NEURO-INCLUSIVE ARCHITECTURE AND DESIGN

by Jessica Meredith

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INTRODUCTION

Diversity is increasingly celebrated as a fundamental and important aspect of our societies. Those individuals and organisations that are valuing and embracing our differences are not only benefiting as a result, but also improving the lives of us all.

One diversity movement that has accelerated in recent years, but is not yet fully understood or integrated by mainstream society is neurodiversity. In particular, it has not yet fully penetrated the realm of architecture and design. However, this intersection of neurodiversity and the built environment has huge transformational potential for not only neurodivergent people, but for everyone.

By understanding and incorporating the principles of neuro-inclusive design, architects and designers can contribute to a more equitable and accessible world.

This paper was written by Jessica Meredith on behalf of modulyss. Jess Meredith (she/her) is an expert in neurodiversity and inclusion, igniting transformative conversations through her work running Differing Minds. With a passion for reframing the narrative around neurodiversity using storytelling and her own lived experience, she offers dynamic, interactive talks that captivate and inspire audiences.

Known for her unique perspectives, Jess' thought-provoking presentations have left a lasting impact on the likes of Accenture, The Adecco Group, Capgemini and The University of Suffolk. With a commitment to empowering everyone to embrace differences, Jess is at the forefront of promoting neuro-inclusion in the workplace, in education and in our societies.

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UNDERSTANDING NEURODIVERSITY

Neurodiversity refers to the natural variation in our brains. The neurodiversity paradigm challenges the notion that certain neurological conditions are disorders or deficits, recognising them as diverse and valuable aspects of human cognitive and sensory functioning.[1] Key principles of neuro-inclusion include acceptance, respect, and accommodation for difference in our neurology.

All of our brains are unique, however some are more fundamentally different than others. For the purposes of the neurodiversity movement it is useful to consider people in two groups; those in the neuro-majority and whose needs are mostly catered for in society, and those in the neuro-minority and whose needs are often not catered for in mainstream society.
There is no universally accepted terminology but many people refer to those in the neuro-minority as 'neurodivergent' and those in the neuro-majority as 'neurotypical'. It is thought that up to 20% of the population are neurodivergent.

Neurodivergent people include those who have the following differences, however this is not an exhaustive list.

- Autism
- ADHD (Attention Deficit Hyperactivity Disorder)
- Dyslexia
- Dyspraxia
- Tourette's Syndrome
- Dyscalculia
- Developmental Language Disorder

Each difference brings its own unique strengths and challenges, and acknowledging this diversity is a fundamental aspect of inclusive design.

THE IMPACT OF BUILT ENVIRONMENTS

The built environment plays a significant role in the lives of individuals with neurological differences. The design of physical spaces can either facilitate or hinder their well-being and participation in society.

The needs of neurodivergent people are often overlooked in the design and development of public spaces, schools, workplaces and more. However, designing inclusively can yield many benefits. Among other things, neurodivergent people can excel at creativity and innovation, attention to detail and pattern spotting, and problem solving.[2] As a society we can all benefit from these skills if we support those who possess them.

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1 Singer, Judy. (1998) Neurodiversity: The Birth of an Idea.

2 "Neurodiversity at work: a biopsychosocial model and the impact on working adults", National Library of Medicine, last modified September 30, 2020. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7732033/. / "Research Shows Neurodivergent Individuals Excel Creatively", Creativity, Psychology Today, last modified December 20, 2022, https://www.psychologytoday.com/gb/blog/eating-disorders-among-gender-expansive-and-neurodivergent-individuals/202212/research-shows.

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One critical aspect that requires consideration in design and development of the built environment is sensory differences. For many neurodivergent people, heightened or diminished sensory perceptions are common, and architectural features can significantly impact their sensory experiences. Factors such as lighting, acoustics, spatial layout, texture and the shape and function of the furniture can significantly impact their experience of a space. These factors can either soothe and enhance, or overwhelm the senses.

For instance, some autistic people may struggle with sensory overload in spaces with harsh fluorescent lighting, while some people with ADHD may find it challenging to concentrate in noisy and open-plan offices. On the other hand, well-designed spaces that account for sensory sensitivities can have a profoundly positive impact, promoting calmness, regulation and focus.[1]

DESIGN PRINCIPLES FOR NEURODIVERSITY

Creating neuro-inclusive spaces involves a set of design principles rooted in universal design concepts. Universal design strives to make spaces usable by everyone and considers the different ways we all think, learn, play and work. It means designing spaces that are accessible, adaptable, comfortable and welcoming for all by building their needs in from the start.

This is a step forward from the majority of current thinking which is to retrospectively accommodate neurodivergent people's needs. These accommodations are often required because their needs have not been considered in the initial development of design.

The following key design principles aim to make environments accessible and inclusive for everyone, regardless of neurological differences.

Sensory design: Architects and designers should carefully select lighting, colour schemes, materials, and acoustics to create environments that are comfortable and accommodating to a wide range of sensory needs.

Wayfinding and orientation: Clear wayfinding systems, including signage and navigation aids, are vital to help neurodivergent people navigate complex spaces with ease. Providing clear visual cues and paths can reduce stress and enhance independence.

Flexibility: Designing flexible spaces that can adapt to different needs and preferences is essential. Consider movable furniture, adjustable workstations, and versatile layouts that allow users to customise their environment.

Inclusivity: To ensure the success of neuro-inclusive design, it is imperative to include neurodivergent individuals in the design process. Their insights and feedback can provide valuable perspectives on the usability and comfort of a space.

1 "Experiences of Sensory Overload and Communication Barriers by Autistic Adults in Health Care Settings", National Library of Medicine, last modified March 9, 2022, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8992902/.

Human-centric: Focus on designing and building spaces with people at the heart. Consider their specific needs, and use empathy and creativity to meet their needs and create optimal use of the space.

By adopting these design principles, architects and designers can create environments that are not only aesthetically pleasing but also functional and supportive for all individuals.

SENSORY INCLUSION

Sensory processing describes the way the body receives, interprets, organises and responds to incoming stimuli through our senses.

There are eight senses that make up our sensory system.[2]

- **Sight** - the visual system uses the eyes to receive information.
- **Sound** - the auditory system uses the ears to receive noise and sound information.
- **Taste** - the gustatory sense uses the tongue to receive taste sensations.
- **Smell** - the olfactory sense uses the nose to receive information.
- **Touch** - the tactile sense is the ability to interpret information coming into the body by the skin.
- **Proprioception** - the ability to interpret where your body is in space and where your body parts are in relation to each other.
- **Vestibular sense** - the gravity or balance sense.
- **Interoception** - sensing internal signals from the body such as pain, hunger, or the need to go to the toilet.

We all have different sensory needs and sensory profiles. For each of our senses we can be either under-responsive or over-responsive.

In order for a space to be universally accessible from a sensory perspective, it's important to design by creating options and choices for people that enable them to control the sensory input they experience.

Here are some recommendations for spaces that are accessible to everyone, regardless of their sensory profile and that give individuals the power to choose their sensory experience.

Lighting and Colour

- Include adjustable lighting options such as dimmers so people can change and control the lighting in different areas.
- Don't use harsh fluorescent lighting or bright white walls or equipment as this can be overwhelming for some people.
- Include good access to natural light.
- Provide areas with sensory lighting for an immersive environment such as bubble tube lamps, reflective balls, L.E.D. light strips, mirror balls and fibre optics.
- Consider the placement of the light, whether flooring may act as a reflecting surface and potential sources of glare.
- Opt for mostly soft colours and use highly stimulating, bright colours sparingly and intentionally.

2 "Evaluating Sensory Integration/Sensory Processing Treatment: Issues and Analysis", Frontiers in Integrative Neuroscience, Frontiers, last modifed November 26, 2020, https://www.frontiersin.org/articles/10.3389/fnint.2020.556660/full?s=08.

Furniture

- Allow sitting to be more active and varied; consider including rocking chairs, wobble chairs, exercise balls and sofas.
- Introduce standing desks.
- Make use of adjustable, ergonomic furniture.

Zoning and Separate Spaces

- Include different zones or separate spaces for different sensory needs.
- Build in somewhere people can go if they need to stand, move, or escape to be quiet and reduce stimuli.
- Provide opportunities for people to reduce sensory input but still be in the space with others.
- Consider including sensory pods where a user can control temperature, music and lighting; create a space for people to recharge.
- Include smaller spaces in larger ones to allow for a choice of environment in the same space.
- Use lighting to support zoning and include the ability to turn off or dim lights in different zones.

Sound

- Include acoustic insulation in floors, ceilings and walls.
- Consider having sound proof booths.
- Have the option for users to experience a variety of acoustic levels; some people will want a quieter space and others may want sounds to engage them.

Textures

- Use a mix of textures to support a variety of sensory needs.
- Consider including a space for those who regulate through tactile experiences such as a texture wall.

Outdoors

- Include a sensory garden with a choice of experiences - try plants that look, smell and feel different.
- If you are building an indoor space, create an indoor sensory garden and therapeutic area.
- Bring the outdoors in – embrace the strong relationship between nature and some neurodivergent experiences.

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WAYFINDING AND ORIENTATION

Wayfinding and orientation are crucial aspects of designing neuro-inclusive spaces. A well-thought-out wayfinding system can make the difference between a user-friendly environment and a confusing, disorienting one. It is especially important for neurodivergent individuals who may rely heavily on clear spatial cues and guidance, and thrive in a predictable, repetitive environment with clear boundaries.

Clear signage: Utilise clear, legible signage with easy-to-understand symbols and text. Ensure that signs are placed at eye level and well-illuminated.

Consistency: Maintain a consistent design language for signage and directional cues throughout a space. Consistency fosters predictability and reduces confusion.

Contrast and visibility: Consider contrast and visual hierarchy to make important signs and directional cues stand out. Ensure that information is easily visible for users with varying visual abilities.

Tactile and auditory cues: Incorporate tactile cues, such as textured flooring or surfaces, and auditory cues, such as audible signals or announcements, to assist individuals with sensory or cognitive differences.

Sensory comfort: Balance the sensory experience by avoiding overwhelming visual or auditory stimuli in wayfinding elements. Ensure that the environment remains calm and non-disruptive.

Adaptive and multimodal wayfinding: Recognise that not all individuals navigate spaces in the same way. Provide multiple modes of wayfinding, such as maps, digital apps, and tactile paths, to accommodate diverse preferences.

Flexibility: Users may have different ways of processing information. Allow for flexibility in how users interact with the wayfinding system. For example, provide both visual and auditory cues.

Error recovery: Ensure you plan for contingencies. If a user makes a wrong turn or misinterprets a sign, design the space so that they can easily correct their path.

Efficiency: Make the wayfinding system efficient and logical, minimising the need for unnecessary decision-making. Create a flow that guides users seamlessly through from one point to another.

Minimise redundant space: Overly redundant space can lack inspiration. Using space to engage people, and providing more than meets the eye, can make them want to explore and move through.

Transition zones: Include transition zones as introductions to spaces to help people adjust as they move from one space to another.

Environments need to make sense and wayfinding is a powerful tool to enable that and to ensure users feel safe. By incorporating these considerations and principles into the design of a wayfinding and orientation system, architects and designers can create neuro-inclusive spaces that work for everyone.

SUSTAINABILITY AND NEURO-INCLUSION

Sustainability and neuro-inclusion both aim to create spaces that are not only functional but also considerate of human needs and well-being. A focus on this intersection can play a really key role in ensuring spaces meet the current and long term needs of all of humanity.[1]

Material selection: Sustainable materials can contribute to neuro-inclusive design such as through the use of eco-friendly materials like non-toxic paints, natural lighting solutions, and acoustically-friendly surfaces. These not only reduce environmental impact but also create healthier, more comfortable spaces for individuals with sensory sensitivities.

Energy efficiency and comfort: Efficient heating, cooling, and ventilation systems not only reduce carbon footprints but also contribute to maintaining consistent and comfortable environmental conditions, which are crucial for many neurodivergent individuals.

Biophilic design: Incorporating elements of nature into architecture, such as green spaces, natural light or views of nature, not only promotes sustainability but also has positive effects on mental health, reducing stress, and improving cognitive function for all individuals, especially those who are neurodivergent.

Flexibility and adaptability: Building adaptable and flexible spaces that can easily be repurposed or modified can reduce waste and accommodate diverse needs, making them more inclusive and sustainable.

Collaboration between sustainability experts, the neurodivergent community and design professionals has huge potential. It's an area with limited exploration to date, but with incredible opportunity to create world class, innovative and forward thinking designs of the future.

CASE STUDIES

There are some great examples of successful integration of neuro-inclusive design principles in architectural projects. These showcase the positive outcomes and experiences of users in a neuro-inclusive space, illustrating the tangible benefits of such design approaches.

Dublin City University - As part of a broader focus on becoming an autism-friendly university, DCU is ensuring its spaces are neuro-inclusive. They are introducing concepts such as "escape spaces" near the green areas of the campus with swings for those seeking movement, and sensory pods with options for light adjustment and music.

Google has introduced meditation chambers as part of an internal Immersive Spaces Series project. The experience in these chambers uses augmented light and sound sequences on the haptic and psychic fronts. There is also an entry component where a user transitions from the noise of the office into the chamber.

1 Hutson, James & Hutson, Piper. (2023). Neuroinclusive workplaces and biophilic design: Strategies for promoting occupational health and sustainability in smart cities. Global Health Economics and Sustainability. 1. 26-36. 10.36922/ghes.0549.

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Barclays have undertaken a fantastic project to make their Glasgow campus their most sustainable and inclusive, including a focus on making it as inclusive as possible for autistic and neurodivergent colleagues. They have included quiet rooms, the ability to book specific desks based on lighting preferences and toilet facility options with paper towels for those who are noise sensitive.

New Struan School in Scotland has been designed with autistic students at heart. It uses colour-coded carpet to determine classrooms, calming colour schemes and curved walls for a calm and easy to navigate environment.

Shrub Oak International School in New York has been designed specifically for autistic students and their sensory needs. There is colour contrasting between the walls and floors to aid space orientation, an avoidance of harsh lighting and noise-reducing carpet.

CHALLENGES AND CONSIDERATIONS

The benefits of neuro-inclusive design are clear, however few spaces are designed to accommodate the diverse ways we all think, communicate, experience and interact with our surroundings.

Some common barriers include limited awareness and understanding of neurodiversity and neuro-inclusive design, resistance to change and perceived budget constraints. Overcoming these challenges requires advocacy, education and collaboration.

Advocacy: Advocating is an integral part of neuro-inclusive design, especially during this time when it is not yet at the heart of the built environment. We need to challenge each other to reconsider the limitations and boundaries of the 'norm' when it comes to design of spaces.

Education: Often neuro-inclusive design is only an expense if it is addressed as an after-thought instead of as a core design principle upfront. It can also be a competitive advantage, counteracting the budget challenges. This is especially true when neurodiversity is celebrated, not just accommodated for.

Collaboration: To create truly inclusive spaces, architects and designers should actively seek collaboration with neurodivergent people and neuro-inclusion experts. Consulting with those with lived neurodivergent experiences can provide valuable insights into the specific needs and preferences of the potential users of the space you are designing and building.

It is crucial to recognise these hurdles and find ways to address them to ensure the successful and necessary integration of neuro-inclusion in design principles.

MOVING FORWARD

In conclusion, neurodiversity is a natural part of human diversity, and the design of our built environment should reflect and embrace this reality. Creating neuro-inclusive spaces that consider the needs and preferences of neurodivergent individuals is not just a matter of ethical responsibility but a means of enhancing the quality of life for all.

By embracing the principles of universal design, sensory design, and flexibility, architects and designers can contribute to a more equitable and accessible world.

It is our hope that this inspires professionals in the field to incorporate neuro-inclusion into their designs and make a positive impact on society.