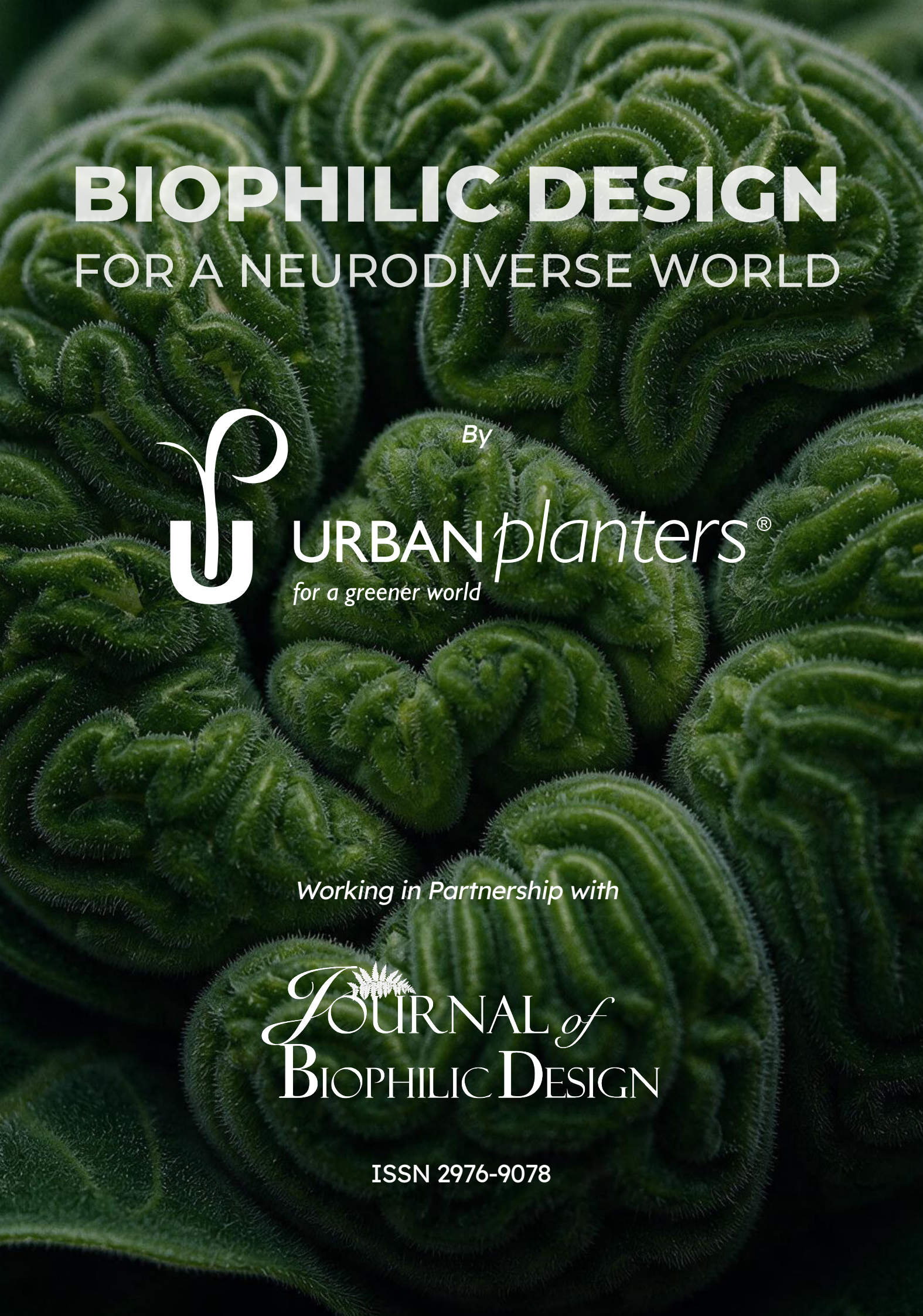


BIOPHILIC DESIGN
FOR A NEURODIVERSE WORLD

By

URBAN *planters*®
for a greener world

Working in Partnership with

JOURNAL of BIOPHILIC DESIGN

ISSN 2976-9078



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About Us

Urban Planters began trading back in 1965 and in that time have grown to be the industry leading interior landscaper.

We love working with plants and we enjoy the challenge of finding new ways of incorporating plants and greenery to all workplace settings across the UK, through our network of operating branches.

We don't just care for our plants; we also care about our customers.

Over the years we have worked with a variety of businesses as Biophilic Design & Biodiversity Consultants, particularly around green infrastructure.

At Urban Planters we help people understand how they can improve the impact of nature on their customers and staff, whilst improving productivity, being more sustainable, helping nature and improving wellbeing.

We Design, Source, Install and Maintain your planting solutions.

With 14 branches and over 150 horticultural service technicians, we can provide a one-stop planting solution to businesses throughout the UK.

0800 358 2245 or urbanplanters.co.uk





- Interior Plant Displays
- Green Walls
- Vertical Greening
- Moss Walls
- Large Indoor Trees
- Biophilic Art
- Landscape Design
- Exterior Grounds Maintenance
- Urban Farming
- Christmas Trees & Decor
- Biodiversity Consultation
- Biophilic Reviews
- Engagement Sessions & Workshops



What is Neurodiversity?

Simply put, neurodiversity is the straight forward yet important idea that there is no one correct way for the human brain to function.

Differences like **ADHD, autism, dyslexia, and dyscalculia** are not flaws; rather, they are important and normal differences in how we think. Instead of viewing these as shortcomings that must be fixed, we should instead accept them as unique viewpoints that offer new ideas and unique benefits to any group.

15-20%

of the global population is neurodivergent*

*Lindenwood University

Why is Neuroinclusion Important in the Workplace?

We reveal incredible potential when we create workplaces where everyone feels like they belong.

Professionals who are neurodivergent often thrive in areas like creativity, invention, and tackling challenging issues. According to research, these coworkers can be up to **31% more skilled** than others in quickly developing skills when they feel supported. But currently, just **25% of neurodivergent individuals feel fully integrated**. We have a real opportunity to do better by offering genuine psychological safety and the simple, personalised adjustments people need to thrive.

> **Neurodiversity is an essential form of human diversity.**
>
> The idea that there is one **'normal'** or **'healthy'** type of brain or mind or one **'right'** style of neurocognitive functioning, is no more valid than the idea that there is one **'normal'** or **'right'** gender, race or culture.

Simple Strategies for Neuroinclusive Spaces

Transforming a space doesn't require a total architectural overhaul. Small, deliberate changes can make a massive difference in cognitive comfort:

- **Visual and Sound Zoning with Greenery:** Create natural privacy screens. This **creates quiet, distinct zones** that reduce peripheral visual distractions.
- **Restorative "Breathing Rooms":** Incorporate plants with unique textures, providing safe, grounding tactile stimuli for self-regulation (stimming).
- **Fractals and Patterns:** Nature is full of repeating geometric patterns (fractals), from ferns to pinecones. Human brains are hardwired to process these patterns effortlessly, which actively reduces visual stress and fatigue.



> By designing biophilic office spaces that prioritise multisensory and multimodal experiences, a more inclusive environment is created that supports the physical and mental health and well-being of the general population, especially neurodiverse individuals.*
>
> *Requena, 2021

Benefits of Biophilic Design

Biophilic design, the integration of nature into built spaces, offers benefits for neurodivergent individuals.

Incorporating biophilic design and greenery into environments can be incredibly beneficial for neurodivergent individuals to help counteract sensory sensitivities. This approach helps create spaces that are more comfortable, predictable, and calming.

- **Calming Sensory Input:**
  Unlike harsh urban stimuli, nature's gentle sounds, soft light, and varied textures calm and reduce sensory overload.
- **Reduced Stress and Anxiety:**
  Biophilic design lowers cortisol to reduce stress.
  For neurodivergent individuals, this effectively regulates anxiety and balances emotions.
- **Enhanced Focus and Cognitive Function:**
  Nature refreshes your brain to cut mental fatigue and boost sharp focus.
- **Predictable and Comfortable Atmosphere:**
  Natural predictability reduces stress. It makes spaces feel safer than artificial designs.
- **Connection to Nature:**
  Humans crave nature. Connecting with it grounds us, healing mind and body.



> Fostering our mental wellbeing is essential for us all, and those who are neurodiverse are no different. In fact, such conditions can make working life a challenge at times, so it is crucial to support those within the workplace and make any reasonable adjustments, practical or otherwise, to aid a supportive environment that nurtures both productivity and resilience. This will have huge benefits for the individual employee's sense of self-worth, inner confidence, and commitment to their work.*
>
> *Bupa Supporting neurodiversity in the workplace report - June 2023

> Simultaneously, the parasympathetic system is suppressed, disrupting the body's natural equilibrium and leading to mental fatigue and energy depletion*
>
> *Adams & Kirkby, 2001

> If environments are perceived by individuals as being stressful or chaotic, the sympathetic system is activated, eliciting a "fight-or-flight" response*
>
> *Perry & Pollard, 1998



Benefits of Plants

The benefits of plants go far beyond simple good looks.

Study after study has shown that plants are natural powerhouses, bringing our homes and workplaces to life in more ways than one.

From fresh air to less stress, plants help us live and work better.

> A plant filled room contains
> **50-60%**
> fewer airborne moulds and bacteria than a room without plants.

For your health plants can:

- Reduce Stress
- Boost Productivity and Creativity
- Increase Happiness and Wellbeing
- Clean the Air by Removing Harmful Toxins
- Sharpen Cognitive Performance

Around the workplace they can:

- Direct Footfall
- Absorb Noise
- Create Barriers
- Improve Humidity
- Control Temperatures



Connection to Outdoors

Creating a genuine connection to outdoor spaces isn't just a nice-to-have visual perk, it's an essential strategic tool for supporting neurodivergent users who frequently experience sensory overload in standard built environments.

Offering access to dedicated break zones gives autistic or ADHD individuals an immediate release valve for non-linear movement and non-synthetic sensory input. Biophilic principles lean heavily on **Attention Restoration Theory**, which demonstrates how natural settings reset depleted executive function through gentle, non-taxing stimuli.



The Spine, Royal College of Physicians, located in Liverpool, is certified under the WELL Building Standard and is widely cited as one of the healthiest workplaces in Europe. The floorplate is designed around the rule that **no occupant is ever more than 7 metres from a window or internal atrium,** ensuring continuous contact with daylight and views out. Landscaped internal courtyards flow directly into exterior garden spaces, easing the mental transition for sensitive occupiers moving between inside and out.

A key case study by **Terrapin Bright Green (14 Patterns of Biophilic Design, 2014)** shows that visual and physical access to nature lowers blood pressure and heart rate variability within minutes. Designers should blur the boundary between inside and out through level-threshold sliding doors, continuous flooring finishes, and internal courtyards. At the **ASLA Center for Landscape Architecture**, integrating an accessible green roof with seamless indoor-outdoor circulation led to sharp reductions in cognitive fatigue, proving that bridging the exterior envelope creates essential safe buffers for sensitive nervous systems.



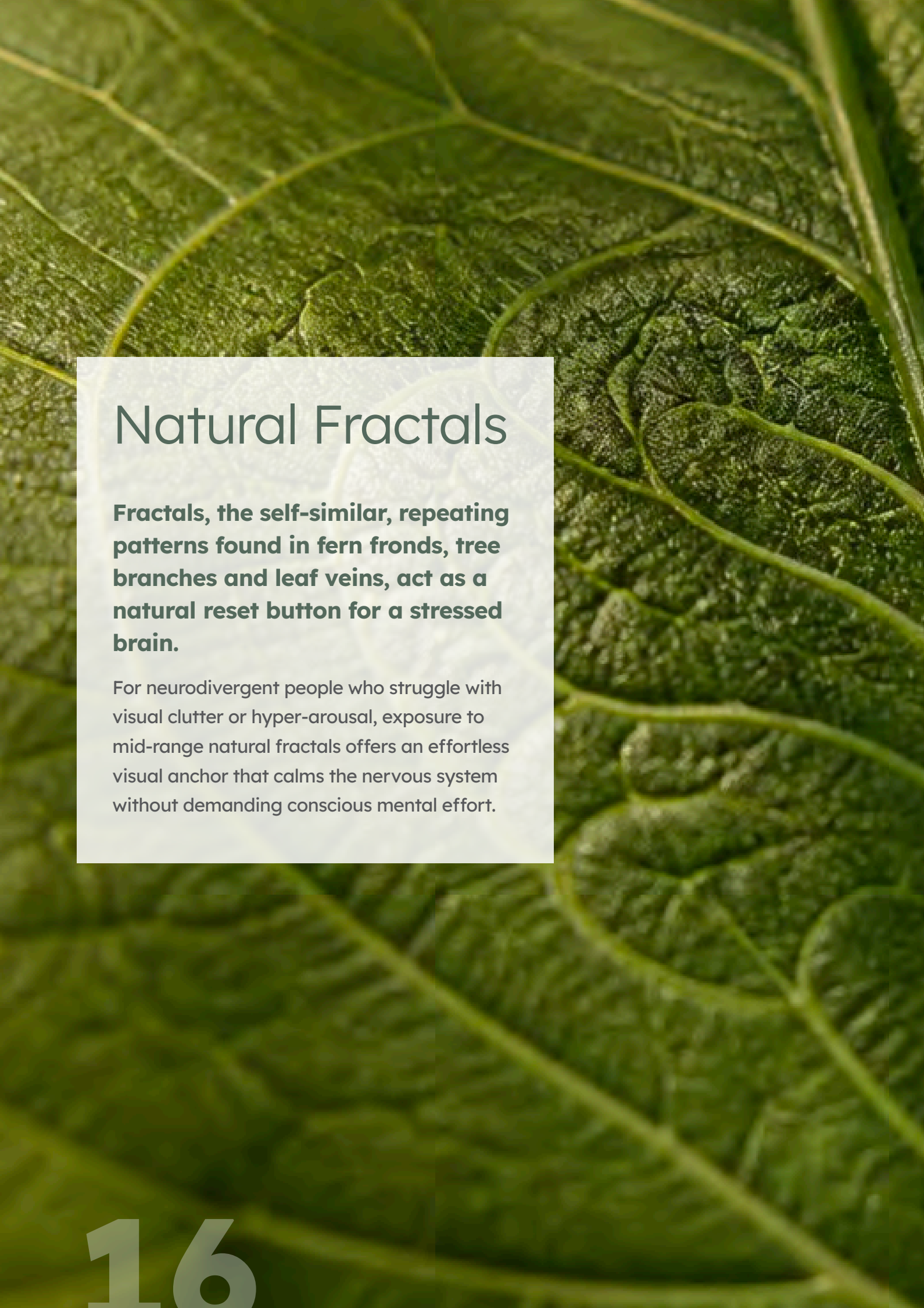
Foliage & Layers

Monotonous, uniform spatial plan can feel rigid and overwhelming to neurodivergent occupants.

By replicating nature's layered, randomised architecture, mixing low understorey plants with mid-tier foliage and light-filtering canopies, designers can craft organic, non-threatening environments. Varied planting gives people agency: dense foliage offers acoustic and visual screening, while semi-transparent planting allows occupants to maintain peripheral awareness without feeling visually exposed.

Research from the **Journal of Environmental Psychology (Berman et al., 2008)** highlights that the complex, multi-layered visual fields found in nature speed up cognitive recovery far more effectively than flat, geometric layouts. Mixing plant heights, leaf textures, and varying densities creates natural depth. In neuroinclusive workspace schemes, multi-tiered indoor planting schemes can allow staff to self-regulate by choosing micro-environments tailored to their immediate sensory needs, whether seeking open exposure or quiet enclosure.

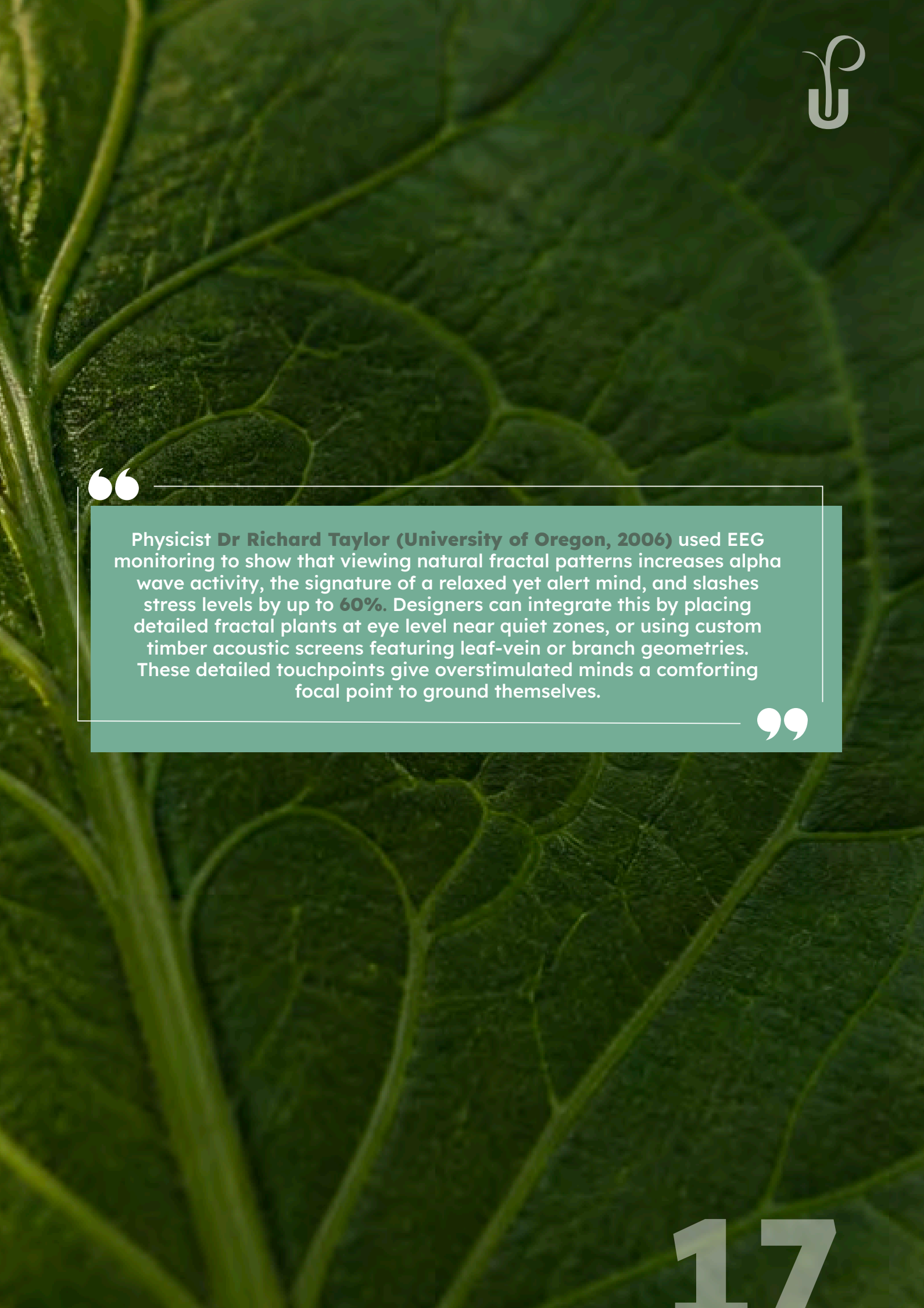
PLP Architecture Workplace Research Study, London, was a controlled eight-week study monitored staff across three workspace scenarios: a plain control space, a moderately planted space, and a heavily planted, multi-tiered environment. Quantitative EEG tracking and heart-rate monitoring showed a **200% increase in overall well-being and environmental satisfaction** in the heavily layered environment compared to the plain baseline. The multi-tiered planting provided natural visual screens that helped occupants tune out visual noise.



Natural Fractals

Fractals, the self-similar, repeating patterns found in fern fronds, tree branches and leaf veins, act as a natural reset button for a stressed brain.

For neurodivergent people who struggle with visual clutter or hyper-arousal, exposure to mid-range natural fractals offers an effortless visual anchor that calms the nervous system without demanding conscious mental effort.



> Physicist **Dr Richard Taylor (University of Oregon, 2006)** used EEG monitoring to show that viewing natural fractal patterns increases alpha wave activity, the signature of a relaxed yet alert mind, and slashes stress levels by up to **60%**. Designers can integrate this by placing detailed fractal plants at eye level near quiet zones, or using custom timber acoustic screens featuring leaf-vein or branch geometries. These detailed touchpoints give overstimulated minds a comforting focal point to ground themselves.



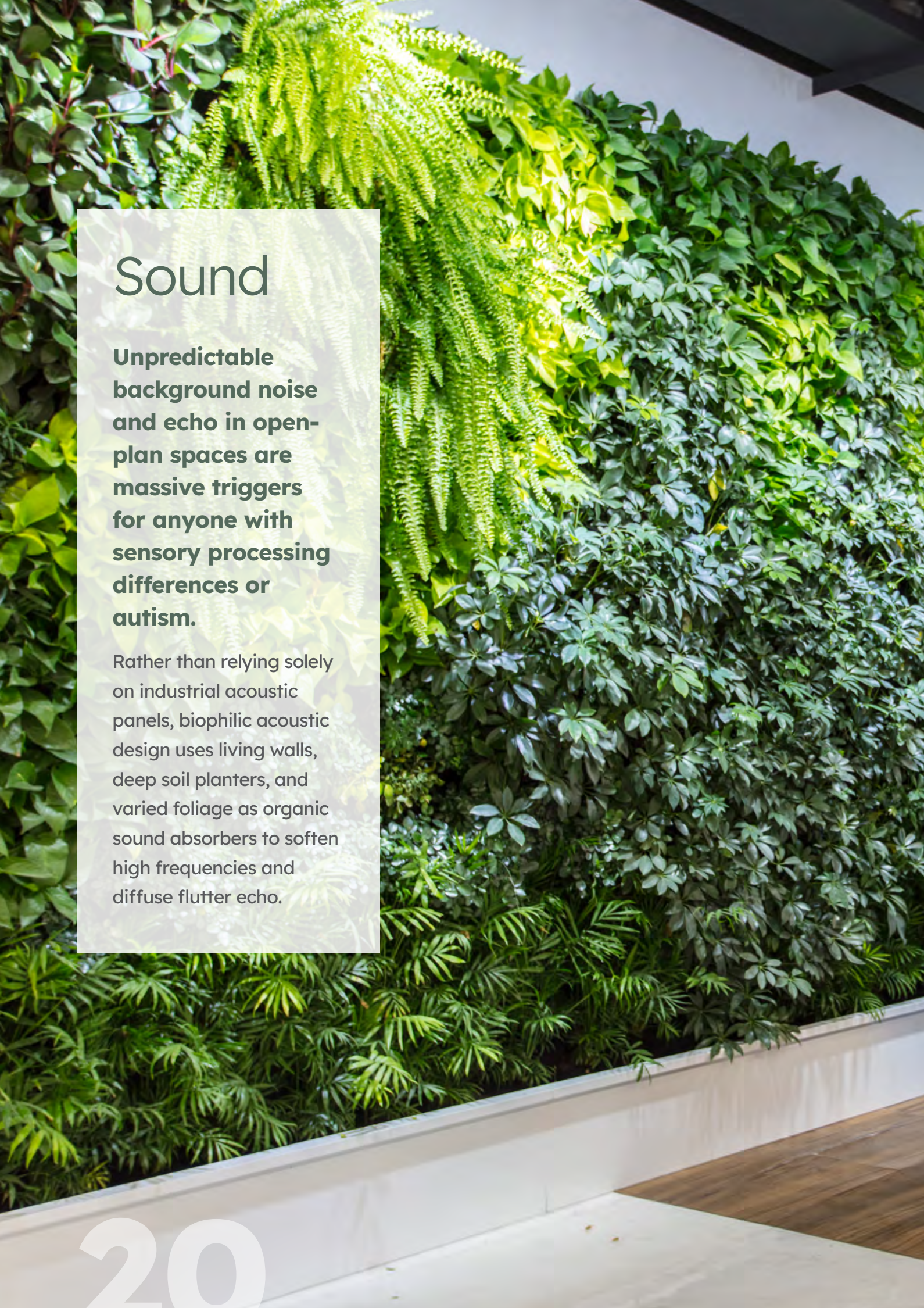
Shelter & Refuge

Refuge, the feeling of being protected while maintaining a clear view of your surroundings, is vital for mitigating environmental hypervigilance in neurodivergent users.

Designing intimate seating pods beneath high plant canopies or behind tall screen planters satisfies our innate drive for shelter without making users feel boxed in or isolated.



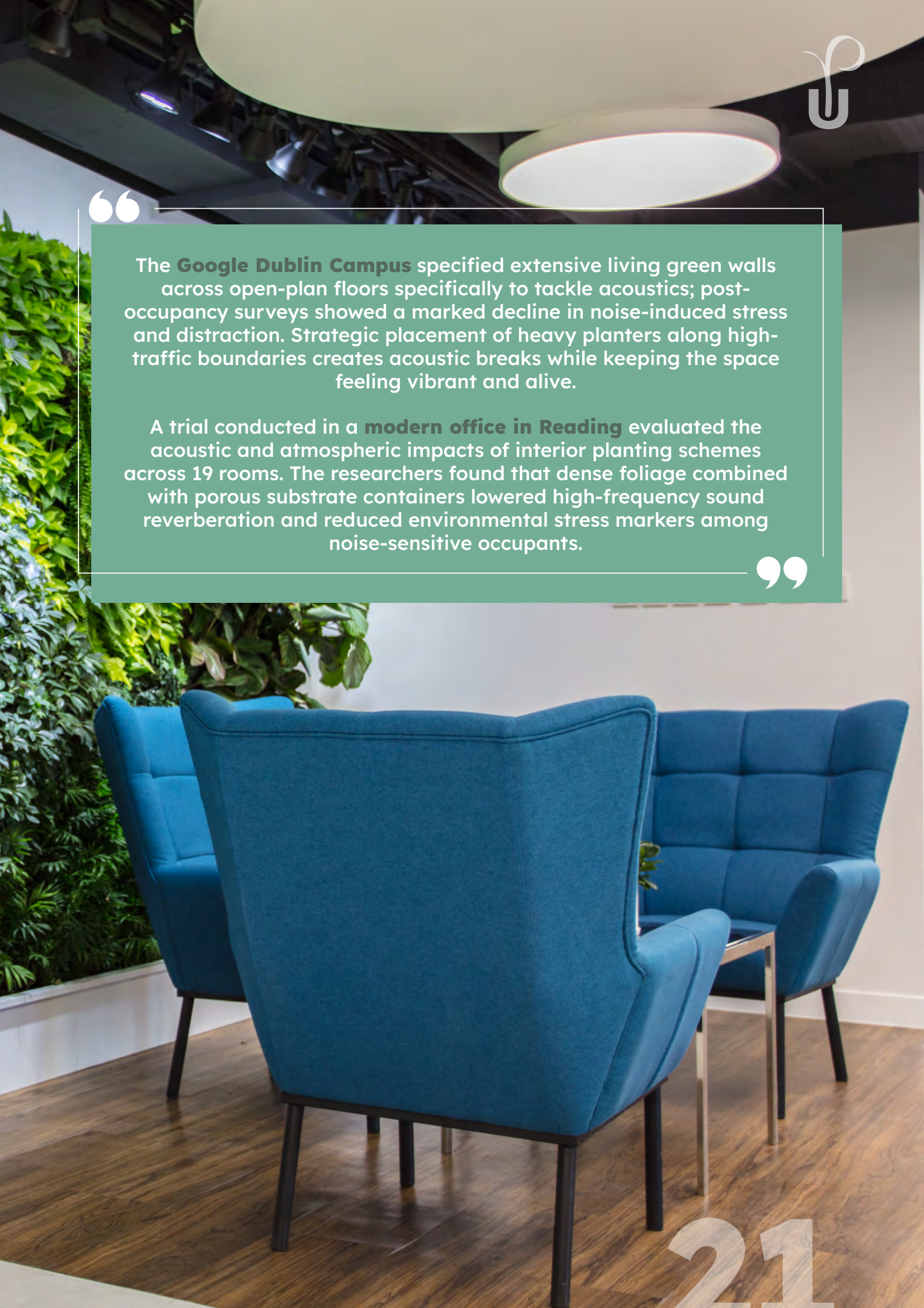
A classic study on stress recovery by **Ulrich et al. (1991)** demonstrated that environments providing distinct “prospect and refuge” trigger rapid drops in salivary cortisol and heart rate spikes compared to stark, open-plan spaces. Modern inclusive design guidelines, such as the **BBC’s Inclusive Design Standards**, actively deploy tall interior planting, overhead arbors, and acoustic alcoves to build these mini-sanctuaries. Placing these semi-hidden nooks alongside main circulation routes allows occupants to step away, lower their sensory guard, and reset before jumping back into shared spaces.



Sound

Unpredictable background noise and echo in open-plan spaces are massive triggers for anyone with sensory processing differences or autism.

Rather than relying solely on industrial acoustic panels, biophilic acoustic design uses living walls, deep soil planters, and varied foliage as organic sound absorbers to soften high frequencies and diffuse flutter echo.



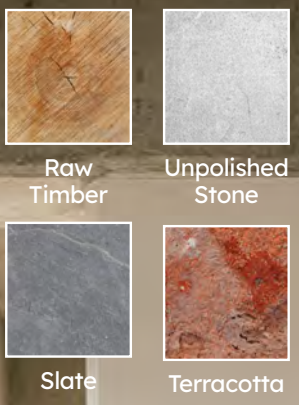
The **Google Dublin Campus** specified extensive living green walls across open-plan floors specifically to tackle acoustics; post-occupancy surveys showed a marked decline in noise-induced stress and distraction. Strategic placement of heavy planters along high-traffic boundaries creates acoustic breaks while keeping the space feeling vibrant and alive.

A trial conducted in a **modern office in Reading** evaluated the acoustic and atmospheric impacts of interior planting schemes across 19 rooms. The researchers found that dense foliage combined with porous substrate containers lowered high-frequency sound reverberation and reduced environmental stress markers among noise-sensitive occupants.

Materials

Tactile interaction with natural materials provides a physical grounding effect that helps bring an overstimulated nervous system back to baseline.

Specifying **raw timber, unpolished stone, slate, and terracotta** introduces varied textures that invite touch, steering attention away from mental fatigue and re-anchoring it in the present moment.





> The BRE led a landmark, long-term live office refurbishment test in Hertfordshire to measure the direct physiological impact of natural materials on office workers. Replacing synthetic desk surfaces, laminate flooring, and vinyl wall finishes with **FSC-certified exposed timber, natural wool acoustic panels, and slate,** researchers measured significant improvements in overnight heart-rate variability (HRV) recovery, indicating a direct reduction in daytime fight-or-flight stress responses.

> A study by **FPInnovations/University of British Columbia (Rice et al., 2006)** found that interior spaces featuring visible, natural wood surfaces directly stimulate the parasympathetic nervous system, suppressing the “fight-or-flight” response. Swapping cold, synthetic laminates for textured wood grain or cool stone gives neurodivergent users rich sensory touchpoints to explore. Incorporating raw material finishes across joinery, handrails, and feature walls creates an inviting, tactile landscape that encourages people to slow down and decompress.

Colours

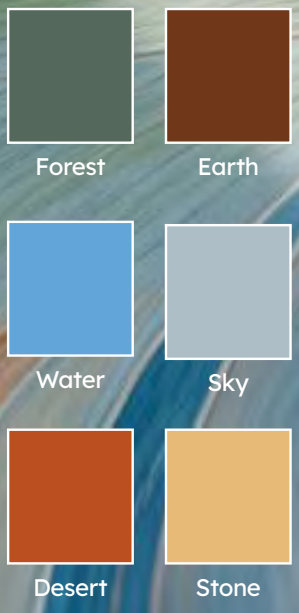
Colour choice directly shapes emotional and physiological arousal.

High-contrast or overly saturated synthetic palettes can easily induce sensory fatigue, whereas nature-inspired palettes, earthy ochres, soft moss greens, muted sky blues, and warm stone tones, foster composure and focus.

Research in **Frontiers in Psychology (Küller et al., 2006)** on environmental colour response revealed that natural, low-saturation hues lead to lower reported stress and emotional exhaustion compared to sterile white or excessively bright spaces. Designers can use nature-based colour themes to intuitively zone large floorplates:

- **Forest & Earth: Deep greens and warm browns to signal quiet focus and deep work zones.**
- **Water & Sky: Soft blues and muted grays in breakouts and refuge spaces for mental reset.**
- **Desert & Stone: Warm terracottas and sandy neutrals along main circulation paths for intuitive wayfinding.**

Using an organic colour palette builds predictable, gentle transitions across the floorplate, helping sensitive users navigate spaces with minimal emotional friction.

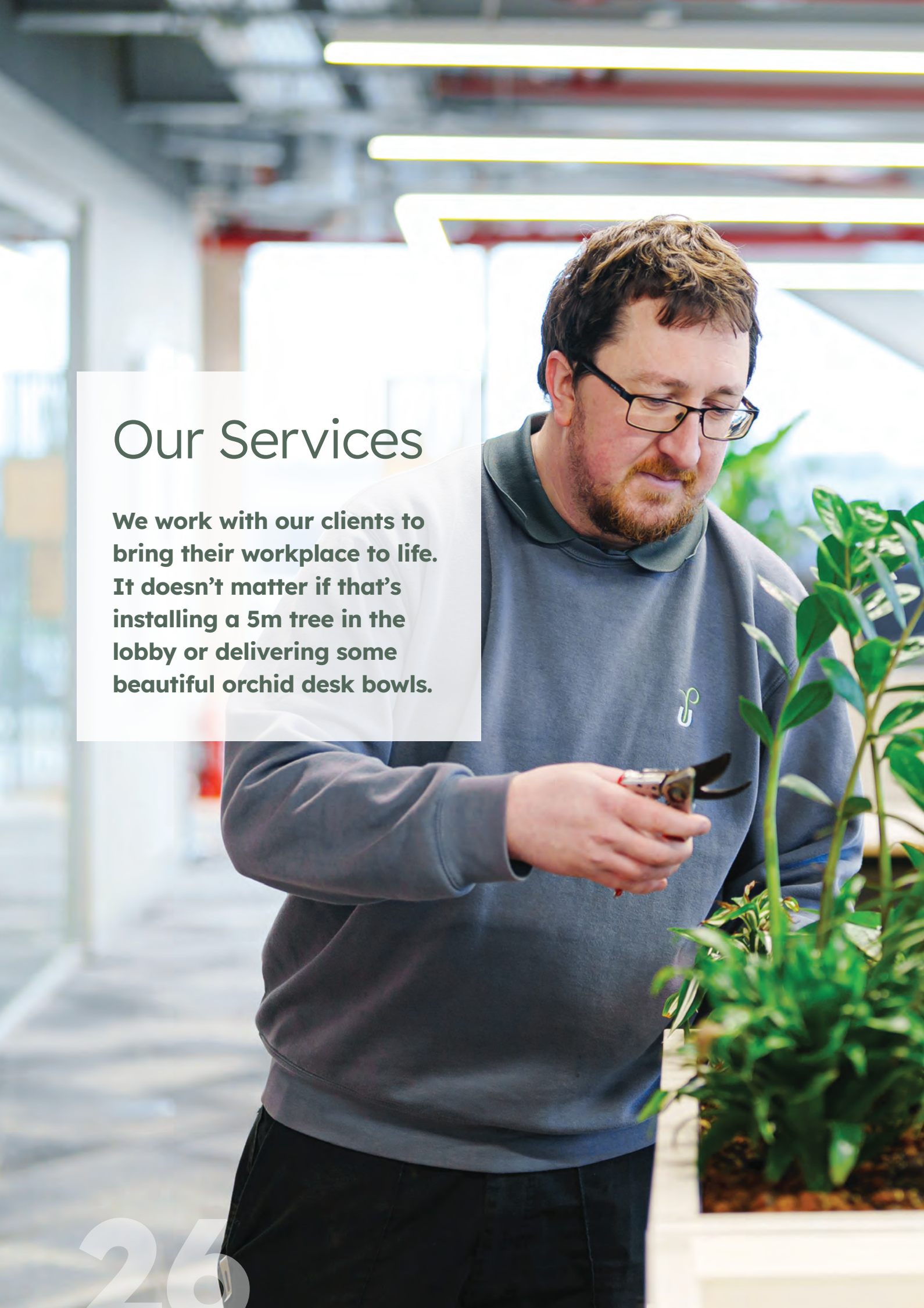




Designers can use

nature-based

colour themes to intuitively zone large spaces.



Our Services

We work with our clients to bring their workplace to life. It doesn't matter if that's installing a 5m tree in the lobby or delivering some beautiful orchid desk bowls.



Interior Plant Displays

The bespoke nature of our designs means your world becomes greener and it's totally unique to you and your business.

We have suppliers in the UK and Netherlands, which gives us access to live or artificial plants, trees and flowering displays to suit all settings.

A big part of the design is also the planter. We handpick the right container to complement the look and feel of the space, whilst also meeting your design and budget requirements.







Green Walls



Green walls offer a stunning visual impact for any interior or exterior, without sacrificing valuable floor space.

Our bespoke process begins with a full site survey, allowing us to design a truly unique feature that can incorporate company logos, signage, or vibrant patterns using different coloured plants.

We select the optimal system for your specific environment, offering everything from living walls with integrated irrigation to maintenance-free artificial and preserved moss designs. Our expert team provides a complete service, managing the project from initial concept and design through to flawless installation and ongoing maintenance, ensuring your vertical garden always looks its best.





Vertical Greening



While traditional green walls can rely on complex, soil-based modules, vertical greening offers a more architectural, low-maintenance approach.

This method uses climbing plants, such as jasmine or ivy, supported by stainless steel cables, mesh, or trellis systems. It allows nature to **“colonize”** a building’s facade naturally, creating a delicate, shimmering veil of foliage rather than a heavy, solid block of greenery.



For designers, this system is significantly lighter and more cost-effective. It provides excellent solar shading, cooling the building envelope through evapotranspiration while protecting the structure from UV damage. By utilising planters at the base of these wire systems, architects can introduce high-climbing greenery to restricted urban sites, delivering the cooling and aesthetic benefits of a green wall with a fraction of the structural complexity. best, covering everything from turf management and expert lawn care to hedge, shrub, and tree maintenance, alongside diligent weed and litter control.

Moss Walls

Discover our stunning moss and preserved planting for beautiful, zero- maintenance greenery.

Perfect for any indoor space, especially **low-light areas,** and they require no water, soil or sunlight to thrive.

We design and install bespoke pieces, from large statement moss walls to company logos, bringing lasting natural texture and vibrant colour to your environment.





Large Indoor Trees

For architects and designers, large-scale indoor trees are the ultimate “hero” element for atriums, lobbies, and expansive public zones.

These towering features do more than fill space; they create focal points almost like living sculptures, transforming vast, hollow voids into curated environments.

We can seamlessly integrate massive greenery into structural layouts, creating a prestigious atmosphere that resonates with visitors the moment they enter.

Live or Artificial?

Live trees can serve as high-performance biological assets. They actively purify the air, regulate humidity, and provide the unmistakable sensory vitality of nature. Integrating live specimens is a clear signal of a firm’s commitment to **biophilic design and well-being certifications** like WELL or BREEAM.

Artificial trees offer a strategic solution for challenging environments. Modern replica trees use natural wood trunks and high-grade foliage to provide the same visual softening of hard materials without the need for complex irrigation systems, specialised lighting, or weight-bearing soil loads. They are ideal for high-traffic areas where maintenance access is limited.

Design Benefits

Whether live or faux, large trees provided by Urban Planters transform sterile interiors into prestigious, life-affirming environments. They improve **acoustics** by scattering sound waves and offer a natural **wayfinding** landmark. For designers, these trees are a powerful tool to soften rigid concrete and glass, creating a memorable **“wow factor”** that boosts occupant happiness and property value.







Biophilic Art

Biophilic Art represents a revolutionary shift in how we integrate nature into the built environment.

Moving beyond traditional greenery, this modular system offers architects and designers a sophisticated, 3D medium to infuse interiors with the restorative power of the outdoors.

The Benefits

- **No Maintenance:**
  These installations use preserved moss and plants, requiring no irrigation, specialized lighting, or drainage, ideal for locations where a living wall isn't feasible.



- **Artisan Craftsmanship:**
  Combining 3D textures with organic materials, each piece acts as a unique vertical sculpture that softens hard materials and improves acoustics.
- **Bespoke Flexibility:**
  Available in three standard sizes or fully custom dimensions, these panels act as a versatile canvas for brand-specific storytelling.

The System

Our Biophilic Art tiles are engineered with a circular economy at their heart. Utilising a meticulous, adhesive-free fastening mechanism, each artisan tile is secured to a backing panel without harmful chemicals. This innovative approach ensures complete flexibility, tiles can be easily replaced, rearranged, or reconfigured as a space evolves. This modularity extends the product's lifespan and supports sustainable design by allowing for disassembly and reuse rather than disposal.

Versatile

Biophilic Art is designed to thrive where traditional planting cannot. It is a premium solution for:

- **Corporate Atriums & Boardrooms:**
  Creating an immediate "wow factor" and supporting ESG and WELL standards.
- **Hospitality & Boutique Hotels:**
  Enhancing guest tranquility in low-light lobbies or spa environments.
- **Retail & Set Design:**
  Offering a lightweight, portable, and striking backdrop for luxury brand experiences.
- **High-End Residential:**
  Adding a tactile, maintenance-free connection to nature in private living spaces.

Landscape Design

Beyond regular upkeep, we offer bespoke landscaping services to transform your environment.

Our experts handle all aspects of hard and soft landscaping, from creating new patios to designing beautiful planting schemes. We also specialise in ecological enhancements to boost biodiversity, creating thriving and sustainable outdoor areas you can be proud of.





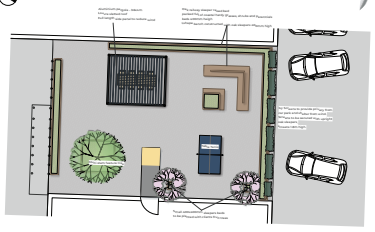






SILVER GILT MEDAL WINNER
RHS
SILVER GILT MEDAL WINNER
RHS BADMINTON FLOWER SHOW
2026









Exterior Grounds Maintenance

Our exterior teams operate across a UK-wide network, dedicated to keeping your outside spaces well-maintained, smart, and professional.

Our comprehensive grounds maintenance services ensure your property always looks its best, covering everything from turf management and expert lawn care to hedge, shrub, and tree maintenance, alongside diligent weed and litter control.





Food Growth with Urban Farming

Transform your workspace into a thriving ecosystem with Urban Farming.

We're not just talking about an indoor garden, but an Urban Farming system designed to bring the vitality of nature directly into the heart of your workspace.

Whether you're looking to spice up the office lunch, provide sustainable "take-home" produce for your team, or host engaging wellness sessions, we can bridge the gap between the corporate world and the natural one.

Our Urban Farming system is a design statement. It transforms sterile interiors into lush, living environments that boost morale and purify the air. **It's the ultimate conversation starter for clients and a breath of fresh air for employees.**





Nook Pods

Nook helps people feel calm & secure, protected from noise, visual distraction, social interruption and sensory overwhelm.

Used in workspace, education, healthcare, libraries and event settings, Nook enhances:

- **Personal Wellbeing:** Create environments that promote psychological comfort.
- **Space Flexibility:** Adapt spaces effortlessly to meet evolving needs, be that regularly, or in response to change.
- **Meeting Volume:** Increase the volume and power of small meetings, while reducing meeting room demand.
- **Engagement & Productivity:** When people feel safe, they connect, engage and focus markedly better.




NOOK


NOOK



CASE STUDY 1

SHOOSMITHS



We partnered with leading law firm Shoosmiths to transform their new Birmingham office with a striking plant scheme designed to complement their sleek, contemporary workspace.

Our goal was to create an inspiring yet practical environment that enhances workplace wellbeing.

Spanning three floors, our installation seamlessly integrates live and high-quality replica plants. **A true centrepiece of our design is the 20th-floor client lounge, where we curated a selection of plants to create a warm, inviting atmosphere reminiscent of a boutique café.** We also designed a unique 'sunset garden,' using replica flora to evoke the charm of an English garden.

Shoosmiths is an award winning design project, that won Project of the Year at the 2024 Plants At Work Design Awards.



Our team carefully selected towering specimens like **Monstera, Strelitzia,** and **Philodendron Xanadu** to create visual impact, alongside lush displays in kitchen areas and trailing **Epipremnum.**

We are thrilled that Shoosmiths praised the finished result as a **“beautifully designed and executed”** project, delivering a unique and refreshing office environment that perfectly fuses functionality with engaging, biophilic design.









CASE STUDY 2

SHEFFIELD HALLAM



When we think about the biophilic effect of indoor plants, it is often in terms of wellbeing, such as lowering stress, but views of nature have also been proven to boost learning and creative thinking in a range of studies.

Little wonder, then, that planting is fast becoming an essential element in learning spaces.

Sheffield Hallam's revamped City Campus atrium is testament to the way universities are embracing planting as part of creating welcoming and nurturing learning environments.

The refurbishment forms part of a wider initiative to create more green spaces in the city, through a strategic partnership with local industries, institutions and organisations.

Sheffield Hallam is an award winning design project, that won Project of the Year at the 2022 Plants At Work Design Awards.

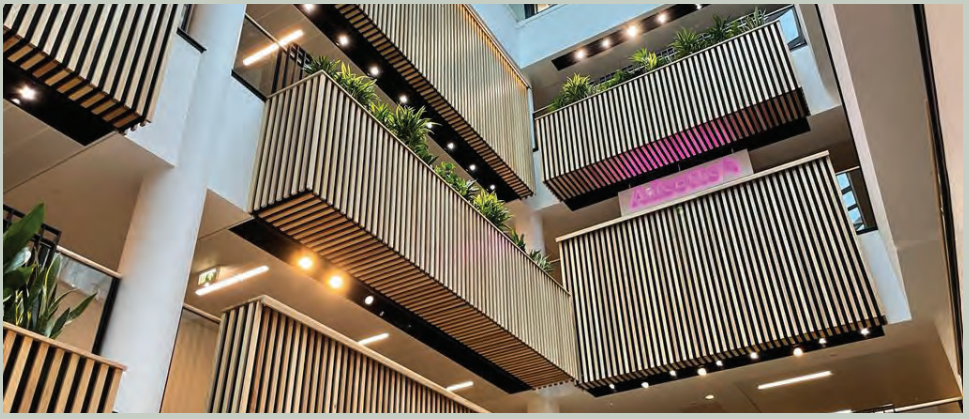




Two years in the planning, Urban Planters South Yorkshire worked alongside architects BDP and BAM Construction to design a sweeping planting scheme for the university's vast atrium and the cafeteria.

Linear and curved troughs line the sides of the atrium across all the floors, densely planted with a selection of species such as Dracaena, Sansevierias, Kentias and Araucarias.

The troughs work with the wooden panels and natural light from the glass ceiling to create a biophilic learning environment.





CASE STUDY 3

ROYAL COLLEGE OF PHYSICIANS



For the first time in its 500-year history, the Royal College of Physicians (RCP) has opened an office outside London.

Located in Liverpool's Paddington Village Knowledge Quarter, "The Spine" is a 14-storey building designed by AHR in partnership with Liverpool Council. The RCP occupies seven floors to bring events and services closer to northern members.

Designed around the human body, the building features vertebrae-like stairs and exterior glazing that mimics skin cells. The Spine aims to be one of the world's healthiest workplaces, holding a **BREEAM Outstanding** rating and tracking toward **WELL Platinum** certification.











Integral to its design is biophilia. Our Urban Planters team introduced extensive indoor greenery to improve air quality and mental wellbeing. The interior palette transitions floor-by-floor like a tree, from earthy tones on lower levels to green foliage hues, ending in sky blues at the top. The scheme earned two national Plants At Work Gold Awards, including Best Project in 2021.

Key features include:

Vertical Villages:
Double-height green spaces on the ground, 10th, and 12th floors containing high-oxygen-producing plants.

Indoor Forest:
Floor-embedded planting beds featuring 4.3-meter-tall Veitchia merillii trees, Alocasias, Philodendrons, and Kentia palms, complete with integrated seating under a woodland-style canopy.

Living Walls:
Two large living walls designed to mimic the cell patterns of the building's exterior facade.

The knowledge and foresight with the planting design made it something rather exceptional and different to work on. When the planting is included in the very design of a new building, it can look and feel part of the structure, so the natural elements can truly bring life to the humanmade.

And, given the client, the strong focus on maximising the health benefits of plants was no real surprise!





Journal of Biophilic Design

RESEARCH & CASE STUDIES

Credit to the Journal of Biophilic Design, with special thanks for their valuable work.

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Bringing the beauty and healing power of nature to our built environment.



Bringing the beauty and healing power of nature to our built environment.

The *Journal of Biophilic Design* is a pioneering global platform dedicated to exploring the health, environmental, and economic benefits of nature-inspired design. Bridging scientific research and architectural practice, it serves as a leading voice for architects, interior designers, urban planners, and wellness advocates.

Through a print and digital magazine alongside a podcast reaching over 30,000 monthly listeners, the Journal shares case studies, thought leadership, and evidence-based science. Its ultimate campaign is to drive biophilic design across healthcare, workplaces, education, homes, and cities worldwide to create healthier, more sustainable environments.

Dr. Vanessa Champion (Ness) is the visionary Founder and Editor of the Journal.

Originally an academic at UCL with a PhD in Greek and Latin, Ness worked at the British Museum, cultivating a fascination with how visual environments shape human behavior. She is a passionate nature lover, artist, and award-winning photographer with nearly three decades of experience.

What are they trying to achieve?

The mission is simple yet impactful: to bring nature closer to people and help us reconnect with our living world.

The catalyst for the Journal was a personal experience witnessing the healing effect a simple view of nature had on hospital patient recovery. Recognizing that humans spend most of their lives indoors surrounded by concrete and artificial lighting, she set out to transform how we design our spaces.

Through her work, Ness strives to:

- **Advocate for Better Design:** Campaigning to prove that bringing nature indoors is a biological necessity that improves mental health, boosts immunity, and increases productivity.
- **Create "Virtual Nature Walls":** Using high-definition photography and audio to bring the therapeutic benefits of the outdoors to hospitals, care homes, schools, and windowless offices.
- **Champion Sustainability:** Shifting the industry toward climate-conscious, regenerative design where built environments respect natural systems.

Ultimately, Ness is trying to ensure that wherever we live, work, learn, or heal, we are never far from the life-affirming benefits of nature.

Examining connection to nature through a neurodiversity paradigm lens

"Research has less often considered diverse groups when exploring how people experience connection to nature. Here we explore understanding and perspectives."

Dr Samantha Friedman

E. O. Wilson's biophilia hypothesis (1984), the theory which underpins the practice of biophilic design, suggests that humans have an innate predisposition to connect with nature. This human-nature relationship has captured the interest of researchers across a range of disciplines and inspired studies across many domains; this includes examining connection to nature in children (e.g., Chawla, 2020), exploring how connection to nature dips in adolescence (e.g., Richardson et al., 2019), and finding associations between connection to nature and pro-environmental thoughts and feelings across the life course (e.g., Liu et al., 2022), amongst many other areas of study.

In exploring how people experience connection to nature, research has less often considered diverse groups; in fact, a primary criticism of research in the field of ecopsychology (the intersection of psychology and ecology) is the limited perspectives considered. Typically, participants of research on people's experiences in and relationships with nature tend to be able-bodied, Western, white, and predominately male (e.g., Dickinson, 2013; Jones & Segal, 2018). To counter this, many researchers are interested in drawing upon the voices and lived experiences of more diverse groups of people. In my own research, I explore how neurodivergent people perceive that nature benefits (or does not benefit) their wellbeing and supports flourishing (broadly defined). In particular, I often focus on autistic people's experiences in nature.

In a recent survey study of autistic adults living in the UK, my co-authors and I sought to understand how the group of participants defined and experienced connection to nature (Friedman et al., under review). In addition to seeking to add more diversity to the available literature on human-nature relationships, we also aimed to introduce a critical autism studies lens to ecopsychology research. This means that rather than viewing autism (or other forms of neurodivergence or disability) as something 'wrong' that needs to be fixed, changed, or cured, we consider autism to be a form of natural variation in how human brains function (Walker, 2014). Autistic people might still need support, however, especially given the many ways that society is not set up to be accessible for autistic people. This perspective on autism (often called the neurodiversity paradigm) does not mean that autistic people should be denied needed support (den Houting, 2019).

Taking this perspective, we developed findings to reflect how this group of autistic participants defined and experienced connection to nature to hopefully contribute to a re-defining of the concept 'connection to nature' that is inclusive of diverse perspectives. First, many of the participants felt that connection to nature was, in part, defined by how nature benefitted them and the ways that they benefitted nature. Some of these benefits included feeling a sense of belonging and an opportunity to engage in sensory-supportive environments. Many of the participants wrote about how their autistic identity was central to their relationship with nature, with some suggesting that their being autistic meant they were able to connect with nature more deeply. Participants also described how they accessed nature through various different means, including green spaces, animals, audio recordings, photos, and videos.

Second, our group of autistic participants noted that their relationships with nature were sometimes similar to a spiritual or religious connection. Some participants described how a close relationship with nature allowed them to feel connections to their ancestors or to cycles of nature throughout history. For many of the participants, it was difficult to describe their relationship with nature because they felt inherently intertwined with nature such that describing they couldn't easily separate out the 'nature' and the 'self'. This echoes Wilson's beliefs that humans are innately driven to connect with nature, as described in the biophilia hypothesis.

Finally, our third finding reflected the fact that while connection to nature is often viewed as a universally positive relationship, there are some negative elements, too. Many of the participants described increased feelings of anxiety or grief related to environmental degradation. Some participants also wrote about examples of nature which are seen as undesirable, like malaria or earthquakes, and highlighted that these, too, are part of what it means to feel close to nature. Of course, there were also some participants who reported that connection to nature did not mean anything to them. This reflects how varied the relationships (or lack thereof) with nature were in this group of autistic adults in the UK.



These findings can inform biophilic design and justify its use, helping to further our aims to integrate autistic people's perspectives into how nature-related terms are conceptualised and put into practice. The autistic people who participated in our study connected to nature and preferred to experience nature in many different ways. Thus, biophilic design should also reflect the variation in how people relate to nature by ensuring that conceptualisations of nature are not unnecessarily limited to only traditional representations. Practitioners of biophilic design should consider the diverse ways that people experience and define nature and reflect this diversity in their designs. Additionally, biophilic design could be used to explore the spiritual, religious, and ancestral elements of having a close relationship with nature, again broadening the ways that nature might be represented. Finally, practitioners of biophilic design can thoughtfully consider both the positive and negative sides to connection to nature to ensure a more realistic representation of human-nature relationships.

https://www.northumbria.ac.uk/about-us/our-staff/f/samantha-friedman/

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Taking the Holistic Approach to Neuroinclusive Workspaces

— CASE STUDY —

Nuria Muñoz

The journey towards neuroinclusive workspaces begins with a holistic understanding of the project context, from the client's brand identity to the unique characteristics of the physical space itself. We need to improve traditional space dynamics through a combination of sensory considerations, biophilic elements, and user-centered design principles.

A COLLABORATIVE PARTNERSHIP: FROM CONCEPT TO CREATION

The transformative journey towards neuroinclusive design often begins with a collaborative partnership between the design firm and the client. For my design company, Habitarmonia, our project with an adventure and outdoor products company based in Munich, Germany represented an opportunity to reimagine traditional workspace paradigms. From the outset, we engaged in extensive consultations with the company's management team, fostering open dialogue and collaboration to ensure a shared vision for project success. As part of this collaboration process, we also conducted workshops with business owners, providing them with insights into biophilic design principles and emphasizing the multidisciplinary nature of creating neuroinclusive spaces. By raising awareness and understanding, we empowered stakeholders to play an active role in shaping the future of their workspace.

UNDERSTANDING THE CONTEXT

A central aspect of our approach is the recognition that effective workspace design must be deeply rooted in the client's brand identity and mission. In the case of the adventure and outdoor products company we delved into the details of the company's ethos, business vision, and strategies, gaining an understanding of what the brand represents. With the goal of creating a neuroinclusive workspace aligned with the values of this company, we analysed the geographical context of the headquarters, taking into account factors such as the city's vitality, mountain views, and accessibility. By integrating elements that reflected the company's commitment to sustainability and outdoor adventure, we ensured that the workspace embodied the essence of the brand, while promoting inclusion and well-being.

EMPOWERING NEURODIVERSITY: DESIGNING WITH EMPATHY AND UNDERSTANDING

A central aspect of Habitarmonia's philosophy is the belief that neuroinclusion is not just a design principle, but a fundamental human right. By actively involving neurodivergent individuals in the design process and prioritizing their needs and preferences, we ensured that the headquarters of the Adventure and Outdoor Company truly represented diverse perspectives and experiences, resulting in a workspace that allowed each person to thrive. From adjustable furniture to sensory rooms and customized lighting options.

INTEGRATION OF BIOPHILIC DESIGN ELEMENTS: ELEVATING THE WORKSPACE EXPERIENCE

The integration of biophilic design elements was a central pillar of our approach. Drawing from a comprehensive set of recommendations, we incorporated these elements to create a workspace that not only fostered neuroinclusion but also promoted well-being and connectivity with the natural world. Habitarmonia strategically incorporated plants and natural materials such as wood and stone throughout the workspace. From reclaimed wood floors to stone-clad walls, all materials were carefully selected to evoke a sense of warmth, authenticity, and connection with the natural world. These tactile elements serve as a tangible reminder to inspire commitment to sustainability and well-being, fostering a sense of rootedness and comfort among occupants.





SENSORY CONSIDERATIONS: CREATING SPACES FOR COMFORT AND ENGAGEMENT

A focal point of neuroinclusive design is the consideration of sensory stimuli within the workspace. Our design strategy prioritized lighting, circadian rhythms, and colour psychology to create environments conducive to neurodiversity. By implementing a wide range of lighting options, including task lighting, ambient lighting, and LED accents, we catered to individual preferences and promoted a sense of comfort and engagement. Additionally, the use of natural materials such as cork and wood, along with eco-friendly practices such as moss walls and clay paint, contributed to creating a tactile and visually pleasing environment. The incorporation of outdoor elements, such as views of the surrounding nature and strategically placed vegetation, fosters a deep connection with the natural world.

MAXIMIZING NATURAL LIGHT: ILLUMINATING THE WORKSPACE ABUNDANTLY

The recommendation to maximize natural light served as a guiding principle in our design process, as we sought to harness the benefits of natural light to improve visual comfort and support circadian rhythms. By utilizing the existing windows of the building, we flooded the workspace with natural light, blurring the boundaries between indoors and outdoors. The result was a bright environment that not only reduced dependence on artificial lighting but also fostered a deep connection with the surrounding landscape.

ACCESS TO VIEWS: HARNESSING THE BEAUTY OF THE SURROUNDINGS

Incorporating views of vegetation and landscapes was another key recommendation that informed our design decisions. By strategically placing workstations and common areas with views of the picturesque surroundings of the Munich neighbourhood of Bogenhausen, Habitarmonia offered occupants opportunities for relaxation, stress reduction, and cognitive recovery. The panoramic views served as a constant reminder of the beauty of nature, inspiring creativity and fostering a sense of calm amidst the bustling urban environment.

INTEGRATION OF BIOMIMETIC ELEMENTS: THE AESTHETICS OF NATURE

To increase visual interest and evoke positive emotional responses, Habitarmonia also incorporated biomimetic elements inspired by nature. Organic shapes and fractal patterns were introduced in architectural details, furniture design, and decorative elements throughout the workspace. These nature-inspired motifs not only added aesthetic appeal but also contributed to a sense of harmony and balance, creating an environment that was inherently welcoming and familiar.

INTEGRATION OF LIVING SYSTEMS: NURTURING A SENSE OF VITALITY

The inclusion of indoor plants was crucial to improving air quality, increasing well-being, and fostering a sense of connection with nature, in accordance with the recommendation to integrate living systems. We selected a range of plant species, from air-purifying ferns to cascading ivies, that infused vitality and life into the workspace. The presence of vegetation not only contributed to creating a healthier indoor environment but also created opportunities for biophilic interactions, as occupants cared for and tended to their botanical companions.

OPTIMIZATION OF THERMAL FACTORS: CREATING COMFORTABLE ENVIRONMENTS

Creating conditions that mirrored natural environments, with variable temperatures and airflow, was essential to fostering comfort and well-being for occupants, as recommended. Habitarmonia implemented state-of-the-art HVAC systems throughout the workspace. By maintaining pleasant temperatures and ensuring adequate ventilation, we created environments conducive to productivity, creativity, and overall well-being.

INCORPORATION OF SOUNDSCAPES: ENHANCING THE AMBIANCE

To create a relaxing and soothing environment, we used natural sounds such as flowing water and birdsong, in accordance with the recommendation to incorporate soundscapes. Whether through strategically placed speakers in restorative areas emitting sounds of nature or the gentle rustle of leaves outside, the environment was enriched with auditory signals from the natural world. These immersive soundscapes provided a sense of tranquillity and immersion, inviting occupants to escape the stress of modern life and find solace in nature's embrace.

By incorporating these recommendations into the design of the Adventure and Outdoor Company headquarters, we enhanced the workspace experience, fostering neuroinclusion, well-being, and connectivity with the natural world. By embracing the principles of biophilic design and prioritizing sensory considerations, we created a workspace that not only met the diverse needs of its occupants but also inspired creativity, collaboration, and personal growth. As organizations worldwide recognize the transformative potential of biophilic design.

Habitarmonia, is a design firm based in Spain, and is committed to improving traditional space dynamics through a combination of sensory considerations, biophilic elements, and user-centred design principles.

www.habitarmonia.com
www.habitarmonia-academy.com

Biophilic Design for Dementia Friendly Spaces

“A well-designed public space has the ability to bring people and communities together, alleviate the impacts of the climate crisis and boost wellbeing.”

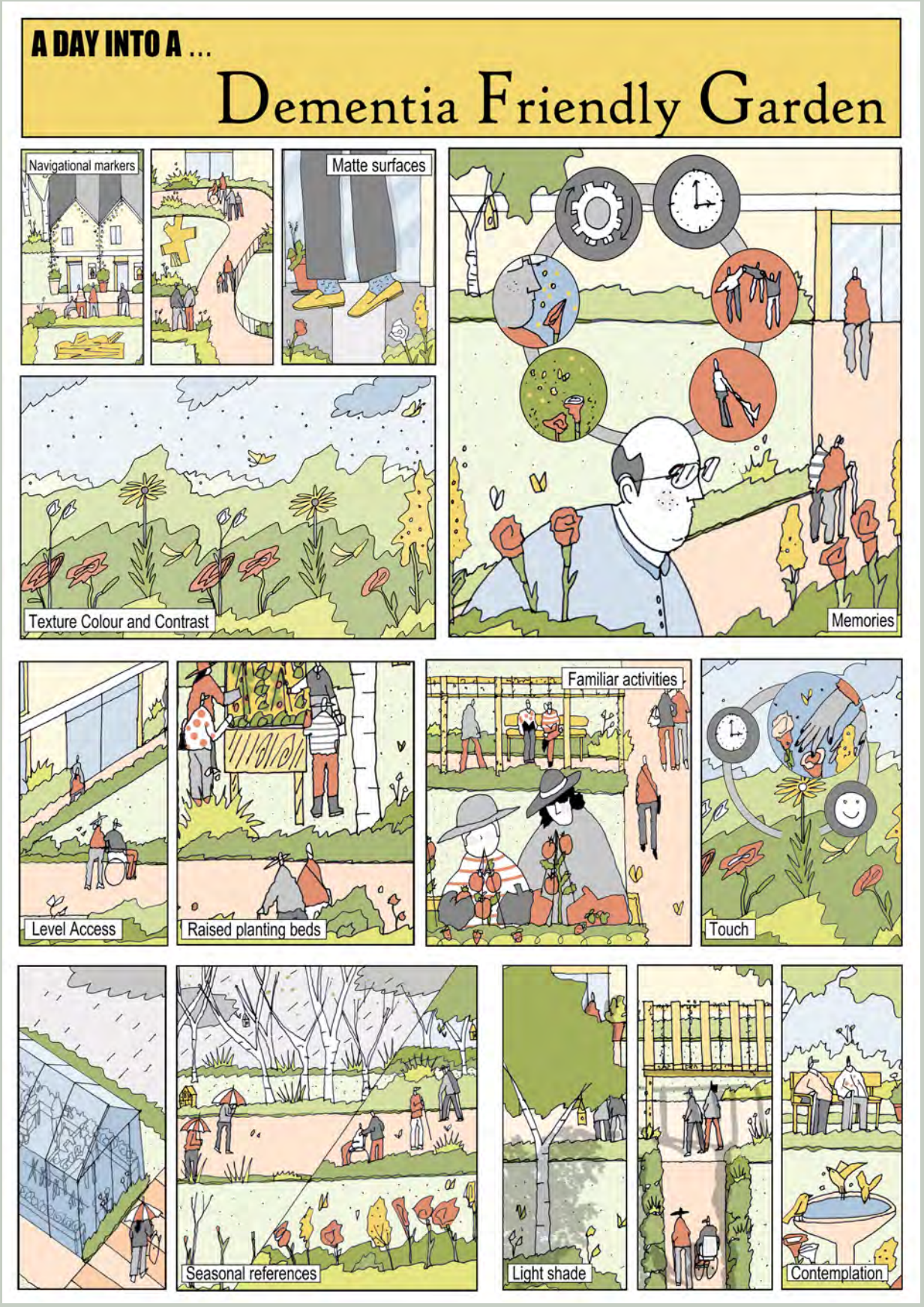
Angeli Ganoo-Fletcher

As the UK’s population ages, landscape architects must focus on leveraging public realm’s potential to combat the effects of cognitive and sensory decline by creating green spaces that empower people with dementia to lead active, healthy and enjoyable lives.

The University of Stirling and the King’s Fund have conducted significant research on how the built environment, including landscape design, impacts people with dementia. Forming design principles that we can draw from to make public realm easier to navigate, more engaging and safer.

Dr Wendy Mitchell, best-selling author and dementia research champion, said that she ‘treats dementia as a game. It throws me a challenge and I solve it to try and keep one step ahead… that’s what dementia is about, a life of adapting.’ A well-planned garden should also be adaptable to allow for a range of activities and events. It’s important that we still retain the qualities that make green spaces joyful, engaging and mood-boosting.

A well-planned garden space is not just visually attractive but can also provide holistic treatment benefits. There’s opportunity to explore physical exercise, which can help with tension and feelings of aggression, as well as private spaces for thought, reflection and exposure to vitamin D for health benefits.


A DAY INTO A ...
Dementia Friendly Garden
Navigational markers
Matte surfaces
Texture Colour and Contrast
Memories
Level Access
Raised planting beds
Familiar activities
Touch
Seasonal references
Light shade
Contemplation



The West Dereham Garden is the result of an outstanding collaboration between
PRP and the Queen Elizabeth Hospital King's Lynn NHS Foundation Trust. The Trust aimed to create a serene, dementia-friendly garden for all patients, staff and carers to enjoy. The Ward was designed in a way to avoid the clinical atmosphere frequently found in care homes and instead incorporated a memory wall, local photographs and a day room which opens directly to the garden serving as a cohesive natural expansion of the ward.

The upkeep of the space is contributed to by patients, in order to empower them with a sense of ownership and stewardship over the local natural environment, ultimately contributing to a holistic treatment plan in combination with medical assistance. Furthermore, their contact with the natural world around the Ward can aid in creating a superior quality of life and a stronger sense of community among the patients.

PRP held a series of co-production exercises with the Trust and local people impacted by dementia, such as members of Kings Lynn Dementia Café (run by the Trust's charity partner West Norfolk Carers) and Carer's Voice in order to develop a truly reflective brief. We then developed multiple concept sketches incorporating different ideas for the space's layout and uses, while enhancing the garden's existing features and ensuring that the final outcome would answer the needs of the people that will be using the space – a key part of PRP's design ethos and of inclusive design.

NEURODIVERSITY

A few constraints were identified in the space following an evaluation. Firstly, the already small size of the available space is surrounded by a secure timber fence and underground services run along the building edge with a recessed manhole cover, limiting the already small space further. Furthermore, emergency access is required, including accessing the garden within the patients' beds.

On the other hand, the garden is secure, overlooked and level which provides a great opportunity for a safe outdoor space. The garden benefits from a well-developed woodland background giving the feeling of a wider landscape and encouraging the relationship between people and nature.

Taking these constraints and opportunities into consideration, the final design offers a simple layout with a central green area and spaces to sit, engage and rest. It includes tables with wheelchair accessibility, a growing area, a flexible terrace, a covered pergola and a selection of landscape features so patients can engage with and explore the garden. The garden allows for the patients to enjoy gardening and connect with the wildlife as well as opportunities to sit with the bird boxes and bug hotels made by the Bridge for Heroes and decorated by West Norfolk Carers Dementia Café.

The planting strategy places the senses front and centre to provide a sensory experience for the patients to help stimulate memories and cognitive activity.



NEURODIVERSITY

Designed as a miniature wildlife haven to support local biodiversity through its design, the garden includes native and evergreen species as well as flowering plants for pollinators and seeds for small mammals and birds. The tree species selected also offer wildlife benefits with edibles, berries for wildlife and bark habitat. A wildflower meadow is also proposed on the perimeter of the garden along with additional trees. These environmental features aid in creating a relationship between the patients and nature, giving life that flows transitionally both inside and outside the Ward.

A set of Design Principles were thought up to guide the design of Dementia-friendly outdoor spaces and support the emotional and physical wellbeing of the patients, creating a connection to the space through the local ecosystems and landscapes. These principles are foundational at PRP when designing gardens and open spaces for Later Living, Extra Care and specialised Care schemes:

- Access, movement and orientation
- Memory and mental mapping
- Sensory stimulation
- Shelter and shade

The following are six elements of biophilic design which, incorporated with PRP's Design Principles can help create a successful, relaxed, holistic relationship between people and nature, providing extensive health and lifestyle benefits:



NEURODIVERSITY

- Environmental features
- Natural shapes and forms
- Natural patterns and processes
- Light and space
- Place-based relationships
- Evolved human-nature relationships

As we look into the future of landscape design, well-designed landscaped spaces will play an increasingly important role in promoting health and wellbeing for all people, not just those with dementia. By encouraging a biophilic, nature focused design strategy we're helping to create inclusive spaces for everyone to enjoy and connect with nature. This not only aids people through increased quality of life, improved physical and mental health and cognitive functionality but also our planet.

Angeli Ganoo-Fletcher is PRP's director of Landscape and oversees the landscape and placemaking portfolio for the PRP studios. With over 25 years of experience, she is responsible for managing the landscape team, covering all aspects of landscape procurement from feasibility stages to design development, implementation, and delivery of large-scale residential and commercial landscapes as well as the intimate landscape required within the care industry. She sits on a couple of Design Review Panels namely the Kingston Placemaking Design Review Panel as well as the Frame Royal Borough of Greenwich Design Review Panel. As a chartered landscape architect, Angeli integrates environmental and social values into external spatial design and arrangement. This approach aims to enhance people's lives and the environments they inhabit.

www.prp-co.uk



Biophilic Design - Transition into Standards

"The British Standard Institute's PAS 6463 "Design for the Mind – Neurodiversity and the Built Environment" has reference to Biophilic Design. Technical author of the Standard shares with us why and how Biophilic Design is important part of this design specification."

Jean Hewitt

The understanding and application of Biophilic design principles has increased very significantly in the last few years and there are numerous authoritative texts and sources of information and specific project examples.

To date, that information and application has been voluntary, and demand and designer led, rather than imposed by any formal requirement or incorporated into more formal guidance generally. The inclusion in the WELL standards is widely welcomed but until recently there has been little mention in standardisation internationally or in the UK.

However, I feel this is about to change and is not something to be feared. The British Standard Institute's PAS 6463 **"Design for the Mind - Neurodiversity and the Built Environment"** was published in 2022 and includes a short section plus numerous mentions of the significant impact that biophilic design can have on building users.

PAS 6463 had a two-year period of development with me as BSI's appointed technical author and a wonderful steering group of experts appointed by the British Standards Institute. A PAS is a fast-track standardisation document, which defines good practice for a product, service or process and it is created in response to either urgent market needs or specific industry requirements. In this case, the initial work was undertaken during the pandemic which perhaps led to wider thinking on wellbeing and the role nature has to play in our lives. In this case, PAS 6463 has been a great vehicle to fast track long awaited guidance to improve the built environment for a significant part of the population and benefit the wellbeing of the population at large.


PAS 6463:2022
Design for the mind – Neurodiversity and the built environment – Guide
TRANSPORT FOR LONDON
BBC
BURO HAPPOLD
forbo
FLOORING SYSTEMS
bsi.

PAS stands for Publicly Available Specification, but the content is not prescriptive – it is full of considerations around different user needs and design principles rather than specifying exactly how designs should appear or measure. Furthermore, it can be applied to any environment, outside and in, and is not targeting buildings that are focused on specialist care and/or supported living.

Like any standard, the content of a PAS has to reach full consensus among stakeholders regarding its technical content, it must not conflict with or duplicate existing standards and must complement any relevant legislation. The primary purpose of a PAS to is to create a standard to meet industry needs, bridging the gap between informal guidance and formal standards. Typically, a PAS has a two-year period for evaluation.

The focus of PAS 6463 is to encourage the design and management of the built environment to be sensory friendly, reducing the risk of a bombardment on the senses triggering sensory overload for the many people who experience hypersensitivity from one or more of the senses, particularly visual, auditory, smell, touch, and proprioception. Whilst a sizeable proportion of people with diagnosed neurodivergent traits experience hypersensitivity, it is not an exclusive club – everyone welcomes calmer environments at times or, at the very least, the option to move to a calmer setting when things get too much. PAS 6463 is therefore about offering choice and control to users, and somewhere to go to recalibrate when things become too much. Biophilic design principles are very much part of this, as such interventions provide a more calming environment which particularly helps people experiencing anxiety in any form and has a preventative effect.

So, if it's not prescriptive, why bother putting it into a standard?

Firstly, despite our innate connection with nature, there are many designers who either simply do not consider the importance of connecting with nature inside a building or feel that not every building warrants such considerations. In some building it may be dismissed as too difficult, (such a buildings where planting is not permitted), but every environment can benefit from even small interventions, and biomimicry can be appropriate in some situations. Including biophilic design in a standard is a reminder to designers and facility managers that this should be considered for all buildings.

Secondly, the inclusion within a standard raises the perceived importance as it will inevitably be taken more seriously than many other forms of guidance. The reason standards are so well respected is that they have been developed by industry experts with objectivity and consensus *(for the PAS it had public consultation before publication with over 4000 comments actioned on the first draft).* The rigorous processes in place eliminate much of the potential for negative impact and maximise the opportunity for success.

PAS 6463 Content on Biophilia and Biophilic Design

PAS 6463 contains much guidance on elements or features to avoid in order to reduce the potential for discomfort, anxiety or sensory overload for people who have sensory sensitivity *(which can be to one or multiple senses).* There are three overriding principles, which I call the three "C's": Clarity, Control and Calm. A key consideration is to create places where everyone can survive or even flourish and our innate connection with nature is a key resource we can all use to make even the busiest environments feel better. PAS 6463 therefore touches on the benefits of biophilia and biophilic design in multiple places throughout its content which help with the calm aspect. Just a few examples from the PAS6463 are given below:

- Designs that offer visual clarity and simplicity;
- Introducing planting where possible, but in an uncluttered way;
- Applying the golden ratio to replicate proportions found in nature;
- Using fractal patterns rather than linear;
- Giving users of the environment access or views of nature;
- Designing lighting that is more closely aligned to daylight;

The objective was to plant a seed that will encourage designers to become more informed about the significant role biophilia can have and always consider how this can be introduced into projects in a variety of ways, alongside many other measures to reduce negatives impacts from buildings and urban spaces.

By introducing biophilic design into design standards, mandatory or voluntary, the importance of biophilia is acknowledged and given emphasis which we hope will strongly encourage designers to explore ways that can work in various building types.

PAS 6463 is free to download at the current time and the uptake and level of interest has been extraordinarily high, driven no doubt by the many individuals who have been negatively impacted by how we design buildings and urban environments. The standard is being taught, referenced, and applied in both the UK and internationally.

Neurodiversity & the Built Environment – PAS 6463:2022 | BSI (bsigroup.com)

Spreading understanding about biophilic design

Good understanding around the application of biophilic design is still not entirely mainstream, and whilst this allows designers to interpret and apply as appropriate in the same way as other design elements with no two buildings being exactly alike, it can also lead to some applications that are unsuccessful.

At the current time, very few academic design courses include inclusive design for all user needs or give any depth to how to introduce biophilia or it's transformative effect on a space. This too is beginning to change with some university courses for built environment professionals including a module on biophilia and inclusion (an example being UCL's highly successful MSc programme at the Bartlett: **"Health, Wellbeing and Sustainable Buildings"** which is in its 6th year and has modules focusing on inclusive design and biophilia.

What next?

There are opportunities to include biophilic design principles in other standards as they emerge for revision, and perhaps to consider if there should be a standard purely on this topic – that is something I would love to explore personally as I have learned first-hand how much difference a standard can make to design development through my role on PAS6463.

Jean Hewitt, Inclusive environments specialist at Buro Happold and technical author of PAS 6463.

https://www.burohappold.com/people/jean-hewitt/

https://www.ucl.ac.uk/bartlett/environmental-design/jean-hewitt

Contents (snapshot from BSI PAS 6463 BSI):

1 Scope
2 Normative references
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9 Mechanical, electrical, plumbing (MEP)
10 Acoustics and noise management
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12 Surface finishes
13 Fixtures, fittings and furniture
14 Safety, recovery and quiet spaces
15 Environment types

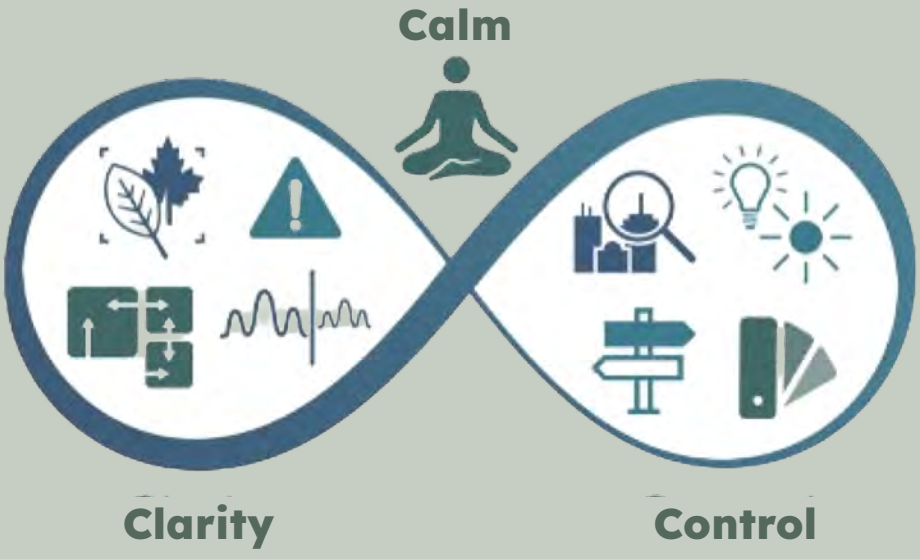
Icon used in standard for biophilia: (Copyright Buro Happold)



PAS 6463 collection of icons: (Copyright Buro Happold)



The three C's: (Copyright Buro Happold)



The Intersection of Neurodiversity and Biophilic Design

"In the contemporary discourse on environmental sustainability and architectural innovation, biophilic design has emerged as a beacon of holistic integration, reconnecting human spaces with the natural world. This philosophy, rooted in the essence of bringing outdoor elements indoors, not only revitalises our physical environments but also echoes a profound parallel with the principles of neurodiversity in the workplace."

Jean Hewitt

Just as maintaining the vitality of green elements within biophilic designs poses an ongoing challenge, so does nurturing the diverse spectrum of human minds in our professional environments. Nature's inherent dynamism – with seasons changing, plants growing, and ecosystems evolving – mirrors the fluidity and expansiveness of neurodivergent individuals. Both realms require a departure from static norms in order to truly flourish.

The crux of biophilic design lies in its adaptability, creating spaces that evolve with the natural rhythms of growth and decay. This adaptability is equally critical when fostering an inclusive workplace for neurodivergent individuals. Static architectural and organisational norms fall short in accommodating the rich array of cognitive Operating Systems. Like the ecosystems embraced by biophilic design, neurodiverse teams thrive in environments that are flexible, responsive, and open to evolution.

In densely populated urban settings, where space is at a premium, biophilic design innovates to introduce natural elements without sacrificing valuable real estate. This mirrors the challenge of embedding neurodiversity support and initiatives within existing organisational structures. Innovations such as vertical gardens and rooftop green spaces parallel strategies like flexible work arrangements, support without the requirement of disclosure, and tailored situational solutions.



The movement towards environmental consciousness and the incorporation of biophilic elements is not just about reshaping our physical surroundings but about reevaluating our relationship with the natural world and its impact on productivity, efficiency and wellbeing. Similarly, advancing neurodiversity support and awareness in the workplace is not solely about making accommodations for a disability, but about fundamentally rethinking our perceptions of the value in natural diversity of thought.

As we navigate these challenges, they transform from obstacles into stepping stones toward a more inclusive, dynamic, and sustainable future.

The journey involves reshaping not only our physical environments but also our cultural landscapes, one green space and one neurodivergent talent at a time.

In conclusion, the principles of biophilic design and neurodiversity are intrinsically linked by the shared values of growth, adaptability, and sustainability.

By embracing these principles, we cultivate spaces – both environmental and organisational – that thrive on diversity and innovation, fostering a healthier planet and a more inclusive society.

https://neurobridge.co.uk

We all need a Nook

"Inclusive design is not an inconvenient additional cost. It's a necessity to unlocking full human potential."

David O'Coimin

The process of product ideation can have all manner of genesis. They say necessity is the mother of invention. In the case of the Nook which I created, it was a combination of frustration and empathy.

I'm a typical ADHD mind. I'm a sensory seeker, an extrovert. I hop from one thing to another with ease and my creativity and energy are huge assets. I am also a disaster when it comes to focus, and I am a nightmare to share an office space with. We all know someone like me.



My hunger for knowledge led me to an epiphanic book, called **'Quiet'** by Susan Cain. Subtitle: The Power of Introverts In a World That Can't Stop Talking. It's fair to say that I now see myself as pre and post that book.

Things that I'd only vaguely classified as useful for putting people into categories of **'like me'** and **'not like me'**, were fully illuminated and blossomed into more rounded understandings of the whats and whys of how people's minds operate in beautifully different ways, and how they need different things in order to thrive.

Moreover, I came to realise that the world of work in particular, and the built environment in general, is not created, and nor does it evolve, with quiet minds in, er, mind.

Building operators create empty boxes for their tenants to populate. Designers create open prairies for collaboration. Facilities arrange space for factory-like order and efficiency.

As a space develops, in workspace as in life, the squeakiest wheel gets the oil. And the squeaking is done by the noisy ones, not the quiet ones. We need a table tennis table, a bar, more music, communal eating areas, a shared common room.

No one thinks about a library or putting the noisy pool table somewhere that's not disturbing. Rarely is a thought spared for the easily overstimulated or for how noise and disturbance ruin focus and destroy a person's sense of safety.


nook
nook

It is with all of this one-sided thinking in mind, this sort of one-size-misfits-all approach, that I came up with the notion of a sustainable, easy to install, retro-fitable and hyper flexible space which would be: quiet inside, without isolating the occupant; which would be simple and accessible rather than high design and aloof; which would create a sense of psychological safety, borrowing from nature – a sort of refuge, from which the user could prospect over the environment, without having to leave it. Somewhere for good focus, for recharge, for deeper connections between colleagues and fundamentally a space where people could shed the anxieties of the open space in the spotlight for a moment.

Without realising it, I had instinctively created a more inclusive space.
I had added a natural ingredient to an unnatural landscape. The den. The hideaway. The Nook.

Fast forward to today and you can now find Nooks in every type of workspace from corporate HQ to high street travel agent, in charities (helped by grants and refurbed Nooks) and libraries, in Museums and Football Stadia, in classrooms and university boulevards, in Hospitals and even a Broadway theatre.

To me this highlights a valuable principle which uncovers an opportunity we are missing – designing with neuroinclusive needs in mind creates solutions which are sorely needed, and which make the world better for all.






sensory
NOOK


sensory
NOOK
sensory
NOOK


0.14
0.01
0.36
0.07
0.01
3.59
EXHIBITOR



Nook is now certified as a Sensory Support Space for Autistic people and used clinically within Autism Centres in the US and in the NHS in the UK.

I will close with an anecdote from a recent conversation with a Museum Director. The Museum works with organisations who help neurodivergent people gain the skills to get into full time employment. One of the people sent to the Museum to train, wore ear defenders all the time. When he sat in the Nook, not only did he take them off, to the shock of those who had gotten to know him, but even more startling, he left them off when he got out and went about dealing with the work, the staff and the public. When asked how come, he told his handler that knowing the Nook was there if he needed it, made him feel safe.

Everyday thousands of people are made to feel safer, seen, more powerful and given a sense of belonging due to inclusive designs like Nook.

If we could design our world to feel kinder, with spaces for quiet moments, protection, and recharge - using principles of universal design, biophilia, trauma informed design and design for the mind – we could unlock the potential we are currently suppressing and make our way out of the darkness of the crisis we face. We are going to need all of our minds, doing our best work, in order to do so. Inclusive design is not an inconvenient additional cost. It's a necessity to unlocking full human potential.

http://nookpod.com

Biophilic Design for Neuroinclusive Workplaces

“Discusses the burgeoning understanding of neurodiversity in a workplace context, and the impact biophilic design can have in mitigating the challenges neurodiverse individuals can encounter there.”

Guy Osmond

Over the last few years, our understanding and cultural acceptance of neurodiversity have advanced rapidly. The natural variations in human neurological traits seen in conditions such as Autism Spectrum Condition (ASC), Attention Deficit Hyperactivity Disorder (ADHD) and dyslexia have become far more widely acknowledged and better understood.

As the challenges and strengths of such **‘differently-wired’** brains come to be recognised, so too does the need to design spaces which accommodate the diverse needs of all individuals everywhere, not least in our offices and working environments.

Conversations about neurodiversity have found fertile ground in this space, where ergonomics and human factors professionals have always championed the importance of recognising and accommodating the needs of the individual.

As Guy Osmond, Founder and MD of Osmond Ergonomics, puts it:
“We have long understood the connection between our environment and our physical and psychological wellbeing, making the case that people must be accommodated as individuals. We are now seeing this recognition taken to the next level as we consider differences of the mind and ways of thinking, and the range of ways in which people experience and interact with their environments and others.”



One topic that has particular significance in this regard is biophilic design. Tapping into our innate connection with the natural world and harnessing its restorative qualities not only enhances the wellbeing of all occupants, but also holds particular promise for supporting neurodivergent individuals in workplace settings.

The journey so far

The language of **'neurodiversity'** first started to emerge in the late 1990s (LeFevre-Levy et al, 2023) but it is only in the past few years that awareness has really permeated the public consciousness. We now know that up to one in five of us has one or more forms of neurodivergence according to some estimates *(DCEG Staff, 2022).*

Guy Osmond believes the pandemic **"was a catalyst for conversations around mental health", which in turn gave a green light to bring other hitherto unspoken issues to the table: topics such as the menopause and neurodiversity. By bringing any one of them into the conversation, the others shift into focus too," he explains.**

"The shift to homeworking and then hybrid working, as a result of Covid, was another important trigger", adds Guy. "At home, people could control their working environment to suit themselves. That experience has thrown into relief the challenges and shortcomings of the office environment, especially for neurodivergent individuals. For those with sensory or processing differences, the 'traditional office', which might be loud, brightly lit, and filled with visual noise, can be a place not just of distraction, but of sensory overload."

Workplace challenges

Harsh lighting and constant noise, as seen in many open-plan offices, can be stressful under any circumstances, but often especially so for neurodivergent individuals due to heightened sensorial perceptions. They might also face discomfort with standardised ways of learning and socialising, and difficulties regulating their moods.

The demand of dealing with this kind of environment and the increased cognitive load can take a real toll, leading to more anxiety, fatigue and, in some cases, potential behavioural changes and poor mental health. *(BSI, 2022).* The British Council for Offices *(BCO)'s* 2022 research report: Designing for Neurodiversity, linked poor office design with increased occurrences of burnout among neurodivergent individuals, who appear more likely to develop the syndrome especially as they often mask or suppress symptoms in order to fit in.



Neurodivergent strengths

On the flip side, as the challenges of neurodivergent traits receive wider recognition, we are also becoming aware of the unique strengths that neurodiversity brings. These include enriching the workplace, providing new perspectives and boosting innovation. For example, the ability of some people with autism to observe and recall detail, recognise patterns, spot illogical processes, or focus single-mindedly on a task have all been linked to business benefits *(Krzeminska et al, 2019)*. Some have noted the association between ADHD, creativity and entrepreneurial success.

Research also suggests that dyslexics may have a greater affinity towards holistic information processing, which allows them to make connections more easily and see the bigger picture *(LeFevre-Levy et al, 2023)*. In certain fields, neurodiverse teams have been found to be 30 per cent more productive than others *(Harvard Business Review, 2017)*. In fact, such is the interest in the benefits of working with such differently-wired brains, that a number of well-known companies, including Microsoft, Goldman Sachs, Google and JP Morgan Chase, have started programmes to recruit and employ neurodivergent workers, claiming several benefits, including increased organisational performance *(LeFevre-Levy et al, 2023)*.

Adds Guy: **"Truly valuing different minds means creating neuroinclusive environments which do not disable them, minimising and managing stressors so that all individuals have the same opportunity to be successful and happy at work. Biophilic design could be a key to unlocking that potential."**

Biophilic design for neurodiversity

As the Designing for Neurodiversity report sets out, certain spaces can be disabling due to their poor design and lack of consideration for the diverse needs of users. It highlights the fact that neurodivergent individuals, while each of their experiences is unique – are often negatively impacted by light and noise pollution and other sensory sensitivities.

Their guiding principles for designing with neurodiversity in mind include ensuring that office spaces provide their occupiers with a sense of psychological safety, be intuitive, and be diverse and agile in their arrangements, taking account of thermal, auditory, visual and olfactory needs. For example, private sound insulated pods or rooms could be offered and lighting should be adjustable.

Specifically, incorporating elements of biophilic design can be a powerful tool in addressing these concerns "allowing individuals to readjust their sensory and social control over their environment." *(Hutson & Hutson, 2023)*.

Adds Guy: **"We know that harnessing our innate connection with nature has been shown to have significant benefits for our physical and mental health - everything from our stress levels to our productivity. "But even if you can't give employees time in nature, incorporating plants, natural light, water features, and calming visual stimuli - organic materials, natural textures and patterns, photos and paintings drawn from nature - has the power to trigger the restorative qualities of the natural world."**

Research into the benefits is compelling – linking biophilic design with a 15% boost to wellbeing, 6% greater productivity, 15% higher creativity, reduced negative emotions and stress, enhanced cognitive functioning, improved employee engagement, retention and productivity. On top of all this, health benefits include a 60%reduction in bacterial colonies, a 24%decrease in headaches, and a reduction in eye irritation by more than half.
(Hutson & Hutson, 2023).

Adds Guy: **“Biophilic design can support neurodivergent individuals in particular, by offering opportunities for sensory modulation and self-regulation. For example, spaces that incorporate elements such as greenery walls or indoor gardens provide a sensory break or an alternative stimulus, helping someone refocus their attention or manage stress.”**

Guy Osmond, Founder and MD of Osmond Ergonomics, a leader in workplace wellbeing solutions for more than three decades.

The multisensory and multimodal qualities of biophilic design are actually better for everyone, adds Guy: **“With more inclusive design, people do not have to change to fit the demands of their environment. Rather the environment, with its flexible spaces and biophilic elements, flexes to accommodate their various sensorial preferences, their shifting needs for privacy and interaction and for stimulation and for calm.**

“Spaces like this are better for everyone – neurotypical and neurodivergent alike. Good design for neurodivergence is essentially just good design for human beings!”

Guy Osmond, Founder and MD of Osmond Ergonomics, a leader in workplace wellbeing solutions for more than three decades.



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Inclusive Biophilic Design: Placemaking for Diversity of Neurotypes

“By embracing the innate human affinity for nature, biophilic design stands as a powerful tool in fostering environments that bolster neurological health and well-being, paving the way for a more inclusive and empathetic approach to architectural design.”

James and Piper Hutson

Abstract

Biophilic design, traditionally focused on enhancing neurotypical well-being, has often overlooked the needs of a broader range of neurotypes, particularly those with neurodivergent conditions such as Attention-Deficit/Hyperactivity Disorder *(ADHD)* and Autism Spectrum Conditions *(ASC)*. This article aims to bridge this gap, emphasizing the importance of inclusive spaces that cater to diverse neurotypes. It explores the potential of biophilic designb principles to be tailored to specific cognitive and sensory sensitivities. For ADHD, elements like plants and flowing water can enhance focus, while environments with sensory modulation, such as textured walls and variable lighting, can alleviate sensory overload for individuals with Autism. Additionally, these strategies can benefit those with other neurological conditions, including traumatic brain injury and PTSD, by reducing stress, fostering connections, and enhancing cognitive function. The article advocates for a broader approach to biophilic design, urging architects and designers to embrace neurodiversity and create environments that support well-being and inclusivity for all, transcending traditional design paradigms.



Introduction

The integration of biophilic design within environmental architecture and artistic installations presents a confluence of artistic creativity and scientific inquiry. This interdisciplinary exploration, particularly relevant to academics, practicing artists, and interior designers, examines the psychological and sensory impacts of biophilic elements in designed spaces.



Installations, such as those at Meow Wolf **(Figure 1)** in Sante Fe, New Mexico, demonstrate the potential of immersive environments to replicate the experiential qualities of nature. These installations challenge the conventional boundaries of design and art, creating multisensory experiences that raise questions about the depth and variety of sensory engagement required to elicit naturalistic responses in an artificial setting. Essential components of biophilic design—such as sensory richness, olfactory elements, concepts of prospect and refuge, and dynamic movement—are critical in creating these profound experiences *(Gillis & Gatersleben, 2015).*

Figure 1. Fancy Town, Meow Wolf, Santa Fe. Creative Commons Attribution 2.0.

The discussion on biophilic design, traditionally anchored in augmenting the well-being of neurotypical individuals – those whose neurological development and functioning align with the societal standard of what is considered typical or normal- has evolved to recognize a broader spectrum of neurodiversity *(Davies et al., 2023).* The initial comprehensive framework for biophilic design vis a vis Kellert, Heerwagen, and Mador *(2011)* posits that incorporating elements of the natural world into built environments is not only aesthetically pleasing but also essential for human well-being. The framework outlines various ways in which nature can be integrated into architecture and urban planning, ranging from the direct inclusion of natural elements to the use of natural shapes, forms, and patterns in design **(Figure 2).** The approach emphasizes the profound impact that connections with nature have on human health, productivity, and overall psychological well-being.



Figure 2. Interior Space Based on Biophilic Design Principles of Kellert et al. Permission of the authors.

Since their publication in 2011, the biophilic design principles of Kellert and team have been a catalyst for expanded research and application, particularly in the context of neurodiversity. While initial discussions have predominantly focused on three specific neurodivergent populations- Attention-Deficit/ Hyperactivity Disorder *(ADHD),* Autism Spectrum Conditions *(ASC)*, and Post-Traumatic Stress Disorder *(PTSD)* – there is an increasing recognition of the need to broaden this scope *(Divya & Naachimuthu, 2020; Hutson & Hutson, 2023; Naumah et al., 2021).* As such, this article will consider targeted design interventions for these three conditions, while also presenting a more comprehensive design framework that caters to a wider range of neurotypes, including Sensory Processing Disorder *(SPD)*, Dyspraxia, Dyslexia, and more.

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The acknowledgment of diverse neurotypes, especially those impacted by PTSD in specialized contexts such as Veterans Affairs hospitals, has illuminated the versatility of biophilic design in addressing unique sensory and cognitive needs *(Rossi, 2017).* Additionally, the role of oxygenation in biophilic environments, crucial for combating issues like sick building syndrome, exemplifies a shift towards a more natural and holistic approach in environmental design *(Ignacio & Shealy, 2023).* The incorporation of oxygenating plants in interior spaces not only purifies the air but also contributes to creating more vibrant and healthful environments. At the same time, biophilic design has also been found to promote social interaction, engaging the social nature of the human nervous system *(Stavrianos, 2016; Tekin & Gutiérrez, 2023).* This facet is essential in fostering community and belonging, offering significant benefits in mitigating feelings of isolation and stress identified in studies during the pandemic *(Yin et al., 2020).* Furthermore, the principles of privacy and visual complexity in biophilic design are critical in creating spaces that respect individual needs while providing visually enriching experiences *(Guo, 2016).*

The importance of empirical research in assessing the effectiveness of innovative biophilic installations, such as algae chandeliers, cannot be overstated. Such research is pivotal in establishing the real-world impact of these designs. As the exploration of biophilic design advances, its potential to benefit a diverse array of neurotypes becomes increasingly evident. This exploration is aimed at broadening the understanding and application of biophilic design to encompass a wide spectrum of sensory and cognitive experiences. The objective is to cultivate inclusive, therapeutic environments that synergize artistic expression with scientific principles, thus providing valuable insights for academics, artists, and designers. This comprehensive approach seeks to transcend traditional design paradigms, offering a broader framework for diverse neurotypes.





Meow Wolf: A Case Study

The fusion of biophilic design within the realms of environmental architecture and artistic installations marks a significant intersection of artistic creativity and scientific inquiry. This interdisciplinary exploration is especially pertinent to a wide audience, including academics, practicing artists, and interior designers, as it delves into the psychological and sensory impacts of biophilic elements within designed spaces. A quintessential example of this is the installations at Meow Wolf in Santa Fe, New Mexico **(Figure 1),** which embody the essence of biophilic design through their immersive environments.

The installation exemplifies biophilic design principles by creating spaces that transcend mere visual appeal, engaging multiple senses to replicate the experiential qualities of nature. These installations challenge and expand upon traditional design and artistic boundaries, fostering multisensory experiences that closely mimic natural environments. The key to Meow Wolf's alignment with biophilic design lies in its meticulous integration of sensory richness, olfactory elements, and the concepts of prospect and refuge, all of which are vital in eliciting a naturalistic response in an otherwise artificial setting. These elements contribute to creating an immersive experience that resonates with the innate human affinity for nature.

The sensory richness of the installation is evident in their use of varied textures, sounds, and visual elements that stimulate the senses in a manner akin to natural environments. The inclusion of olfactory elements further enhances this experience, drawing on the powerful connection between scent and memory to evoke natural settings. The concept of prospect and refuge, as elucidated in biophilic design, is ingeniously incorporated into the installation. This is achieved through design elements that provide vantage points *(prospect)* while also offering secluded areas *(refuge),* thereby mirroring the dynamic interplay found in natural landscapes. Additionally, the incorporation of dynamic movement within the installations, such as interactive features and kinetic art, adds an element of spontaneity and life, reminiscent of the ever-changing and evolving nature of the natural world.

These aspects of the installation underscore their alignment with the principles of biophilic design as outlined by Gillis and Gatersleben *(2015).* By creating environments that closely mirror the complexities and intricacies of natural settings, Meow Wolf offers a profound example of how biophilic design can be effectively realized in artistic and architectural contexts. This approach not only enhances the aesthetic appeal of these spaces but also fosters a deeper connection between humans and the natural environment, highlighting the potential for biophilic design to transform our experience of built environments.

Implementing Inclusive Biophilic Design: Considerations

In the realm of biophilic design, the incorporation of neurotype-specific elements stands as a cornerstone of creating truly inclusive spaces. The proposed approach involves an understanding of various neurotypes, including conditions such as ADHD, ASC, and PTSD, and tailoring design elements to meet their unique sensory and cognitive needs. The consideration is crucial for crafting environments that not only accommodate but actively support the well-being of individuals with diverse neurological profiles. Similarly, the functionality of the space being designed plays a pivotal role. Different spaces, be it homes, workplaces, educational institutions, or healthcare facilities, serve distinct functions and thus require specialized design approaches (*Ryan & Browning, 2020).* For instance, a healthcare facility might prioritize elements that foster tranquillity and healing, while an educational space might focus more on elements that stimulate focus and creativity *(Totaforti, 2018).*

The sensory experience of a space, encompassing aspects like lighting, colour palette, and acoustic design, significantly impacts its inhabitants. Natural and adjustable lighting solutions are employed to cater to varying light sensitivities and to influence mood and focus positively *(Xie et al., 2022).* The colour palette selection is another aspect that profoundly affects the psychological and emotional state of occupants. Carefully chosen colours can set the tone of a space, ranging from soothing, earthy tones for relaxation areas to vibrant colours that energize and stimulate creativity *(Kellert & Calabrese, 2015).* Additionally, acoustic design plays a vital role, especially for individuals with auditory sensitivities. Managing sound through the use of sound-absorbing materials, creating quiet zones, or incorporating natural soundscapes can significantly enhance the comfort and usability of a space *(Torresin etal., 2020).*

Another critical aspect of inclusive biophilic design is the spatial layout and accessibility, ensuring that spaces are intuitive and easily navigable for all, including those with physical disabilities or mobility challenges. This includes considering the placement of biophilic elements like plants and water features to enhance aesthetic appeal and improve air quality, without impeding movement *(Park & Lee, 2015).* The integration of texture and tactile elements caters to sensory stimulation or provides calming effects, which is especially important for neurodivergent individuals *(Demers & Potvin, 2017).* Furthermore, balancing visual complexity with areas of privacy allows individuals to engage with their environment at their comfort levels, offering spaces for both social interaction and solitude. Technological integration, such as smart lighting and temperature control systems, adds a layer of personalization, enabling occupants to tailor their environment to their specific needs *(Parsaee et al., 2019).*

Lastly, sustainability and environmental impact are fundamental to biophilic design, ensuring that design choices not only benefit the occupants but also contribute positively to environmental health *(Wijesooriya & Brambilla, 2021).* This comprehensive approach to design underscores the importance of creating spaces that are not just physically accessible but are also cognitively and sensorially accommodating, fostering well-being and inclusivity for a diverse range of individuals.

Table 1. Considerations for Implementing Inclusive Biophilic Design

Consideration	Description
Neurotype-Specific Design	Tailor design elements to specific neurotypes like ADHD, ASC, PTSD, etc., for supportive environments.
Functionality of Space	Design approach varies based on space function (e.g., homes, workplaces, educational institutions).
Lighting Considerations	Use natural and adjustable lighting to influence mood and cater to light sensitivities.
Biophilic Elements	Incorporate nature (plants, water, natural materials) for aesthetic appeal and stress reduction.
Oxygenation and Air Quality	Improve air quality through natural methods like plants, beneficial for respiratory health.
Color Palette Selection	Select colors that influence psychological and emotional states, suited to the space's use.
Acoustic Design	Manage sound for auditory comfort, using sound-absorbing materials and natural soundscapes.
Spatial Layout and Accessibility	Ensure spaces are intuitive and accessible, accommodating a range of physical abilities.
Texture and Tactile Elements	Use diverse textures for sensory stimulation or calming effects, important for neurodivergent individuals.
Visual Complexity and Privacy	Balance stimulating visuals with privacy areas, allowing engagement at individual comfort levels.
Social Interaction Areas	Create areas that encourage community building and offer solitude to cater to varying social needs.
Technological Integration	Use smart technology for personalized environmental control (light, temperature, etc.).
Sustainability and Environmental Impact	Make sustainable and environmentally friendly design choices for health and well-being.

Case Studies in Biophilic Design

In the field of biophilic design, the installation Serpentine Serenity by June Sekiguchi (https://www.portseattle.org/page/serpentine-serenity) emerges as a paradigmatic example, showcasing how artistic creativity can be harnessed to foster inclusive and soothing spaces. This installation, distinguished by its use of movement and fluid shapes, offers profound insights into designing environments that resonate with neurodivergent individuals. The essence of Serpentine Serenity lies in its emulation of natural flow, reminiscent of the tranquil movements of water and the graceful sway of tree branches. This approach is particularly effective in creating an atmosphere that is calming and conducive to individuals sensitive to sensory inputs. The integration of curvilinear forms, evident in the installation's design, encourages architects and designers to infuse their spaces with similar elements. By incorporating curved walls, winding pathways, and circular seating areas, the monotony of rigid, linear layouts is broken, fostering an environment that is organic, inviting, and reflective of natural harmony.

Further enhancing this connection with nature, the installation incorporates dynamic elements like kinetic sculptures and mobiles that subtly respond to air currents, mimicking the gentle rustling of leaves. Such features add a dynamic yet soothing visual stimulus to the space, engaging the senses in a gentle, non-overwhelming manner. The layout of spaces inspired by the installation emphasizes fluidity, encouraging natural movement and eschewing the harshness of sharp angles and straight lines. This design philosophy promotes exploration and relaxation, akin to strolling through a serene forest or meandering along a gentle stream. Additionally, lighting plays a pivotal role in these environments. Soft, gentle lighting that simulates the dappled effect of sunlight filtering through foliage can be particularly comforting for those with sensory sensitivities. Not only does this enhance the aesthetic appeal, but it also contributes to creating a more comfortable and tranquil environment. Natural materials, such as wood, stone, and fabrics with organic patterns, are utilized to deepen the connection to nature, contributing to the overall serenity and aesthetic coherence of the space. The inclusion of water features like indoor fountains or water walls further augments this calming effect, with the sound of flowing water masking distracting noises and creating a peaceful sanctuary within the space.

Another exemplary case study in the realm of biophilic design is the installation Tree.ONE by ecoLogicStudio (https://www. ecologicstudio.com/projects/treeone),
showcased at the Chengdu Contemporary Art Museum. This installation, embodying principles of biomimicry, serves as a profound example of how natural processes can be replicated within indoor spaces to enhance air quality and well-being, particularly for neurodivergent individuals. Drawing inspiration from the structure and functions of trees, Tree.ONE utilizes biomimicry to purify air in a manner akin to that of natural forests. This approach not only benefits individuals with allergies or respiratory issues by improving air quality but also introduces a visually and tactilely appealing natural element into the built environment.

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The implementation of the design highlights the importance of integrating plant-based systems in biophilic design. These systems, functioning as living, breathing components of the design, do not merely serve aesthetic purposes but play a crucial role in enhancing indoor air quality. The installation of living walls or vertical gardens, incorporating moss, ferns, or other air-purifying plants, adds a lush, green dimension to the space while acting as natural air filters. Such installations are instrumental in absorbing pollutants and releasing oxygen, thereby contributing significantly to the health and comfort of the space's occupants. Additionally, these green installations offer the added benefit of noise reduction, creating a more serene environment that is particularly conducive to the needs of neurodivergent individuals who may be more sensitive to sensory stimuli.

Inhale, Exhale by Jason Bruges Studio (https://www.jasonbruges.com/) serves as another example of how interactive installations can be effectively incorporated into biophilic design to support sensory modulation. This installation, utilizing sensors to detect breathing patterns and create corresponding visual and auditory experiences, exemplifies the dynamic and therapeutic potential of interactive features in design. Such installations are especially beneficial for individuals with stress and anxiety, including those who are neurodivergent. Neurodivergent individuals often exhibit a higher prevalence of anxiety disorders compared to the neurotypical population, making this approach particularly impactful. To integrate similar interactive elements, designers and artists are encouraged to focus on creating installations that respond to the presence and actions of occupants. This involves the integration of sensory-responsive technology capable of adapting to and influencing the environment in real-time. Installations that modify lighting, color, or sound in response to movement or ambient sounds can create an engaging, therapeutic experience, particularly when founded on neuro-inclusive principles of color and sound therapy.



The effectiveness of these interactive installations lies in their capacity to provide a calming, immersive experience, coupled with the option for personalization and control. For individuals who may be overwhelmed by certain sensory inputs, the ability to interact with and influence their environment is both empowering and soothing. Achieving this requires installations that are intuitive and easy to interact with, ensuring accessibility and enjoyment for all users, regardless of their sensory processing needs. Additionally, the incorporation of natural elements into these installations augments the biophilic experience. Mimicking natural phenomena, such as the movement of leaves or the flow of water, these installations provide a connection to nature and a soothing sensory experience. Exposure to natural elements through biophilic design has been shown to positively impact cognitive functions, including enhanced concentration, creativity, and problem-solving abilities. The presence of natural light, greenery, and nature views can stimulate the brain, leading to increased productivity and mental clarity. In designing these installations, inclusivity is paramount. Designers must ensure that the interactive elements are accessible to individuals with varying abilities and sensitivities, potentially involving installations that allow for the adjustment of sensory input intensity.

Drawing inspiration from Inhale, Exhale, designers can craft interactive biophilic installations that enrich aesthetic appeal and cater to the cognitive and sensory needs of neurodivergent individuals. These installations offer unique and engaging ways to experience and interact with the environment, promoting relaxation and well-being through sensory modulation. This approach underscores the potential of biophilic design to create inclusive, responsive, and therapeutic spaces in both public and private settings, harnessing nature's rich sensory experience for the benefit of the nervous system.

The last two case studies represent the potential of carefully considered biophilic design to have measurable impact on the health of large populations and provide sustainable alternatives to traditional interior design. The Lungs of the City project by the Eindhoven University of Technology (https://www.ens-cleanair.com/en/projects/lungs-of-the-city/) and Moss Walls by Naturahq (https://www.naturahq.com/moss-walls) present innovative approaches in biophilic design, focusing on air purification and sustainable integration of natural elements in built environments. These case studies offer insightful perspectives on creating healthier and more inclusive spaces, especially beneficial for neurodivergent individuals.

Lungs of the City leverages the natural air-purifying capabilities of algae, demonstrating an inventive method of enhancing indoor air quality. This approach utilizes algae not only as an effective air purifier but also as an aesthetic element in design, contributing to the visual vibrancy of spaces. The integration of algae-based systems into architectural designs, such as incorporating algae into glass panels or terrariums, provides a balance between functionality and visual appeal. These installations, ideally placed in common areas, lobbies, or relaxation spaces, not only improve air quality but also invite interaction and engagement. The success of such installations hinges on selecting the appropriate type of algae and implementing effective maintenance plans, ensuring the longevity and effectiveness of the systems.

On the other hand, Moss Walls by Naturahq
exemplifies the use of maintenance-free natural installations in biophilic design. These installations provide the visual and tactile benefits of natural elements without the extensive care required by traditional plant installations. Moss walls introduce a lush, green texture to indoor environments, enhancing the visual complexity and serenity of spaces. They foster a sense of connection with nature, which can be particularly calming for individuals with sensory sensitivities. When implementing moss walls, it is vital to consider their placement and integration into the overall design, ensuring they are positioned to maximize visual impact and accessibility. The choice of materials and design should align with the aesthetic of the space, creating a cohesive and harmonious environment.

Furthermore, the sustainability and environmental impact of these installations are important considerations, underscoring a commitment to environmental stewardship. Both examples demonstrate the potential of biophilic design to not only enhance the aesthetic appeal of
spaces but also create nurturing and inclusive environments. By integrating these innovative natural installations, designers can craft spaces that bring the benefits of nature indoors without the burden of extensive maintenance. These case studies exemplify the fusion of art, functionality, and sustainability in biophilic design, offering innovative solutions for modern architectural and interior design challenges. They underscore the capacity of biophilic design to support the well-being of all occupants, particularly neurodivergent individuals, by creating environments that are healthful, engaging, and sustainable.

Tailoring Biophilic Design to Diverse Neurotypes: A Considered Approach

In the evolving field of biophilic design, the focus has broadened to encompass a range of neurotypes, each with unique sensory processing considerations. To effectively support these diverse needs, biophilic design must be tailored with precision, integrating specific interventions that align with the sensory and cognitive profiles of various neurotypes. Table 2 serves as a foundational guide for this tailored approach, providing a structured framework for designers and architects to create environments that are not only aesthetically pleasing but also cognitively and sensorially supportive.

Table 2. Design Considerations for Supporting Various Neurotypes

Consideration	Neurotype	Environment Type	Design Intervention
Sensory Sensitivity	ASD, SPD	Educational, Healthcare	Low sensory stimulation areas, controlled lighting
Focus and Attention	ADHD, Dyslexia	Educational, Workplace	Distraction-free zones, ergonomic furniture
Social Interaction	ASD, PTSD	Public Spaces, Healthcare	Designated social areas, private spaces
Stress and Anxiety	PTSD, Anxiety Disorders	Healthcare, Residential	Calming colors, nature integration
Auditory Sensitivity	ASD, SPD	Educational, Residential	Soundproofing, ambient soundscapes
Visual Stimulation	ASD, ADHD	Workplace, Educational	Adjustable lighting, visual aids
Tactile Sensitivity	ASD, SPD	Healthcare, Educational	Textured materials, sensory-friendly furnishings
Olfactory Sensitivity	ASD, Anxiety Disorders, SPD	Healthcare, Residential, Public Spaces	Controlled scent environments, natural aromatherapy

For individuals with ASC and SPD, for example, environments with low sensory stimulation and controlled lighting are crucial. These interventions address the heightened sensory sensitivities common in these neurotypes, creating spaces that reduce the likelihood of sensory overload. In educational and healthcare settings, where these individuals often spend significant time, such design considerations can greatly enhance comfort and functionality. On the other hand, ADHD and Dyslexia present different challenges, primarily related to focus and attention. Here, the design interventions focus on creating distraction-free zones and incorporating ergonomic furniture. These elements are particularly beneficial in educational and workplace environments, where concentration and comfort are paramount to productivity and learning. Social interaction takes on a different dimension for neurotypes like ASC and PTSD. Designated social areas balanced with private spaces allow individuals to engage at their own pace, providing opportunities for interaction without overwhelming them. This balance is especially important in public spaces and healthcare environments, where social dynamics play a critical role in the overall experience. Stress and anxiety, common in individuals with PTSD and other anxiety disorders, can be mitigated through the use of calming colors and the integration of natural elements, typical of biophilic design. Healthcare and residential settings, in particular, can benefit from such interventions, creating a tranquil environment conducive to relaxation and recovery.



Auditory sensitivities, often experienced by individuals with ASC and SPD, require a thoughtful approach to sound management. Solutions like soundproofing and the use of ambient soundscapes can create an auditory environment that is both comforting and non-intrusive. Such considerations are vital in educational and residential settings, where auditory experiences significantly impact daily life. Likewise, visual stimulation and tactile sensitivity are other areas where biophilic design can be tailored to meet specific neurotypical needs. Adjustable lighting and visual aids cater to the visual processing needs of individuals with ASC and ADHD, particularly in workplace and educational environments. Similarly, the use of textured materials and sensory-friendly furnishings can provide a positive tactile experience for individuals with ASC and SPD, essential in healthcare and educational settings.

Tailoring biophilic design to diverse neurotypes involves a deep understanding of the unique sensory and cognitive experiences of these individuals. By employing targeted design interventions, as outlined in the table, architects and designers can create spaces that are not only aligned with biophilic principles but also cater to the diverse needs of the neurodiverse population. This approach underscores the importance of inclusive design practices, ensuring that environments are supportive and enriching for all individuals, regardless of their neurotype. Conclusion: Embracing Neurodiversity through Biophilic Design The exploration and implementation of biophilic design, characterized by its integration of elements like kinetic botanical sculptures and air-purifying textiles, mark a pivotal commitment to neurodiversity in architectural planning. This approach illuminates the remarkable potential of biophilic design to craft environments that are not only sensory-engaging but also deeply supportive of various neurotypes.

Tailoring design elements to meet the specific needs of neurodivergent individuals allows designers to create spaces that transcend physical accessibility, offering cognitive and sensory accommodations that are essential for a holistic experience.

This initiative significantly underscores the role of architecture and design in enhancing societal well-being. It moves beyond mere aesthetic appeal or environmental sustainability, focusing instead on improving health, comfort, and inclusivity. The application of biophilic design principles is a substantial step toward addressing the diverse needs of the population. It reflects the evolving nature of design as a discipline increasingly cognizant of its social and ethical responsibilities.
Through the innate human connection to nature, biophilic design has the profound capacity to foster environments conducive to neurological health and overall well-being. The essence of this exploration lies in its recognition that design must be inclusive, catering to a broad spectrum of human experiences and sensitivities. By meticulously tailoring design elements to cater to individuals with neurodiverse
conditions, including but not limited to ASC, Dyslexia, Traumatic Brain Injury (TBI), ADHD, anxiety disorders, and sensory processing disorders, designers and architects can create environments that are more than physically accessible; they are cognitively and sensorially accommodating.

Furthermore, the integration of these innovative design elements into the fabric of architectural and environmental planning speaks to a larger narrative. It underscores the significant role of architecture and design in contributing to societal well-being. This inclusive approach to design extends its implications far beyond individual buildings or installations, influencing broader urban planning and environmental policies.
The incorporation of inclusive biophilic design principles represents a significant stride in acknowledging and addressing the diverse needs of the population. As the field continues to explore and innovate, maintaining a focus on inclusivity is imperative. This ensures that our built environments are not only sustainable and aesthetically pleasing but also nurturing and
supportive for all individuals, irrespective of their neurotype. By embracing the innate human affinity for nature, biophilic design stands as a powerful tool in fostering environments that bolster neurological health and well-being, paving the way for a more inclusive and empathetic approach to architectural design.

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Biophilia's Impact on Sensory Processing, Cognitive Well-Being and Neuro-Inclusion

Kay Sargent, FASID, FIIDA, CID, LEED® AP, MCR.w, WELL AP

Our brain functions are wired uniquely, and we all process information differently. This is the essence of neurodiversity. Neurotypical individuals tend to fall within expected parameters, while neurodivergent individuals process the world differently. These variances are naturally occurring in the unique ways we all think, process, feel and act are naturally occurring differences in neurocognitive functioning.

Unlike many physical disabilities, neurodivergence is not visible. Today, approximately one in five individuals globally identify as neurodivergent, forming one of the largest underrepresented groups in the workplace[1].

As designers, our challenge is to create inclusive environments for all. Understanding how environmental conditions impact individuals is critical to helping create spaces where everyone can thrive. This begins with grasping how we handle sensory stimulation and human sensory thresholds in the spaces we inhabit.

SENSORY THRESHOLDS

One of the most overlooked workplace challenges is sensory processing and our varying sensitivities to the daily onslaught of sensory stimuli. We all have different thresholds for processing sensory input, and no one is immune to the impact of sensory stimulation in the built environment. Even neurotypical individuals who fall into a predictable range of responses to stimulation are affected.



HOK's recent research has shown that "when you design for the extreme, you benefit the mean." In other words, addressing sensory stimulation and processing in built environments benefits both neurodivergent and neurotypical individuals. But what might be irritating for some can be debilitating for others. Those with more acute sensitivities to sensory stimulation tend to fall into two main categories:

- **Hypersensitive:** Individuals who prefer environments with less or controlled stimuli. They tend to dislike excessive stimuli such as loud spaces, bright lights, crowds or unwanted smells.

- **Hyposensitive:** Individuals who prefer or need more stimuli to process it successfully. They may have difficulty seeing, hearing or feeling the acute sensory details in a space. They often seek out more tactile, bolder, more active or sound-filled spaces.

In a recent survey by SensoryIntelligence2, 40% of respondents identified as neurotypical, 40% as hypersensitive and 20% as hyposensitive. This highlights the importance of addressing the needs and preferences of a wide variety of individuals when designing spaces.

BIOPHILIC INFLUENCES IN BUILT ENVIRONMENTS

Biophilia offers balance in today's high-tech, chaotic world. Natural and biophilic features can have a calming, comforting effect. Biophilic design strategies can reduce stress, enhance creativity and clarity of thought, improve well-being, boost health outcomes and expedite healing for both the neurodivergent and neurotypical. Using colors that are abundant in nature, such as browns, greens and blues, can also create a sense of comfort and calm. Many biophilic design principles that benefit neurotypical people in the workplace can also contribute to environments that are more inclusive of neurodivergence.



BIOPHILIC DESIGN ELEMENTS FOR NEURO-INCLUSION

Incorporating thoughtful biophilic elements across various sensory experiences can help create inclusive environments that support neurodiversity:

Visual

- Access to natural light and views of nature to invigorate occupants (among the most essential features in spaces)
- Incorporation of biomorphic forms from nature to create more organic settings
- Use of organic shapes and configurations that are less rigid and more natural
- Fractal patterns emulating natural elements
- Dynamic, varied, and diffused lighting Auditory
- Natural sounds instead of static sound masking (less irritating and more comforting)

Tactile

- Natural materials, such as wood, stone and moss
- Plants that enhance air quality, sound and visible control within the space
- Incorporating air movement and variable thermal flow, such as the use of fans

Olfactory

- Strategic use of natural fragrances and smells Spatial and Environmental
- Spaces that are simultaneously complex and ordered
- Elements of prospect and refuge to enable some degree of control and safety
- Bringing the outside in and the inside out
- Introducing elements of mystery, peril and delight
- Water elements providing relief for those struggling with sensory overload or deprivation

In recent years, we have gained a much deeper understanding of how environmental elements within the spaces we occupy impact our physical and mental well-being.

Biophilic

elements play a significant role in creating environments that support neurodivergent individuals while also promoting a more calming and inviting space for everyone.

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https://www.hok.com/people/leadership/view/kay-sargent/

HOK NEURODIVERSITY DISCLAIMER

Neurodiversity is a term used to describe a broad range of conditions, some of which likely will be unresponsive to design solutions. HOK's approach to inclusive design is based on our experience as designers and architects with the objective of providing a wide range of options for users with different needs. Any attempt to address the needs of neurodiverse individuals should also include review of human resources policies, implementation of technology solutions and building operations among other considerations. HOK does not represent that any design solution discussed in this article is capable of achieving any specific outcome for an individual user.

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PLANTS

plants@work

Plants of the Month

Dracaena an indoor classic with a flamboyant streak

Coll Smith with Urban Planters

Beautiful leaves in fashionable colours on a sturdy trunk: Dracaena is a statement plant with an exotic look.



Dracaena comes as a tall, full houseplant or tree; it can have more than one trunk from which its colourful leaves sprout in a range of colours from green, yellow and gold. They can also have touches of pink or red around their edges too. The different varieties offer a range of leaves too, from small, narrow and pointy to large and soft. They are easy to care for too – a plantman's dream.

Dracaena is derived from the Greek 'drákaina', a female dragon. This refers to the resin of the plant, which is bright red and explains why it is known as the dragon tree and dragon's blood plant. 'The resin is used in the paint industry. The plant is the botanical symbol of Tenerife. Icod de los Vinos is home to one of the largest and oldest dragon trees in the world called El Drago Milenario *(the thousand year old dragon).* That's a slight exaggeration, as the plant is probably between 250 and 350 years old.'

Zamioculcas zamiifolia aka the ZZ plant

Zamioculcas zamiifolia is commonly known as the ZZ plant. According to The Joy of Plants, it is not only beautiful but also 'virtually indestructible'. It has sturdy, noticeably regular leathery leaves that grow on branches that makes them look a little like feathers. Its sturdy stems are the result of special veins that store water and nutrients ensuring that it is one of the easiest plants to keep.

As proof of this, ZZ plants are easy to keep – 'light, dark, forgetting to water it' don't seem to have an adverse effect on this plant. It retains it dark green colour and grows albeit slowly.

It originates in Tanzania, Zanzibar and across central Africa where it has to tolerate long periods of dry weather alternating with torrential downpours which accounts for its tolerance of dry conditions.

Zamioculcas is a stoic type: it does not shed, does not grow rapidly and is the embodiment of stability.

These three plants were used at The Atrium, Sheffield Hallam University by Urban Planters
https://www.urbanplanters.co.uk



Peace lily – a beautiful plant with cheerful white flags



The Peace lily is a well known plant with 'stylish dark green leaves with radiant white banners or flags'; it's 'bound to steal your heart'. Colours and shapes The peace lily's white bracts often thought to be its flowers but the flowers are much smaller and appear on the tiny spike protected by the white bract. This plant is easy to care for and gives you clear signals. When it needs water, it will droop. Once you have given it water, it will visibly perk up again within an hour. Peace lily aka the Spathiphyllum to give this plant its real name, is a member of the Araceae *(Arum)* family and grows in the tropical rainforests of Colombia and Venezuela. There are over 50 different varieties of this plant which was introduced into Europe in nineteenth century. Its name Spathiphyllum is derived from the Greek: 'spath' for spoon and 'phyl' for leaves - in reference to its spoon-shaped leaf.

Symbolism

'Unsurprisingly, the peace lily is known as a bringer of peace: the white flower represents the white flag which is recognised internationally as a truce signal.'

www.plantsatwork.org.uk
https://www.thejoyofplants.co.uk

Neurodiversity and biophilic design

“Connecting to nature through horticulture at home and in the workplace is incredibly beneficial for so many of us, it helps reduce stress levels and gives us respite on so many different levels.”

Thomas Palfreyman

The BBC says1 that ‘Neurodiversity is a word used to describe the different thinking styles that affect how people communicate with the world around them. It is an umbrella term – a word that sums up lots of different things. It includes conditions like autism, ADHD, dyslexia, dyspraxia, dyscalculia, and Tourette’s syndrome.’ It also covers conditions such as brain bleeds and strokes.

‘Understanding neurodiversity[2] starts by acknowledging the broad range of cognitive variations, including Autism Spectrum Disorder *(ASD)*[3], ADHD[4], dyslexia[5], dyscalculia[6], and dyspraxia[7].

Despite their distinct characteristics, **individuals with neurodivergent conditions typically perceive environments in a manner that’s different from neurotypical individuals.** This unique way of experiencing the world can bring challenges and strengths to the workplace.’ This is how American company Natura explain it.

We can make a great deal of difference to the lives of people with these conditions
by encouraging them to appreciate horticulture generally and to notice the changes that the different seasons offer. It is also important to ensure that their places of work offer environments that embrace nature in a way that is mindful of their condition.





Improving your office for everyone
There are several ways that we can look at offices/places of work and find ways to improve the office for everyone, especially for those suffering from neurodivergent tendencies. Consider these three conditions in particular which could cause problems for staff with these problems:

- bright lighting
- noisy offices particularly those that have large open layouts with constant noise
- rigid routines

As well as the general wellbeing of these employees, we also need to consider how to make offices neurodivergent-friendly.

The biophilia factor

We know that plants in offices and other workplaces can improve the working conditions for all of us, so it is no surprise that plants can also improve conditions for neurodiverse workers too.

Apart from the joy that plants bring generally, they can also help productivity. Houseplants work from the basics of giving us something to admire in our workspace to the many reasons that research has found they can benefit us. These benefits range from improving our mental health to refreshing the air and improving our productivity. Plants@work members and Urban Planters have been explaining how sharing our workspace with several plants can help to keep our stress levels down and this is shown by many research studies.

Research has also shown that plants can refresh the air making it cleaner for the occupants to breathe; this is great to know if you are working in an office with sealed windows or in an area where the outside air is likely to be contaminated by traffic fumes.

Other studies have shown that having plants in your workplace helps to improve productivity and also influences your creativity. While these research areas might seem obscure, they have been proven several times by different researchers.[8]

Over the years research has explored the benefits of having plants in all kinds of work spaces. It has also shown how plants help to make workspaces more comfortable for everyone using these spaces, including those with problems experienced by neurodiverse individuals, whose number continues to increase and is shown as 30% of the population in some studies.[9]

As you can see, neurodiversity encompasses a wide range of differences in the way peoples' brains process information.

Stress Reduction

A lot of research has shown how including plants in your décor can reduce stress for individuals generally. For those suffering from Autism and/ or ADHD this would be particularly helpful as they typically have a
heightened sensitivity to stress and stressful situations.

Improved Concentration and Productivity

Similarly, plants help with concentration and productivity for those on the neurodiverse spectrum who find contact with nature helps.

Sound Reduction

We all know that workplaces can be noisy especially if you work in a large establishment. Using plants to reduce the noise by offering a barrier of plants that can both absorb and buffer the noise is a great help for this group of people.
There is no doubt that by having plants in and around your buildings will help in various ways. Urban Planters can assess how and where to use plants in your building for the benefit of everyone, especially those with a neurodiverse condition.





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[2] https://blog.naturahq.com/how-plants-help-create-a-neurodivergent-friendly-office

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Celebrating neurodiverse superpowers

How our environment can help us cope with day-to-day challenges.

“For me, biophilia is vital to my survival.”

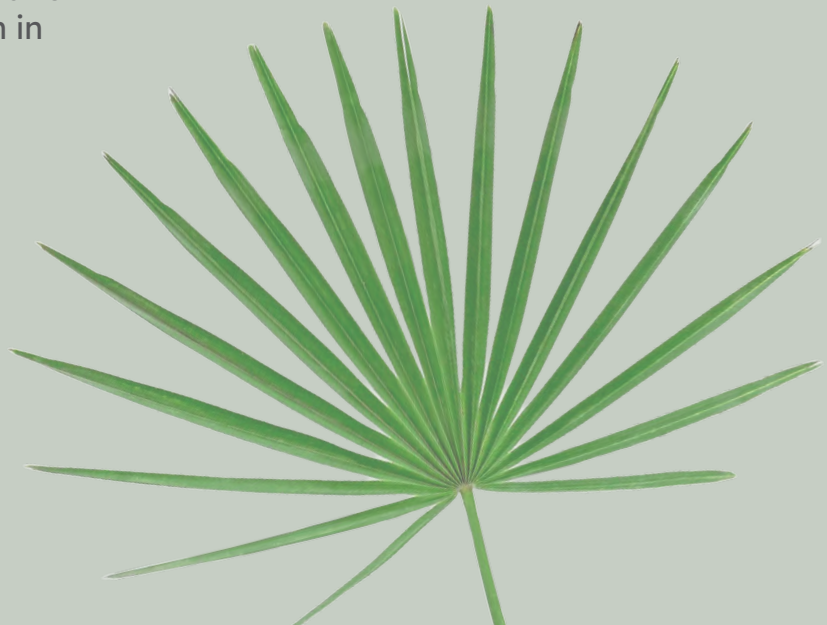
Lara Cowan

Neurodiversity Celebration Week means March is all about celebrating those with neurodiverse superpowers; product leaders like Steve Jobs, entrepreneurs like Richard Branson, top actors like Orlando Bloom and Keira Knightley, influencers like Stacey Machelle, athletes like Simone Biles and us, those of us who are chugging away making it work for us too.

When we are neurodivergent, we struggle with our executive function including emotional regulation. This often plays havoc with our professional and personal lives. However, it is most definitely not a measure of how bright we are, it doesn’t negate how highly capable in other areas of our lives we might be, but it can lead to horrible stress, shame and a reduction in our capacity to undertake daily tasks.

Nature has been my natural anti-depressant and constant ally for the last three decades and through Botanic Shed I work to help more people experience the ‘green cure.’ Discoveries about my brain in recent years, have been pivotal in helping me create a better life.

There are many ways to approach the treatment of neurodivergent symptoms so, although I personally have not taken medication *(yet)*, I support the point here made by Barbara Ingersoll, Ph. D. “Asking if you should use medication or a complementary therapy to treat ADHD is like asking whether you should eat fruits or vegetables, you often need both.”



Using real, personal experiences, I am going to briefly outline the types of pressure that the brain can cope with, even in the shadows of, or under the spotlight of 'cognitive impairments' and 'divergences' when supported by nature.

I will also introduce you to the viewpoints of two other women on the impact of nature in the lives of neurodivergent people that they look after.

Just two years into University, I started a family which shortly afterwards shattered catastrophically. It left me quite scarred and shocked. I then struggled for 20 years with undiagnosed post-traumatic stress disorder (PTSD) alongside ADHD and a significant number of autistic traits.

Lucky me, I had nature on my side in many forms. The setting of that traumatic relationship was a tropical green paradise, and I was able to retreat to my parents' house in a small village in Oxfordshire, where I had gardened through my childhood. I could work outside and walk for hours a day. Gardening I think has been a massively effective medicine for me. There are several studies supporting the use of gardening to rehabilitate people with a whole range of mental health symptoms including the use of gardening programs as an intervention to increase children's ability to delay gratification which helps us with our erratic impulses. The garden offers a setting for optimum learning relationships described as something waiting to be discovered, a lack of fixed rules, and an interaction that is changing and adapting daily (Mendizza and Pearce 2004).

Throughout my twenties and thirties, I experienced high-level anxiety and bouts of feeling low, but I spent so much time outdoors, it was my love and my medicine. I saw patterns in the trees that comforted me. I needed them. My outdoors time was and still is a non-negotiable part of life. I needed her most when I was in employment, facing the challenges of expectations of attention to detail that I couldn't meet, or interaction with confrontational or dishonest people. My anxiety spiked painfully in these situationS.

However, there came a breaking point when recently, in my early forties, life threw more challenges my way. So huge that my coping strategies started failing. My physical health declined considerably. My Mum thought I had cancer. The NHS discovered that, I had been coping with undiagnosed post-traumatic stress disorder *(PTSD)* for two decades. This 'stress disorder' had obviously been compromising my executive functioning (focus, memory, impulses) and gave me an aura of vulnerability which made everything quite a struggle. At the same time, I was assessed for ADHD by my GP and given forms to complete to get a formal assessment *(forms, which in typical style I have not yet completed).*

When my sister got diagnosed with ADHD, *(which she would never been at all aware of had her therapist not been curious as to why she was finding life so hard,)* she quite literally said "I think you've got the wrong sister." What she meant was that my ADHD traits were so obvious. At the time we didn't know how

well-hidden ADHD could be in people like her. She is a thoroughbred organizer, practical minded, but her brain was actually crushing under the pressure. ADHD often is hidden or expressed in depression in women.

Anxiety, depression and constantly feeling stupid and that we are not fulfilling our potential are typical experiences for people with ADHA. These have been themes of my life and nature has been a key medicine against depression and anxiety.

Plants indoors, images of plants and trees, breathwork and qigong outdoors, walking and gardening are all bottled up in my own figurative medicine cabinet. My routine plant checks help me slow down and then take that slower speed to planning my workday and my interaction with humans who aren't so forgiving of mistakes or spontaneous outbursts. ASD traits are also ameliorated by time spent in nature. A teacher interviewed in a Natural England Report stated: What I have found working with autistic children is that they just are different when you take them into nature, to how they are in a classroom. When we are in school, it's very contrived, and they know they will have to do things that they may not be very comfortable about doing, but when they go into nature e.g. woods or fields I think they feel much more relaxed, they seem to understand the environment, they feel more comfortable – maybe because they are much freer to roam and explore, and to be involved in the sensory aspects of nature. Most other interviewees in the study also considered personal well-being as one of the primary benefits for autistic children of engaging with the natural environment including: helping them to relax, feel more comfortable with their surroundings and have heightened sensory experiences."

Mauline Vernon, an ADHA specialist at ADHD in Balance Ltd in London, provides training and consultancy to organisations and families, teaching psychoeducation to help them to understand and subsequently manage the symptoms of ADHD.

"We recognise the vital role that nature plays in supporting those with ADHD, our training programmes and coaching interventions incorporate many aspects of nature, inclusive the practice of mindfulness in nature. Using breathwork can assist in supporting the executive functioning skills such as managing impulsivity. Breathing in naturally occurring scents will support the brain functioning of those who have ADHD, whether in a wooded area full of trees, or your garden, clients benefit from immersing themselves with any of the scents they notice in the natural environment around them. Whether pinecones, flowers, bark or soil all contribute to regulating the heartbeat and relaxing the nervous system, which is fundamental in supporting the working memory, aiding concentration, regulating impulsivity and managing anxiety."

Sara-Louise Ackrill, who lives with ADHD and Autism and is voted Top 80 UK Neurodiversity Evangelists 2023 is a Social Entrepreneur and founder of Wired Differently. She says; **"Nature takes its own time. I can't speed it up or slow itdown. So, nature is a reminder I don't –**
and shouldn't – control everything. So as

an autistic person, I get chance to reframe what progress and productivity mean.I am forced to gain some perspective on what I'm expected to achieve day to day. And as a person with ADHD, if I'm going to struggle with getting dopamine hits, it's when I'm in the countryside *(without the instant gratification of city life)* that I have to regulate myself without the dubious coping strategies of spending, jumping in an out of Ubers and trying the 'latest' whatever it is. I am from Devon and when I go back, I'm reminded of a different pace, life feels like it can be paused for a while, so I can catch up. And as much as I love man-made construction and am uplifted by architecture for example, there is something really grounding and reassuring in nature. That feeling we all need sometimes that nature is far bigger than any of us. And that's quite a transpersonal experience. Nature is a reality check. Quite humbling. And it highlights how we need to do better as people. As a neurodivergent person who by nature thrives on intensity ... this is appealing to me. Or maybe it's being neurodivergent that means I interpret this in the first place."

It is scientifically proven across numerous studies, that nature is good for brain development and excellent for stress busting.

Researchers, at the Universities of Sheffield, Westminster and Virginia, found that a greener front garden can make you feel happier, more relaxed and closer to nature. Their four-year scientific research project spear-headed by the Royal Horticultural Society added ornamental plants to previously bare front gardens in economically deprived streets of Salford *(Greater Manchester).* Before the experiment, only 24% of residents had healthy cortisol patterns. Over the course of the year following the plantings, this increased to 53% of residents having healthy cortisol patterns.

In "The Cognitive Benefits of Interacting with Nature," a study published in the journal Psychology Today in 2008, researchers showed that, when participants walked in nature or viewed pictures of it, as opposed to doing the same with an urban environment, their directed-attention abilities improved. Basically, getting out into nature helps you focus more on specific tasks, and this works better than, say, running on a treadmill or playing indoor basketball. Even looking at pictures of nature can help improve focus.

Having nature in our environment helps us to focus (even on the boring tasks) and we have less cortisol spikes which are the 'interventions' neurodivergent people so desperately need, as a part of a holistic system of approaches to help us feel calmer and achieve our goals. Our brains have means that are out of reach to those without neurodivergences. Yes, we can think faster, see more clearly, and create more prolifically. But we can also fail faster and make mistakes more often than others, get into debt, rush into relationships, and seek out dopamine hits that distract us *(impulsive, addictive shopping has most definitely been a downfall for me).* So, we need to understand our brains, know what works and structure an environment around us that supports our cognitive function. Because who knows where the mind can take us if it's healthy and happy.



The biophilia hypothesis, which says humans are innately attracted to nature, and therefore exposure is beneficial for the development of a brain is far more than a hypothesis. For me, biophilia is vital to my survival.

https://www.botanicshed.com

Photography: photographer and visual artist, Oliver Barnett



> For me,
> **biophilia is vital**
> to my survival.

Harnessing Nature: The Impact of Green and Blue Spaces on Neurodevelopment

“Unlock your brain’s full potential: how Nature’s Wonders boost your mind.”

Dr Owen Wiseman

Long has the intricate relationship between humans and nature been a subject of fascination and study.1 In recent years, a growing body of research has clarified the profound impact that exposure to nature – both green spaces like forests and parks, and blue spaces such as rivers, lakes, and oceans – can have on neurodevelopment and cognition.

The Foundation of Neurodevelopment and Cognition

Neurodevelopment is the process by which the nervous system, including the brain, develops and matures. This process is influenced by a combination of genetic and environmental factors, including air pollution. Urban areas with plenty of congestion and traffic put children at risk as the pollutants pass from mother to child.[2]
Cognition encompasses the mental processes involved in gaining knowledge and comprehension, including thinking, knowing, remembering, judging, and problem-solving. These complex processes are foundational to how humans interact and interpret the world around them.

The Role of Green Spaces in Neurodevelopment

Green spaces, such as parks, forests, and community gardens, provide essential opportunities for physical activity, relaxation, and social interaction.
In multiple countries, visits to urban parks increased during the COVID-19 pandemic as people sought safe areas to connect with nature.[3, 4, 5]





These environments can significantly impact neurodevelopment, particularly in children. Studies have shown that children with regular access to green spaces have better attention spans, reduced symptoms of Attention Deficit Hyperactivity Disorder *(ADHD),* and improved cognitive outcomes compared to those with limited access.[6,7,8]

One of the mechanisms by which green spaces may benefit our minds is by calming the activity of our amygdala, the emotional 'control centre' of our brain.[9] Those in greener environments are also more resilient to negative emotions, showing lower brain activation in the prefrontal cortex.[10]

Natural settings have been found to lower cortisol levels; a hormone associated with stress. This reduction in stress facilitates a more encouraging environment for learning and cognitive processing. Additionally, the complexity and richness of forest and water may stimulate sensory and cognitive development by offering a wide range of stimuli not found in urban settings.

Blue Spaces and Cognitive Function

We often hear about green space and time with forests, but we seldom hear about the power of our local streams and rivers. The sight and sound of water are intrinsically calming, and time spent in blue spaces fosters a profound sense of peace.[11]

For children and teenagers, being near water can significantly enhance overall behaviour, offering special benefits. Skipping stones across a lake or splashing in a stream promotes a healthier mental and emotional state. Time around water has also been shown to improve behaviour overall and can be particularly beneficial for those diagnosed with a disability.[12]

Neuroplasticity and Nature Exposure

Exposure to nature not only supports cognitive function and development but also promotes neuroplasticity – the brain's ability to form new neural connections throughout life. This adaptability is crucial for learning and memory, and it shows that our environments can shape our brains in significant ways.

Engagement with natural environments stimulates sensory, emotional, and cognitive processing, all of which can encourage neural growth and reorganization. Studies have even shown that kids who spend more time with parks and gardens have more grey matter in their brains.[13]

So, when we're out in nature, we're not just relaxing or having fun – we're giving our brain a much-needed workout!

Practical Implications and Future Directions

The evidence supporting the positive effects of nature exposure on neurodevelopment and cognition has practical implications for urban planning, education, and public health. Cities can be designed to incorporate more green and blue spaces, making nature accessible to more people. Schools and educational programs might integrate outdoor learning environments to support learning and development. Furthermore, public health initiatives could promote nature-based activities as part of a holistic approach to mental health and cognitive well-being.

By incorporating more natural elements in the places where we work and play, we can enhance our brain's performance and clarity.

Dr Owen Wiseman is the founder of HealthWISE Consulting, a multi-interest organization focused on supporting the health of Canadians through direct patient care and helping business clients invest in the wellness of employees with programs that work. He is also an advisor to an international phytopharmaceutical company and was awarded Ottawa's Best Health Educator of 2022 for his clinical work and passion for promoting equitable access to nature. He sits on various boards and committees that raise awareness and provide programs that help get people outdoors and in nature.

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Nature Connection & Neurodiversity

“Sometimes nature works when all else fails.”

Tansy Jane Dowman

When I first started connecting with nature, I was amazed by its profound impact on my mental health and well-being. Despite trying out other wellness avenues like yoga and meditation, I often felt frustrated and impatient, battling against boredom and an overactive mind that demanded attention.



Initially, my walks in nature weren’t intentional well-being activities; they were simply a chance to get some fresh air and fulfil my daily dogwalking routine. But a noticeable shift began to occur during those walks. Intuitively, I began to slow down, remove distractions, and simply notice my surroundings more than usual. Unlike the previous frustrations, I felt engaged, tranquil, and deeply present as I observed the environment and invested attention through my senses. So powerful was this discovery that it led me to build a career guiding others into nature to discover their own well-being connection.

In 2021, a late diagnosis of ADHD prompted me to learn everything about it – symptoms, challenges, nuances, and others’ experiences. Reflecting on my early nature connection days with this fresh perspective, I now understand why it had such a profound impact. I recognise clearly the way Nature is a direct support for many traits and challenges faced by Neurodivergents navigating a neurotypical world.



Neurodivergents tend to be highly sensitive
people both physically and emotionally, which can present many challenges when faced with the often chaotic, noisy, and demanding energy of the human world. Natural spaces therefore offer a peaceful sanctuary, allowing those sensitivities to tune into the environment without feeling overwhelmed.

Sensory overload, for example, is a common experience and challenge among Neurodivergents. This happens when one or more senses are overstimulated, resulting in uncomfortable interference and triggering feelings of anxiety, overwhelm, and loss of focus. Yet, when immersed in nature, these heightened senses become a gift, allowing a deeper connection with the environment and providing natural calming relief.

Instead of causing interference, the multi-layering of sensory input in Nature is a joy to receive as you enjoy the soothing sounds of birdsong, notice the gentle swaying of branches in the breeze, and breathe in the earthy or floral scents that you pass by.

Emotional dysregulation is another identified challenge. It's something that we will all struggle with at some point in our lives, but for Neurodivergents, it can feel more intense, happen more frequently, and be more difficult to manage.

Emotional regulation involves managing the nervous system and discovering







Calm state within the body, facilitating a deeper connection with the present moment. Studies in the nature connection practice of Forest bathing have shown that spending mindful time in Nature can reduce blood pressure, heart rate, and the stress hormone cortisol. When these three things lower, a sense of ease and calm has space to grow, allowing you to feel re-centred.

The natural world offers a very grounding atmosphere to immerse yourself in, particularly being among trees that stand tall and strong and are deeply rooted into the Earth. The simple act of sitting against the trunk of a tree can bring about a huge sense of peace and relief, offering a feeling of support you can freely lean into.

Nature connection can be transformative for everyone but is particularly profound for Neurodivergents. Providing space and tranquillity away from the frantic pace of the human world. Through mindful sensory and grounding exercises, individuals can regulate their nervous systems, reduce stress, and cultivate a sense of calm and ease. As we continue to recognise and harness the therapeutic benefits of nature, we pave the way for a more inclusive and supportive environment for Neurodivergents to thrive and find solace in the natural world.



Founder of Tansy in the Wild
Outdoor Life Coach & Nature Connection Guide

www.tansyinthewild.com



Designing for Neurodiversity: How Urban Planters Can Help

Sensory input directly impacts focus, stress levels, and cognitive energy.

Biophilic design provides a practical framework for creating neuroinclusive spaces - balancing visual stimulation, acoustics, natural textures, and restorative zones so every mind can perform at its best.

At Urban Planters we translate neuroinclusive research into functional, living installations.

At Urban Planters we translate neuroinclusive research into functional, living installations.

Book a Biophilic Review:
Our Biophilic Review provides a structured, on-site assessment of your physical workplace through a neurodiverse and biophilic lens.

Sensory Mapping:
Evaluating visual noise, natural light, plant density, and acoustic pathways to pinpoint high-stress areas.

Restorative Zone Planning
Identifying underused layout pockets that can be transformed into quiet, low-stimulation recharge spaces.

Actionable Blueprint:
Delivering a clear report with prioritised recommendations tailored to your building, culture, and budget.

Talks & Educational Workshops:
We host expert-led talks designed for leadership, facilities, and HR teams. These sessions break down how natural elements impact brain function, offering clear strategies for supporting neurodivergent colleagues through intentional environment design.

Interactive Engagement Events:
Hands-on events bring the benefits of biophilia directly to your workforce while building awareness around sensory wellbeing.

Tactile Planting Workshops:
Guided sessions where staff create personal desk plants or terrariums, encouraging mindfulness and hands-on connection with organic materials.

Collaborative Space Audits:
Guided walkthroughs that invite employees to share how they experience their working environment and where design improvements are needed most.

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Nature is not a place to visit,
it is home.
Gary Snyder





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