research seeks to translate interdisciplinary knowledge into a coherent architectural framework that informs urban planners, landscape architects, and designers in creating equitable, health-supportive, and cognitively restorative public spaces. Through this integration, the study contributes to advancing inclusive design discourse by providing practical spatial guidance for accommodating diverse sensory and cognitive needs within urban green space environments.

2 LITERATURE REVIEW

2.1 Neurodiversity Inclusivity in Built Environment

Neurodiversity refers to the neurological differences in human cognitive functioning, encompassing neurological profiles such as autism spectrum disorder (ASD), Attention-Deficit/Hyperactivity Disorder (ADHD), dyslexia, and dyspraxia. Neurodivergent individuals may experience environments differently due to variations in sensory processing, attention regulation, communication, and emotional control when compared to neurotypical populations (Kapp et al., 2023). These challenges highlight the importance of identifying spatial and environmental attributes that support restoration for the community. Many also report heightened sensitivity to sensory stimuli, such as noise, bright light, large crowds, or unpredictable motion. These environmental factors can lead to sensory overstimulation, distraction, and emotional dysregulation. (Finnigan, 2024; Pincus & Beller, 2025). Sensory discomfort frequently leads to withdrawal or avoidance of public spaces.

Because most public spaces are designed according to neurotypical norms, neurodivergent users often encounter barriers that reduce accessibility, comfort, and restorative potential. Recreational parks may serve as empowering environments tailored for neurodivergent individuals where they can also thrive in an urban green space regardless of their neurodiverse traits. To ensuring guidance in developing neuroinclusive park design that addressed these challenges, it needs to go beyond standard practices. When designing for neurodiversity, architects pay attention on spatial sequencing or zoning since different people have different sensitivities to have self- control, options and choices for each individual. In this area, designing an environment that support for solidarity and collaboration. Encouragement on movement and innovation can be helpful for neurodivergent users. Architectural research demonstrates that spatial configuration directly influences movement patterns, social interaction, and behavioural engagement within built environments. (Spence, 2020) mentioned that spatial experience is shaped through multisensory engagement rather than visual alone, suggesting that restorative environments require intentional spatial organisation to support flexibility social participation, sensory regulation and autonomy.

2.2 Restorative Environment Theories and The Role

The field of restorative environments has expanded and evolved in the late 1980s and has received greater relevance in recent decades within environment-behaviour and landscape studies. Restorative environment research explains how interaction with natural settings contributes to cognitive recovery (attentional performance) and affective (emotional regulation) and social development (communication). Restoration Theory (ART) proposes that natural environments facilitate recovery from directed attention fatigue through qualities such as providing psychological distance from daily life (being away), displaying well-organized content (extent), providing aesthetic value and generating interest (fascination), and meeting people's needs (compatibility) allowing involuntary attention to replace cognitively demanding tasks. Similarly, Stress Recovery Theory (SRT) emphasises the physiological and emotional benefits of natural environments, suggesting that exposure to natural elements can reduce stress and promote positive emotional states. Table 1 illustrates the restorative design theory expanded that influence in developing Neuro-Inclusive design framework. These theoretical components form the conceptual basis for the proposed design framework

Building on these theoretical foundations, recent restorative environment research emphasises that the presence of natural elements does not shape restorative outcomes alone, but also how environmental qualities are structured, perceived, and experienced through multisensory interaction. Restorative environments support wellbeing when spatial characteristics enable individuals to experience clarity, comfort, and a balanced level of environmental stimulation, allowing users to engage with their surroundings without cognitive overload (Ramli et al., 2023). Environmental features such as visual coherence, acoustic comfort, natural materials, and opportunities for sensory modulation contribute to psychological recovery by supporting both attentional restoration and emotional regulation (Hunter et al., 2023). In addition to restorative environment theories, sensory-therapeutic garden research emphasises multisensory engagement through vegetation, texture, sound, and spatial organisation, highlighting the role of sensory interaction in supporting psychological comfort and healing (Dinu Roman Szabo et al., 2023). In this context, restorative design extends beyond aesthetic integration of nature towards the deliberate orchestration of sensory experiences, spatial legibility, and environmental control, enabling users to regulate their interaction with space according to individual cognitive and sensory needs. This perspective is particularly relevant in neuroinclusive design, where restorative qualities must accommodate diverse sensory thresholds and patterns of environmental perception rather than assuming uniform user responses (Finnigan, 2024).

Table 1 Restorative Design Theory (Source: Abdullah Sani 2026)

Influencing Theories of Restorative Design	Attributes from theory
A.R.T Attention Restoration Theory (Kaplan & Kaplan, 1989)	• Extent • Being Away • Fascination • Compatibility
S.R.T Stress Reduction Theory (R.S. Ulrich et al., 2023)	• Sense of Privacy & Control • Social Support • Physical Movement & Exercise • Positive Natural Distractions
Sensory Therapeutic Gardens (Dinu Roman Szabo et al,2023	• Contextual • Organization • Accessibility and • Visibility • Sensory Stimulation • (through vegetation) • Biodiversity • Shade and Seating • Softscape Dominance

Biophilia theory proposed by biologist (Wilson, 1984)	• Water Features • Privacy • User interaction with nature • Biophilia: A genetic predisposition to seek and benefit from nature results in psychological restoration from green spaces. • Evolutionary needs for food, shelter, safety, and restoration realized in psychological response to natural spaces.

2.3 Environmental and Physical Design Attributes supporting restoration

Environmental and physical design attributes play a critical role in shaping restorative experiences within urban green spaces. Nature-based elements such as vegetation, water features, and biodiversity enhance opportunities for soft fascination and psychological relief, while spatial characteristics including enclosure, prospect, and environmental diversity influence perceptions of safety and comfort. Multisensory environmental qualities such as acoustic buffering, tactile engagement, and visual coherence also play an important role in shaping restorative outcomes (Zhuang, 2025). Environments with variable sensory conditions may diminish restorative potential, even with natural features present. This indicates that restorative design should prioritize sensory experience as a fundamental aspect of environmental quality instead of seeing it as a mere secondary accessibility issue.

While restorative environment research has primarily focus on biophilic components, more recent studies have highlighted the importance of environmental predictability and user control in supporting restorative experiences, particularly for individuals with sensory sensitivities. Design attributes that allow neurodivergent users to regulate exposure to environmental stimuli, such as the availability of quiet areas, refuge spaces, and alternative circulation routes, contribute to both emotional comfort and attentional recovery (Finnigan, 2024). A key insight from the theoretical would be to meet the needs of neurodivergent individuals we should highlight on choice and control. However, existing literature often examines these attributes independently, resulting in fragmented guidance for designers seeking to apply restorative principles in practice. At the end, architects should celebrate the unique ways in which people engage with their environment.

2.4 Spatial Sequencing, Autonomy, and Neuroinclusive Design

Spatial organisation plays a critical role in mediating sensory experience and user engagement within park environments. The concept of spatial sequencing refers to the arrangement of spaces along gradients of stimulation, allowing users to transition between environments of varying sensory intensity. Such sequencing supports gradual adaptation and reduces the risk of sensory overload, particularly for neurodivergent users who may require predictable transitions between spaces.

Autonomy became a fundamental element in facilitating inclusive restorative processes. Settings that foster social engagement while providing avenues for retreat enable users to modulate their participation based on personal comfort and sensory tolerance. The presence of both lively social sections and more peaceful refuge areas allows for flexible interaction patterns. This strengthens the feeling of control over the environment, which helps with emotional regulation and feelings of safety. This study indicates that inclusive restorative environments ought to support various types of involvement instead of favouring a singular pattern of usage.

Equally important is the provision of autonomy and choice within public environments. Neurodivergent users rely heavily on environmental clarity to navigate and feel secure (Mostafa, 2023). Clear spatial structure and predictable transitions improve confidence and independence. Opportunities

for both social interaction and solitude enable users to regulate their level of engagement according to personal comfort and sensory tolerance. Neuroinclusive design therefore emphasises flexibility, environmental choice, and the coexistence of active and restorative zones within a single spatial system. Despite growing recognition of these principles, there remains limited integration of sensory regulation, spatial sequencing, and restorative theory within a unified architectural framework.

2.5 Neurodivergent-inclusive Restorative Park Design Framework

The preceding discussion highlights the need for a more integrative approach that bridges restorative environment theory, sensory-responsive design, and spatial organisation within urban park environment. While existing studies provide valuable insights into individual components of restorative environments, a coherent framework capable of translating interdisciplinary knowledge into practical design guidance remains lacking. Addressing this gap requires synthesising theoretical understanding with empirical and professional insights to develop a framework that supports diverse cognitive and sensory experiences within urban park environments. This study responds to this need by proposing an evidence-informed restorative park design framework that integrates environmental attributes, sensory regulation, spatial sequencing, and user autonomy into a unified architectural model. Hence, this is a good effort of sustainability and equality where neurodivergent be able to participate in enjoying green spaces.

3 METHODOLOGY

This study adopted a mixed-method research design aimed at developing a neurodivergent-inclusive restorative park design framework. To attain a comprehensive and all-encompassing understanding of the intricate and multifaceted research topic that is currently under examination, it is essential that a wide ranging and varied selection of both qualitative and quantitative data be meticulously collected and compiled through the synthesis of theoretical, empirical, and professional knowledge. Rather than relying on a single method, this triangulation methodology will generate an evidence-informed architectural framework. The collected data will then be analysed using thematic analysis tools to draw meaningful conclusions and recommendations that can enhance educational practices and promote an inclusive restorative environment. This approach enables the translation of restorative environment theory into spatial design strategies that respond to diverse sensory and cognitive needs within urban park environments.

The goal of a Systematic Literature Review (SLR) is to identify, evaluate, and synthesise relevant primary research to develop a comprehensive understanding of the topic under investigation. Environmental and physical design attributes associated with restorative experiences were identified through systematic literature synthesis. These attributes were then examined within an existing urban recreational park environment through observational analysis to understand how design attributes translated in spaces and effect on people's feel, perceived and experience the space. One day duration is conducted at Putrajaya Botanical Garden. The observation was then validated and incorporated by four expert perspectives for the relevancy of identified attributes within practical design contexts. The integration of these stages enabled the development of a coherent framework that connects restorative theory with neuro-inclusive environmental design.

The SLR was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009). Peer- reviewed literature published between 2020 and 2025 was retrieved from Scopus, Web of Science, and Google Scholar using search terms related to restorative environments, environmental psychology, inclusive design, and sensory-responsive environments. Environmental and physical design attributes consistently associated with restorative outcomes were extracted and categorised into thematic domains. These domains provided the theoretical foundation for identifying key environmental attributes relevant to sensory regulation and cognitive restoration in park environments.

The second stage involved observational analysis conducted within an urban recreational park specifically at Putrajaya Botanical Garden setting to examine how restorative attributes identified in the literature are manifested spatially. The observation employed an adapted Restorative Design Scale (RDS), measuring the potential for mental restoration in urban green. The observation was conducted with the perspective of architectural designer where qualities and criteria that make for a successful healing and restorative environment was observed and synthesised from Attention Restoration Theory, Stress Recovery Theory, and sensory-based environmental considerations. Specifically, the assessment examined key Restorative Design Scale (RDS) criteria including novelty and intrigue, environmental diversity, sociality and movement, mindfulness, and design elements. Figure 1 illustrates the creation of the restorative design scale based on synthesizes of Attention Restoration Theory (ART), Stress Reduction Theory (SRT) and influence theory such as biophilic theory into five criteria of what creates a mentally restorative space. These criteria were evaluated through site observation and thematic categorisation to identify spatial configurations that support or constrain restorative experiences, particularly in relation to sensory comfort and environmental predictability.

To complement the literature findings, semi-structured expert interviews were conducted with purposively selected professionals from architecture, environmental psychology and occupational therapy. This approach enabled in-depth exploration of sensory comfort, accessibility, and restorative design strategies while maintaining consistency across interviews (Adhabi & Anozie, 2017).

The final stage involved cross-analytical synthesis across the three methodological components. Environmental attributes derived from literature synthesis were compared with observational findings and expert interpretations to identify recurring principles influencing restorative outcomes. These principles were subsequently organised into four interrelated framework components: nature-based and biophilic attributes, multisensory environmental regulation, spatial sequencing and environmental complexity, and sociality with user autonomy. The resulting framework represents an integrative model that translates restorative environment theory into spatial design guidance for neuroinclusive park environments. Figure 2 illustrates the development methodology of the neurodivergent-inclusive restorative park design framework through systematic literature review, observational analysis, and expert validation.

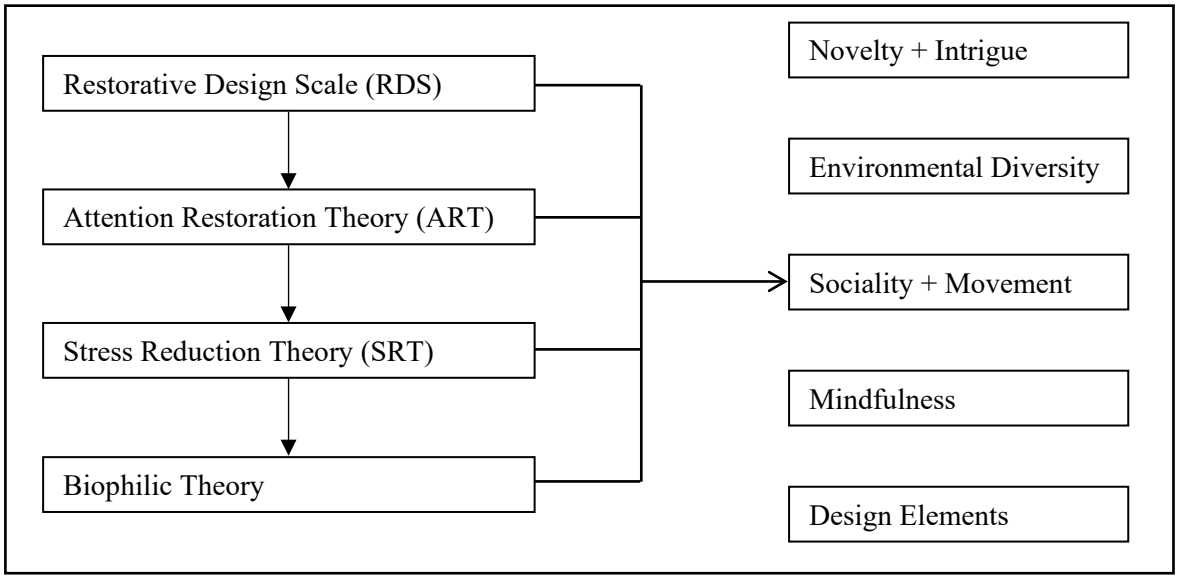

Figure 1 Theoretical study related to Restorative Design Scale (RDS)
(Source: Abdullah Sani, 2026)

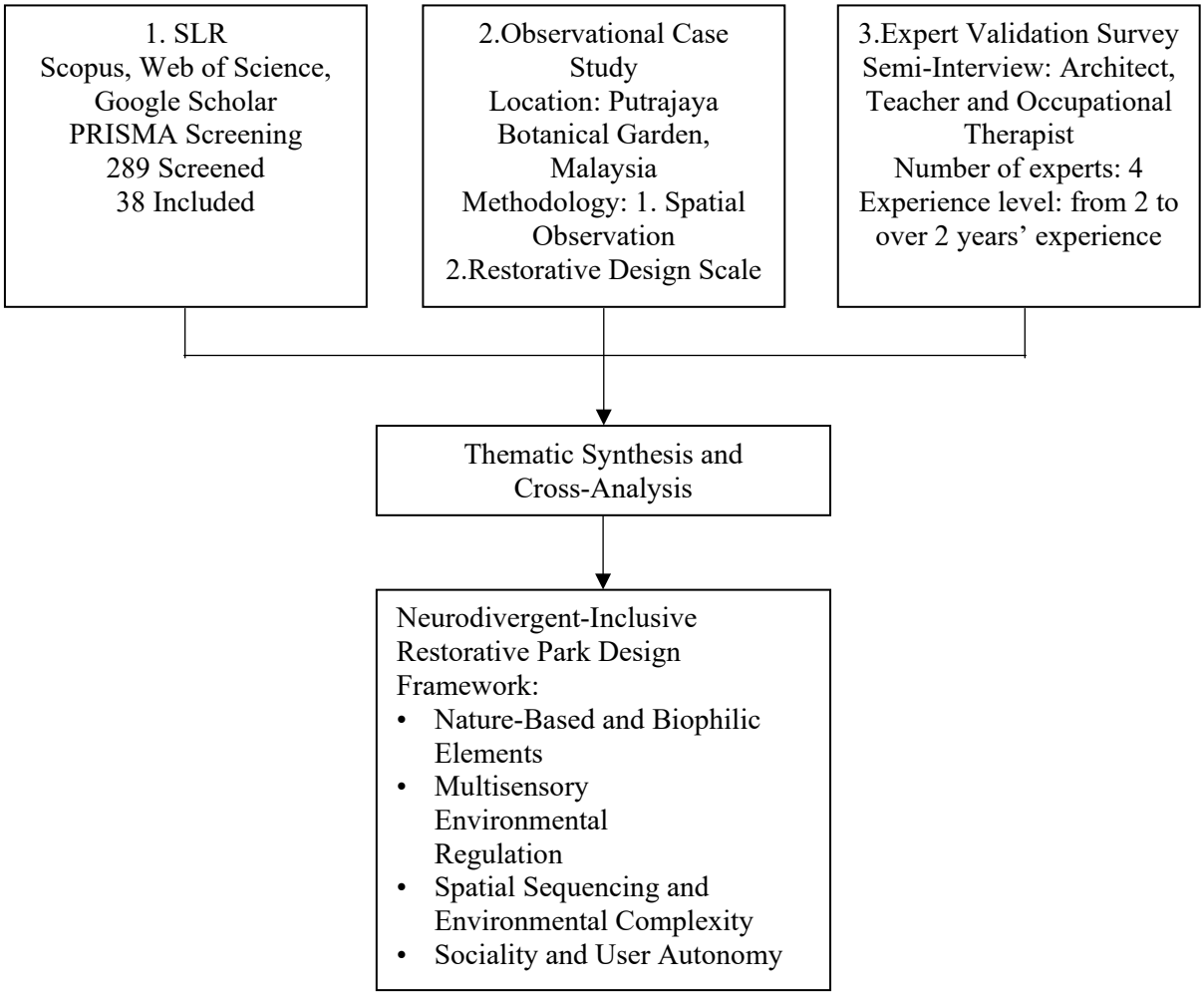

Figure 2 Development of the Neurodivergent-Inclusive Restorative Park Design Framework (Source: Abdullah Sani, 2026)

4 FINDINGS AND DISCUSSION

4.1 Development of a Neurodivergent-Inclusive Restorative Park Design Framework

The primary outcome of this study is the development of a neurodivergent-inclusive restorative park design framework that integrates restorative environment theory with sensory-responsive spatial design principles. The framework emerges through the synthesis of theoretical understanding, observational insights, and expert-informed perspectives, enabling restorative principles to be translated into spatially applicable design strategies. The framework conceptualises restorative experience as an interaction between environmental attributes, sensory regulation, and spatial organisation, recognising that restorative outcomes are shaped not only by the presence of natural elements but also by how environments are structured and experienced. Figure 3 illustrates conceptual framework for the development of a Neurodivergent-Inclusive Restorative Park Design.

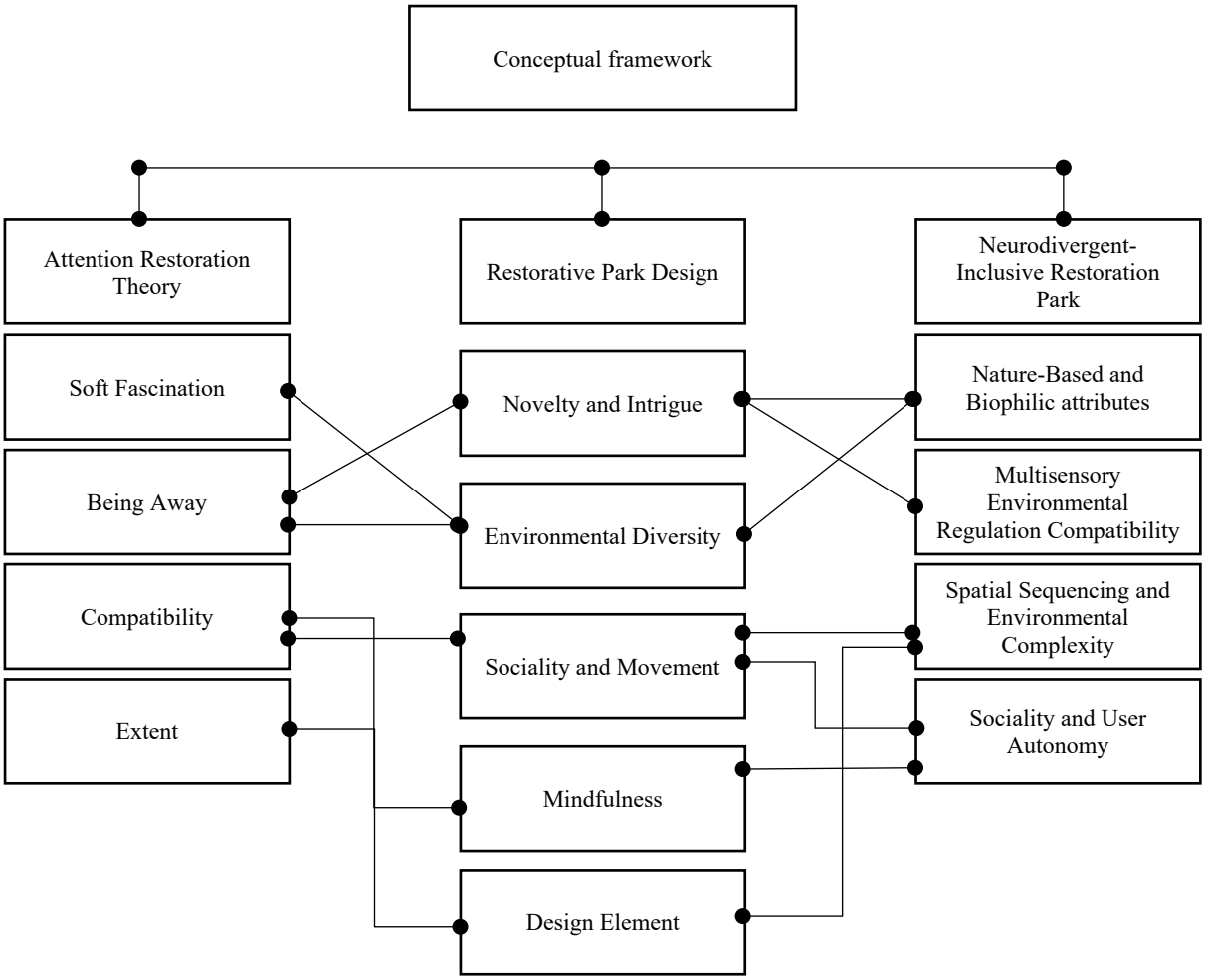

Figure 3 Development of the conceptual framework of Neurodivergent-Inclusive Restorative Park Design (Source: Abdullah Sani, 2026)

Table 2 Summary of the Neurodivergent-Inclusive Restorative Park Design Framework with Expert Validation (Source: Abdullah Sani, 2026)

Framework Component	Validated Design Attributes	Role in Restorative Experience	Implication for Framework Development
Nature-Based and Biophilic Attributes	Vegetation, water features, natural materials, shaded areas, biodiversity	Natural elements can promote calmness, emotional regulation, and attentional recovery. Restoration depends on how nature is organised and experienced.	Incorporation of vegetation layers, shaded areas, water features, and natural materials to create calming environments with reduced cognitive demand and predictable environmental conditions.
Multisensory Environmental Regulation	Acoustic buffering, visual calmness, controlled stimulation, refuge spaces	Sensory regulation and controlled levels of stimulation can influence emotional stability and attentional recovery	Acoustic buffering, visual filtering, low-stimulation zones, and gradual transitions between environments to allow users to regulate sensory exposure and reduce overstimulation.
Spatial Sequencing and Environmental Complexity	Gradual transitions, environmental gradients, spatial legibility, clear circulation	Supports restoration through gradual transitions between environments of varying stimulation	Organisation of park spaces along gradients of stimulation, clear spatial transitions, and legible circulation routes that enable gradual movement between active and calm environments.
Sociality and User Autonomy	Choice of engagement, alternative routes, social and quiet zones, withdrawal spaces	Enhances restorative engagement by allowing users to regulate levels of social interaction and environmental engagement according to individual comfort and sensory tolerance.	Provision of flexible social spaces alongside refuge areas, alternative movement routes, and seating arrangements that support autonomy and user-directed engagement.

4.2 Nature-Based and Biophilic Elements

Biophilic integration refers to the incorporation of natural elements within built and landscape environments to support human well-being through meaningful engagement with nature. The inclusion of living vegetation, water features, natural materials, and shaded environments has been widely associated with psychological restoration, improved concentration, and reduced cognitive fatigue (Soga & Gaston, 2020). Consistent with restorative environment theory, such natural features contribute to soft fascination, enabling users to disengage from directed attention demands and facilitating attentional recovery. However, restorative outcomes are influenced not only by the presence of natural elements but by how these elements are spatially organised and experienced. Natural environments that demonstrate clear spatial structure, visual continuity, and moderated levels of sensory stimulation are more likely to support emotional stability and sustained engagement, whereas environments characterised by excessive visual complexity or uncontrolled sensory exposure may diminish restorative benefits despite the availability of natural features (Hunter et al., 2023). The proposed framework therefore emphasises the organisation of biophilic elements in ways that enhance environmental legibility while supporting sensory regulation.

Within neuroinclusive park environments, sensory gardens represent a biophilic design strategy that supports multisensory engagement while maintaining environmental predictability. By enabling interaction with nature through visual, tactile, olfactory, and auditory stimuli, sensory gardens create opportunities for controlled sensory exploration that can promote relaxation, attentional recovery, and emotional comfort (Bahr, 2024). The use of diverse planting species, textured surfaces, and natural materials allows environmental variation to be experienced without generating excessive stimulation, which is particularly important for neurodivergent users with varying sensory sensitivities. Elements

such as soft planting textures, natural fragrances, and moderated soundscapes can encourage calm engagement with the environment, while flexible spatial arrangements allow for both individual reflection and social interaction. In this context, sensory gardens function not only as aesthetic landscape features but as spatial mechanisms that facilitate sensory regulation and support inclusive restorative experiences within public park settings (Syed et al., 2025).

4.3 Multisensory Environmental Regulation and Restorative Experience

A key finding of the framework is the central role of multisensory environmental regulation in shaping restorative experiences for neurodivergent users. Although restorative environment theories primarily focus on visual interaction with nature, incorporating sensory factors reveals that auditory, visual, and kinetic cues profoundly affect environmental comfort and attentional restoration. Sensory predictability and environmental control are essential factors that promote emotional stability, especially for persons with increased sensory sensitivity. Sensory predictability and environmental control emerged as critical conditions supporting emotional stability, particularly for individuals with heightened sensory sensitivity (Qu & Ma, 2024). In accordance with neuroinclusive architectural research, spatial experience is influenced by the interplay of various sensory systems rather than solely by visual perception, indicating that restorative environments should be regarded as multisensory experiences rather than merely visual landscapes. (Syed et al.,2025)

Design strategies that mitigate excessive stimulation, provide refuge spaces, and allow gradual engagement with environmental stimuli contribute to more inclusive restorative environments by providing gradual transitions between high- and low-stimulation zones will help in support attentional recovery by allowing users to adjust their level of environmental engagement over time. The provision of refuge spaces or moments of withdrawal further enables users to recalibrate sensory input before re-engaging with shared environments, reinforcing autonomy and perceived control as essential components of restorative experience (Egan, 2024). Sensory regulation therefore becomes a foundational mechanism within restorative park design rather than an auxiliary accessibility consideration. Acoustical buffering can be created through dense vegetation belts, water features that mask noise while maintaining natural soundscapes. Visual calmness may be supported through coherent planting palettes, reduced visual clutter and the use of natural materials that mimic organic elements.

4.4 Spatial Sequencing And Environmental Complexity

Spatial sequencing is also identified by the framework as a key mechanism that connects ambient characteristics and user experience. Restorative outcomes were found to be influenced by transitions between spaces rather than by isolated environmental features. Organising Park environments along gradients of environmental complexity allows users to adjust to varying levels of stimulation, supporting sensory adaptation and reducing cognitive fatigue (British Standards Institution, 2021). According to recent studies, spatial continuity and environmental transitions assist attentional recovery and emotional control by enabling progressive adjustment across environments with varying sensory intensities, which in turn contributes to felt comfort.

Environmental complexity, when appropriately structured, contributes to soft fascination and exploratory engagement without imposing excessive cognitive demand. Predictable spatial transitions and clear environmental cues enhance orientation and psychological comfort, particularly for neurodivergent users who may rely on environmental consistency to navigate public environments (Finnigan, 2024). The findings therefore suggest that spatial sequencing operationalises restorative theory within design practice by structuring environments that support gradual engagement between exposure to open social areas and quieter refuge spaces within experiential continuity. The findings therefore suggest that spatial sequencing implements restorative theory within design practice by structuring environments that support gradual engagement and experiential continuity, translating restorative principles into spatial strategies that accommodate diverse sensory and cognitive needs.

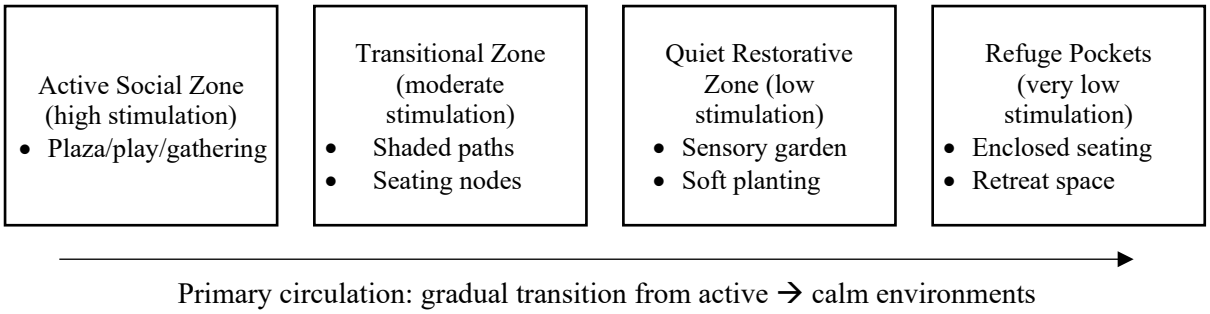

Figure 4 Example of spatial sequencing in restorative park (Source: Abdullah Sani, 2026)

4.5 Sociality, Autonomy, and Inclusive Restorative Engagement

The significance of spatial settings that enable people to control social contact and environmental engagement in accordance with their own comfort and sensory tolerance is highlighted by the discovery that autonomy and user-directed engagement are essential elements of inclusive healing environments. Autonomy and user-directed engagement emerged as essential components of inclusive restorative environments. People can control their participation based on their own comfort level and sensory tolerance when social contact and withdrawal chances are provided. (Egan, 2024). Flexible patterns of involvement are made possible by the presence of socially busy regions and more sedate refuge spaces, which strengthens the sense of environmental control that promotes emotional regulation.

By integrating autonomy into spatial design, the framework expands the understanding of accessibility beyond physical inclusion towards experiential inclusion. Restorative environments are therefore conceptualised as adaptable systems that accommodate diverse patterns of engagement, acknowledging that restoration may occur through both social interaction and solitude depending on individual needs.

4.6 Theoretical and Design Implications

The proposed framework contributes to restorative environment discourse by extending the application of Attention Restoration Theory and Stress Recovery Theory into the domain of neuroinclusive environmental design. While existing theories explain mechanisms of psychological recovery, the framework demonstrates how these mechanisms can be translated into spatial and environmental strategies applicable within park design. This integration bridges environmental psychology and architectural practice, providing a structured approach for designers seeking to create restorative environments that respond to diverse cognitive and sensory experiences.

Importantly, the findings challenge the assumption of universal restorative response by highlighting the role of sensory variability in shaping environmental experience. Inclusive restorative design therefore requires environments that allow flexibility, environmental choice, and graduated exposure to stimulation. The framework positions restoration as an outcome of spatial organisation, sensory regulation, and environmental diversity, offering practical guidance for architects and landscape architects in the development of neuroinclusive urban green spaces.

5 CONCLUSIONS

This study developed a framework for restorative park design that is inclusive of neurodivergent individuals, merging restorative environment theory with principles of sensory-responsive spatial design. By synthesising insights from literature, observational understanding of park environments, and expert-informed perspectives, the research translates restorative concepts into a coherent architectural framework applicable to inclusive park design. The findings demonstrate that restorative experiences within urban green spaces are not determined solely by the presence of natural elements, but emerge

through the interaction between environmental attributes, sensory regulation, spatial sequencing, and user autonomy. In this respect, restorative environments are understood not as static settings but as adaptable spatial systems capable of accommodating varying sensory responses and patterns of engagement. The framework therefore reframes restoration as a spatially mediated and experience-dependent process, extending the application of Attention Restoration Theory and Stress Recovery Theory towards neuroinclusive environmental design.

The study further highlights that neuroinclusive restorative environments require design approaches capable of supporting a spectrum of sensory experiences rather than a single optimal condition. Environments that allow spaces to transition between stimulation and calmness, openness and refuge, and social interaction and solitude enable users to regulate their own engagement according to individual comfort and sensory needs. Such an approach positions spatial diversity, environmental legibility, and sensory flexibility as essential qualities in inclusive park design, allowing environments to simultaneously support users with differing sensitivities. By emphasising adaptability, predictability, and user autonomy, the proposed framework contributes to both theoretical and practical discourse by bridging restorative environment research with architectural and landscape practice. While further empirical validation across different contexts is required, the framework provides a foundation for future research and design applications aimed at advancing neuroinclusive, inclusive, and health-supportive urban environments that accommodate difference as an inherent aspect of public space design. Future research should focus on applying and testing the proposed framework within real-world design projects to evaluate its practical effectiveness and adaptability across different park contexts.

ACKNOWLEDGEMENT

The author wishes to express her sincere gratitude to supervisory team for their dedication and contributions throughout this study. Special thanks are also extended to the Department of Architecture, UiTM Seri Iskandar Perak.

FUNDING

This research was funded by the Journal Support Fund, Institute of Postgraduate Studies (IPSis), Universiti Teknologi MARA.

AUTHOR CONTRIBUTIONS

All authors played equal contributions towards the production of this paper.

CONFLICT OF INTEREST

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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