STREETS FOR DIVERSITY

Rees Jeffreys Road Fund

EXPLORING HOW NEURODIVERGENT PEOPLE EXPERIENCE STREETS

Royal College of Art

THE HELEN HAMLYN CENTRE FOR DESIGN

INTELLIGENT MOBILITY DESIGN CENTRE

“Trees help teach humans how to treat them. Right now there’s all different types of trees in this park. Some fat ones, wrinkly ones, tall ones, ones that are covered in what we might call our warts and things. And yet we appreciate all of them. We love all of them. We adore all of them. But we’re not like that with humans, are we?”

- Elinor Rowlands, a participant in walk and talk research

1. EXECUTIVE SUMMARY

TO CONTENT

Streets belong to everyone, but while we all have different experiences of our streets, neurodivergent people's response to our public realm can be attuned to different, often subtle, sensory and perceptual qualities in their surroundings.

To help us understand these experiences, and through conversations with road safety, transport planning and neurodiversity researchers, we carried out a short qualitative scoping study that used participatory design approaches to explore how neurodivergent people experience our streets.

We heard from around 50 neurodivergent citizens and professionals who took part in a range of activities: walk and talks', online surveys, interviews and a creative workshop which together explored the challenges and opportunities found on our urban streets.

We found that, for many of our participants, the streets were indeed places that were unpredictable and often uncomfortable, although many used a range of strategies to make journeys as pleasant as possible. They spent a great deal of time and energy planning their journeys in order to avoid discomfort but still found challenges from speed, noise and pollution; from a lack of pedestrian space, seating and segregation; and by issues of claustrophobia, sensory overload and safety.

Design opportunities include a focus on increasing the safety of our streets for pedestrians and cyclists, by increasing separation between transport modes, by providing more space on the pavement and by thinking more carefully about the multi-sensory environment that makes up our public realm. Street art, green and blue spaces and texturally rich and socially inclusive spaces need to be integrated into our streets, not only to soften the edges of our urban jungles but also to support the sensitivity and focus on experience that neurodivergent people bring to society.

While this research was limited in scope and did not engage with all forms of neurodivergence, it shows that there are different ways to design our streets with neurodivergence in mind. Next steps include identifying places to co-design and trial real world 'neurodivergent-friendly' junctions and streets and to codify these design interventions so that neurodivergent perspectives are included in the design of all our futures streets and public realm.

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2.
WHY WE DID THIS

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Aim and Context

Streets are places that belong to everyone. They not only help us to get around, but also define and shape our neighbourhoods and form an important foundation for our everyday lives. They can have a big impact on the way we live, how active we can be, how well we know our community and affect our overall well being.

There is very little knowledge on how neurodivergent people experience streets and this scoping project aims to bridge this gap in research and hypothesise that our current streets and public realm may exclude by design some of us that are neurodivergent.

This project adopted an inclusive design methodology to enable neurodivergent people to participate in the study and express opinions as they experience streets and the key challenges and opportunities. Based on the research the project has identified 12 design opportunities, which are considered to be important when designing or adapting a street with neurodivergent people in mind.

Terminology and People Involved

Neurodiversity/ Neurodivergent

Neurodiversity is the overarching term to recognise all types of brains and neurologies. As a population, we are all neurodiverse, whether we live with a neurological condition or not. Neurodivergent describes a neurology that is not what most people would consider 'normal'. Someone who is neurodivergent is not neurotypical. The term "neurodivergent" has initially been used for the autistic population. However, the notion has recently been broadened to include attention deficit hyperactivity disorder (ADHD), dyslexia, tourette's syndrome, and dyspraxia.

For this project, the research team have used the word 'neurodivergent' and refers to an individual person whose brain functions in ways that are different from what's considered 'normal'. It is apparent that many neurodivergent people have different views on what terminology reflects their condition, and it is important also to recognise that this varies from person to person.

"Neurodivergent is a term used to describe people who have been labelled as divergent from the typical. So neurodiversity includes typicality and neurodivergent is stating your divergence from that typicality. "

- Dr Damian Milton

The Partners

Rees Jeffreys Road Fund

Rees Jeffreys Road Fund

This project is funded by Rees Jeffreys Road Fund. William Rees Jeffreys was a visionary whose life work was creating better, more attractive, safer and more accessible roads and streets, he established the Road Fund in 1950, which is to encourage and promote better and safer roads, through design, engineering and aesthetics, leading to enhanced experience for everyone, their objectives are:

- To assist the provision of educational activities and access to studies that would lead to improvements in the design of highways and adjoining land.
- To promote engagement, co-ordination and the interchange of ideas between the designers and manufacturers of road vehicles, the land-use planning profession and highway engineers.
- To encourage and promote improvements to the design, efficiency and safety of highways.
- To conserve and enhance the visual and environmental quality and diversity of the roadside environment.

Royal College of Art
THE HELEN HAMLYN CENTRE FOR DESIGN

The Helen Hamlyn Centre for Design

The Helen Hamlyn Centre for Design (HHCD) at the Royal College of Art (RCA) undertakes research and design projects with external partners that contribute towards improving people's lives. The Centre's approach is inclusive and interdisciplinary, and to date the HHCD has worked on a range of projects involving a span of people with neurodiverse experience such as autism, dementia and dyslexia.

Royal College of Art Research Centre
INTELLIGENT MOBILITY DESIGN CENTRE

The Intelligent Mobility Design Centre

Established from a renowned centre of excellence in automotive design, the IMDC's mission is to create a new mobile future for social, environmental and economic good through design and research. The IMDC is an interdisciplinary centre exploring, experimenting, prototyping and evaluating new mobility and automotive transitions via the synthesis of design and research methods.

3.
WHAT WE LEARNT

TO CONTENT

Insights

The research methods used in the project generated a rich and nuanced collection of insights about how neurodivergent people experience streets, which is organised into 14 key insights, presented with photographs taken by or instructed by the participants. The following is a summary of the insights:

The first insight is that being neurodivergent is a way of being (1), and is an integral part of life and participants are often very self-aware of the way they do things..A journey can often feel very intricate and overwhelming. Some participants need to “get through it”, others find the streets enjoyable. Occasionally, the street is a destination not just a means for a journey, e.g. a place to take a stroll. Preparing for the journey is a complex thing to do (2), which may sometimes be so exhausting that people cancel their journeys or avoid going out.

Navigating is multi-layered - making decisions on way-finding, timing, transportation mode and sensory environment - with many decisions made during preparation.. Way-finding is often difficult and the street is passively unhelpful (3). It also involves intricate decisions on getting timings right with transportation and arrival time.

Waiting can be daunting (4). An unexpected delay in transportation can make space for intrusive thoughts, flashbacks and/or trauma. Grounding through sitting is often necessary (5) for people who feel overwhelmed, in pain or just need to take a break en-route. It helps to be seated whilst waiting. It can be surmised that seats are places that are designated for non-movement so there is a lot less to attend to (even in the busiest of all streets) and does not draw attention.

Walking is the preferred way of getting around (6). (e-)Cycling is preferred over walking if pain is involved. A taxi is a short-cut to way-finding. Open and airy public transport is also appreciated.

Layering on top of finding the right direction to the destination, the sensory environment is another layer to navigate (7). Decisions have to be made around crowds and sensory environments, as well as physical conditions. With the exception of smell, heat and pollution, for every sensory stimulation that some participants find overwhelming, there will be some participants who find the stimulation important to stay focused with. Claustrophobic situations compound sensory discomfort (8). Narrow pavements create frustration and annoyance (9) - a pedestrian walking in the middle of the pavement was enough to enrage a participant. Certain sections of pavements certainly did not lend themselves to people with walking sticks or had a slope which means things on wheels (e.g. prams) might run off like water. Many people spend their time coping with the streets (by planning around rush hours, using back roads to avoid crowds, wearing sunglasses, headphones and clothes to create the right level of comfort), instead of enjoying them.

In a dynamic and diverse street, unexpected events can be expected. Unpredictability is a strong theme. To understand design opportunities, it is important to acknowledge that unpredictability is frightening because of its consequences (10). Dealing with unpredictability has two paths: familiarity and resilience (11). Familiarity is learnable. Resilience is what gives participants the freedom to not over-think before the journey. There is, however, one situation where clear rules and perfect communication is needed - conflict points. A conflict point is a word used by one participant to describe a location where vehicles, cyclists and pedestrians have to contest for space and/or right of way. These include crossings, shared streets and around road works and constructions. Safety at conflict points must be teachable to everyone (12).

Green and blue spaces are replenishing (13), creating space for heat, pollution, sound and smell to disperse and dissipate. But like all spaces, it has other consequences that could negatively impact neurodivergent people, for example, dogs - according to some of the participants. The joys of street experience are not to be overlooked (14), throughout the insights, it can be seen that over stimulation for some can be enjoyable to others.

1. Being

Being neurodivergent is an integral part of being and participants are often very self-aware of the way they do things. There is more to the street experience than navigation, waiting, way-finding, sensory environment, safety, unpredictability and / or familiarity and resilience. It is also a part of life. The following quotes are by neurodivergent people which describe their different experiences and ways of being on the street.

"I think all autistic people need methodologies to survive ways of being, ways of living, ways of managing barriers, ways of reducing barriers. We call them strategies. But I think strategies put too much pressure on autistic people when they fail or they're not able to keep up that strategy. Or that strategy doesn't work some days, some days when it works, other days it doesn't."

- Elinor Rowlands, a participant in walk and talk research

"I would like to not block things out, but I can't really. Because people need to do stuff in the streets, so I might as well adapt to what the streets are, and try not to let my autism dominate myself and other people around me, which happened a lot to me as a kid. [I wish] that I could just stim for a few seconds or something like that. I used to have fits and meltdown quite a lot. Trying to act normal is exhausting. I don't give them a chance to come out at home. I try to keep them down as much as possible. I am worried about having an outburst. I used to have outbursts as a kid, so I learnt to keep that stuff down."

"Any type of overwhelming experience can have the potential to derail me for hours and impacts how I feel about myself and my ability to navigate the world."

"If I'm outside for too long, or if I go out too many times a week, I would feel very exhausted and overwhelmed. I would need days without 'outside' so that I'm not exposed to all the stimuli and anxiety. I sometimes also feel sad that such an easy and everyday thing like going outside and walking on the street could be so challenging for me. I also would think that, how am I able to function in society in the long term due to my struggles with going outside."

"I think I chant when I have to get somewhere quickly. And then I take photos when I don't have to be so quickly. [...] I also video myself. Not my face, but just sometimes chanting (poetry), which is stimming, verbal stimming, in order to leave the house or get to places. I might video the activity. [...] I think I was told off so much at school for stimming and actually it is the main thing I turn to when doing art."

"... the problem was I would have terrible autistic burnout. So I kind of hid my sleeping the way people hide, like, drinking. I would have some days where I just couldn't get out of bed, I was so exhausted. So the taxi's have aided my weight gain but have also stopped the autistic burnout from being as bad. [...] I'm autistic with ADHD, so I have this motor in my head that I need to do, do, do, do, do."

2. Preparing for the journey is a complex thing to do

Preparation is about researching and choosing a route that has the right level of stimulation, appropriate timings and memorising anything that might be helpful, e.g. landmarks en route. As well as engaging in personal rituals, accounting for energy levels, packing items necessary to create sensory comfort for the anticipated day ("Mary Poppins bag"*) and reflecting on past experiences in similar areas to identify any missed considerations.

Decisions on timing itself are a significant part of planning - rush hours, school hours and sunny days could mean overcrowding.

"Over-think" is the word that is used by a group of participants to describe the process of preparing for the journey - over-think to the extent that they might cancel the journey.

"I saved my walking ability for this, you know. I took the bus instead of cycling. I'm really happy to do it [...] but I have to mentally plan the walking I'm going to do in a day."

"I research possible roadblocks (also traffic jams) and the weather situation for the whole time I suspect that I will be out. Also I check my handbag if I packed everything I might need - headphones, earplugs and sunglasses normally being the minimum. And I sit down and actively try to recall the last time I have been in this area or a similar one and what I missed back then."

"I make sure I feel confident with my route before I leave so I don't have to loiter in an uncomfortable place when lost."

"I need predictable experiences so cycling can be very challenging when I have unexpected issues with the route. Google and most other route planners automatically adjust for closures on most main roads, but not for cycle routes."

"I either do my doctor appointments in the middle afternoon or late afternoon so that I don't have to bump into the school kids or deal with rush hour traffic."

"I cannot go to busy public streets or spaces without advance planning for any potential hazards that might overstimulate me and I will find streets incredibly challenging if I don't have earphones or loop plugs to use."

"Sunglasses, headphones, breathing exercises, positive mantras to myself, advance checking for any notifications of unexpected changes in the area such as a public event.""I put on headphones and pick a 'travelling outside' song, put on this ointment that makes me feel more refreshed and awake, eat a mint candy."

In practice, researching involves the use of Google Map street view, terrain view, journey planner and generally the internet to find external information. Memory is also used to inform decisions - past experience can lead to particular beliefs that are important to account for.

* Not every participant packs a "Mary Poppins bag" and some would leave with minimal belongings.

3. Way-finding is difficult and the street is passively unhelpful

When way-finding on the streets, participants reported getting lost due to, for example, left-right orientation issues. As well as, road closures and finding it hard to follow signage and visual cues. It is as if the streets have been passively unhelpful.

Relying on navigation apps on phones has been mentioned frequently. The trouble with mainly relying on the phone is: the phone might run out of battery and/or, even worse, get snatched.

Getting lost can be overwhelming. The potential to or actually missing out on the planned minimal waiting time for transportation and doing purposeful things could be “derailing” and impact confidence, self-esteem and relationships.

“I always look at famous landmarks to help me when I’m on the streets.”

“I also suffer from impairments in my feet and legs, which makes it even more challenging to process all the hoops and evaluate at the same time what is the best way to take.”

“I think taking taxis has also helped me to not get lost because I get lost a lot. And I get bad panic attacks. And what I would do before, when I take the tube, is get there like an hour before so that I’d make sure where I was and then I’d sit in the cafe and wait until it was then my time.”

4. Waiting can be daunting

Waiting is uncomfortable, for participants who want to “get through it (the journey)”. Especially in situations where unwanted attention from people could be involved and the waiting duration is uncertain (like in traffic jams or when train delays). This means additional planning for some - additional effort to minimise waiting time and/or provisioning plenty of time to travel.

There are places that are more comfortable for waiting - waiting in fresh air is better than waiting in claustrophobic places.

Waiting in places where it is easy to keep occupied or distracted (e.g. play games on phone) is also helpful, especially for people who have experienced trauma, flash-backs and/or have intrusive thoughts.

“I had a panic attack [...] because there was a long traffic jam [...] I had to get off the bus a little bit (and sit at the bus stop to play music/videos in low volume from his phone) and get on another one. [...] If I were on the tube and have a panic attack, I wouldn’t know what to do.”

“I feel good when I have a space to wait (for the bus for instance) where people cannot walk around me. Tend to stand up against a wall or alike.”

“If there’s a train strike that means delays, and it means you have to spend long spells on a platform and it does feel kind of daunting for me, especially if it’s like during rush hour.”

5. Grounding through sitting is often necessary

A seat needs to be where you need it.

Sitting down is often a necessary way to create head space, to replenish energy or to stop intrusive thoughts from preventing you from completing your journey. It can help with tiredness or exhaustion, stress or anxiety, to alleviate pain, to ground yourself and/or calm down after a panic attack. Half of the participants proceeded to sit down for part or all of the Walk and Talk.

Sitting places that we observed turned out to be wherever the next visible seat is. It can be a quiet bench in a local park or a bench by a busy A-Road (some participants like noise), right in the middle of actions, fumes, pollution, noise and all along a major road that links regional towns and cities, or at an almost empty cafe/ outdoor pub bench if it is towards the start and end of a walk and talk journey. For one participant with chronic pain, she would sit on the pavement or lean on a cycle stand, even if on a wet day.

"I used to sit on the floor outside (a supermarket in a quiet location) because there wasn't anywhere to sit and I can't stand for long periods of time."

"When you're talking about neurodiversity or if you're talking about autism, you're also talking about fibromyalgia and chronic pain, chronic fatigue."

Sit down to focus on distraction.

Some participants told us that they wouldn't stop their journey - "get through it"- notably where trauma, intrusive thoughts and/or flashbacks were mentioned.

Instead, being able to sit down in transportation was a way to help them to distract themselves from intrusive thoughts or flashbacks while still being able to make progress on their journey.

"I don't like going on public transport during rush hour because, you know, it's so crowded, you never have a place to sit [...] then you can't really (play a game on your phone or something). So like, you know, if you're on the train and you get from one place to another, you can always play a game on your phone or something and you know, it kind of just takes away whatever uneasy feelings I have."

6. Walking is the preferred way of getting around

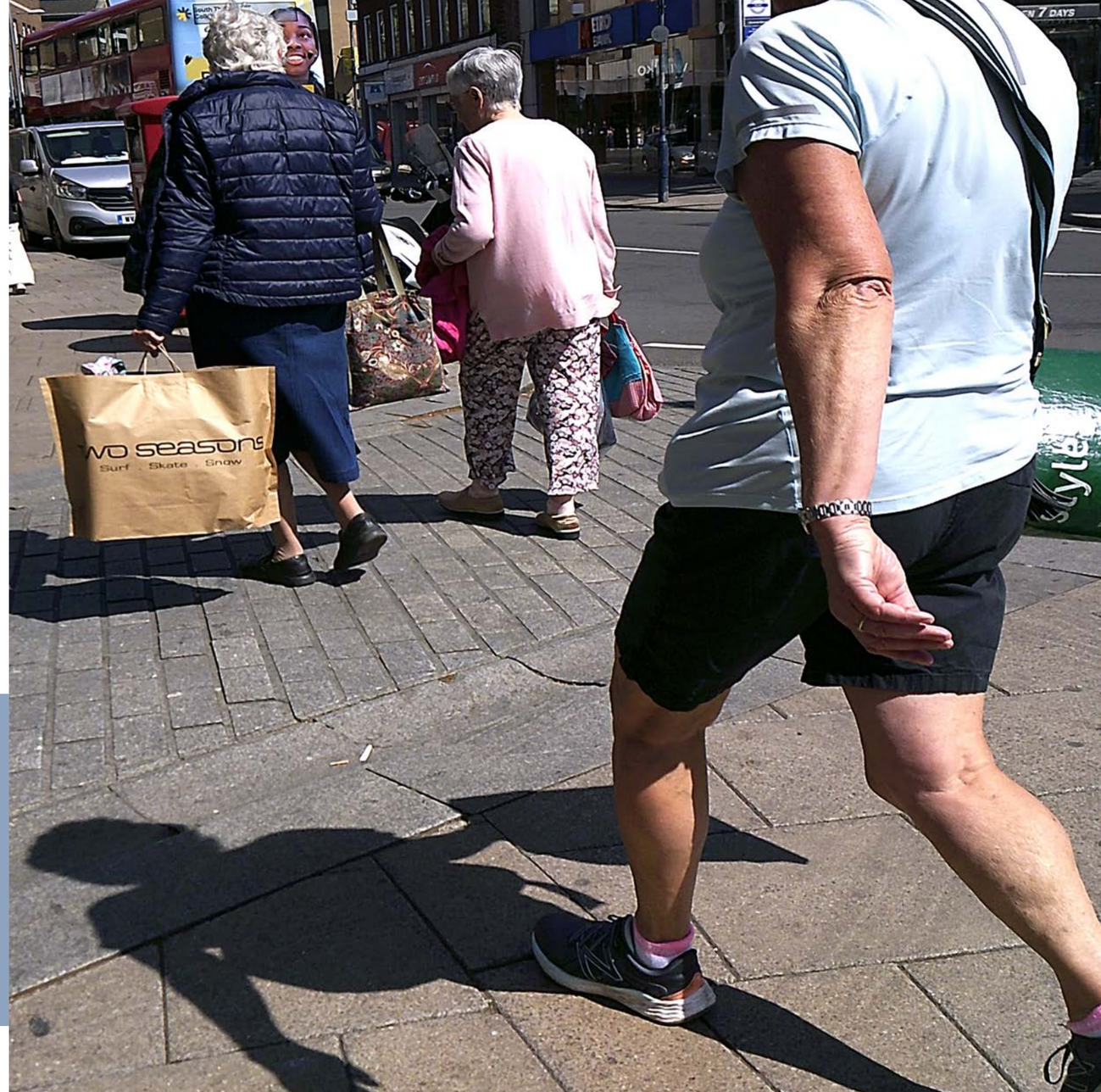
Walking is preferred by participants, unless pain or physical conditions are involved, then cycling or taxi is preferred. Specifically, if it would take the same time to walk or to get on public transport, walking is preferred. It is also seen as a healthier option.

Bicycles and taxis are seen as a short-cut to autonomy and safety. Taxi is also used as a tool to fix/avoid getting lost, physical and mental exhaustion. However, taxis don't carry child seats, thus not friendly for disabled parents.

The Tube is often claustrophobic, hot and muggy, especially in summer. When used, participants preferred the Elizabeth line, DLR, and overground. Buses can also be trigger points due to heat, crowded conditions and noise, although the introduction of electric buses has reduced noise, as some participants mentioned. Buses also lack sufficient space to avoid conflict especially for disabled parents or those with prams.

"In winter when it's darker, say 5 p.m., I feel like, oh, I shouldn't really be taking the bus home. I should be taking the taxi cause I don't want to be waiting in the dark for half an hour (for outside London bus service) and then walking home for half an hour in the dark."

" I have an e-bike, and it's my primary way of getting around. [...] I've got a freedom pass [...] It was more like cycling was good for my mental health. So important to me just to like get some exercise and also being able to have the autonomy [...] I find it a lot less stressful than having to like change and wait for trains, and it's a lot more predictable because if there is an obstacle like a car or something in front of you, then you can see it immediately. You know what the problem is. And so then you've got a sense of how long it's going to take because you've got like an overview of where you are."



7. The sensory environment is another layer to navigate

The sensory environment includes smell, crowd, heat, pollution (fumes and rubbish), sound, sight, lighting, touch and texture - in reality, they are not so separable and one sensation might trigger another sensation to be more noticeable.

With the exception of smell, heat and pollution, for every sensory stimulation that some participants find overwhelming, there will be others who find the stimulation important to stay focused, e.g. messy visuals and noise.

While the majority of the research participants seek to avoid or zone out the over-stimulation, e.g., by taking the back roads and/or use of earplugs, headphones, sunglasses, clothing, etc., some seek sensory stimulation to stay focused and to belong.

People navigating indiscernible grey and busy-ness. All sorts of wheels are negotiating the same terrain.

Smell, crowds and re-routing

Smell is not as mentioned as often as crowd, light or sound as a source of over-stimulation, however, every specific mention of smell is related to a re-route, and crowds too can stop participants from accessing certain streets.

Smells put one participant off and would make her reroute away from pedestrianised streets with small shops and restaurants/takeaways where people hang out.

"If there are overcrowded streets I can experience very physical symptoms of anxiety which include chest tightness, tense shoulders and shortness of breath, which can be difficult to manage in such busy areas."

"I do actually like it (busy high street along an A-road) because I have ADHD and [...] I'd find the bit in [...] mainly residential (area), [...] so boring and it was hard for me to concentrate. [...] I definitely don't speak for autistic people but I like stimulation [...] for me, I find [...] people on the street and noise and stuff [...] keep me in the present. Otherwise my mind wanders off."

Heat and pollution

Heat and pollution are often overlooked in the discussion of the sensory environment. It is somehow related to cleanliness. Cleanliness also is important to some workshop participants. There are sensations that form street experience albeit unarticulated - one workshop participant has mentioned the sensation of a rainy day (air pressure and humidity).

Several participants from Walk and Talk took photos of rubbish (bits of plastics on the road, in the river) or remarked on fumes from traffic as defeating the point of a walk.

"So I have walked past [gym air vents] a few times and they have been hot enough, that's a bit gross. Um, because I've got my headphones in and I don't notice it until I walk past and I feel the heat, because I don't hear the noise. If it didn't have my headphones in, I'd probably not walk so close."

"I like to walk and talk but can't do this easily on a street with cars as I'm tuned into the traffic noise and fumes. Much more draining than walking and talking in quiet green space."

Lighting

Lighting creates contrast and atmosphere.

Overly bright or unevenly spaced lights and/or frequent shifts between light and dark can be dizzying.

However, the decorative lighting around traffic and traffic lights should be very carefully considered as confusion (not merely distraction) can compromise safety - although opinions differ depending on context and people..

Decorative lights are nevertheless enjoyed by some and lit shop signs are used as a cue to location.

"Sharply contrasting patterns (even dark grout against pale bricks) are disorienting. Walking past railings with the sun shining through them is also very difficult and makes me dizzy."

"Lights from oncoming vehicles, particularly when they come through a row of trees - the flashing can be really hard on the brain (also a real issue on the train if there are no shades on the window)."

"Christmas lights can be challenging. I find it harder to cross the road as I can't tell with all the lights from Christmas lights, street lights, shop lights, car lights and then being able to focus on the colours or the traffic lights to know when to cross."

"I don't go, 'Oh, there's a flashing light over there. What's that?' Unless I think, oh, it's an orange flashing light, maybe I need to pay attention to it."

Sound

Noise from traffic and road works are frequently mentioned by participants as overwhelming. Although sometimes traffic is not noticed and sometimes it is liked.

Sudden loud sounds, such as from unforeseen road works and sirens, can trigger concerns or panic related to a sense of safety. Loudness is a subjective perception.

Far away sounds can be heard as loud and clear as a nearby sound and sounds played out loud from people's mobile devices in a bus can trigger a panic attack with one participant.

Equally, the lack of sounds, for example, from bicycles and micro-mobility modes, can be overwhelming. Sound is a piece of information about what is approaching/leaving.

"Streets and roads can be scary because of sudden traffic noise and difficulties judging safe distances and when it is okay to cross where there are no lights."

"I like noise. It's just that for this (walk and talk) shouting over the traffic would be stressful."

Sight

It has been noted that the sense of sight was rarely specifically mentioned, beyond relating to lighting levels and business (messy visuals). The reason is unclear, perhaps it has been subsumed into other sensations and situations like roadworks, construction sites and hoardings and contributes to feelings of open space, etc.

Touch and texture

Touch and texture need to be further explored. A number of participants use stimming as a means to manage stress and one created a ‘stim ring’ and visited textile shops for relief. The idea of bringing more texture into our streets was discussed but not resolved.

“If I’m somewhere very busy, I look for the blank spaces on the tube in London. I’d look between the posters or at the ceiling or floor.”

“I find messy visuals really distracting.”

A photo of scaffolding in front of small shops.
Paraphrasing the participant: I hate scaffolding. It’s everywhere to make money.

8. Claustrophobic situations compound sensory discomfort

Claustrophobic places or situations (for example, created by busy activities on narrow pavement) intensifies the feeling of being oppressed, and potentially compounding the discomfort of hot temperatures, smells, pollution, crowd, noise, and/or trigger sensory overload.

"Quite often these buses are running. So they're really hot when you walk past. They smell really bad because of the pollution and quite often there's like people crossing in both directions [...] and it feels quite claustrophobic. [...] You feel the pollution. [...] I think it's the very narrow pavement. And also up here you can see the path is closed. [...] It just feels quite oppressive."

"It (traffic noise) feels quite quiet and even the traffic feels quite distant, although it's right there [...] here (across the river from the traffic) it smells cleaner, it feels cleaner, um, which in turn makes it feel calmer, I think. [...] Although obviously we can see a lot of traffic."

9. Narrow pavement creates frustration and safety concerns

People walking in the middle of the footway enraged one participant and annoyed others. What kind of pavement do we have such that walking in the middle of it alone enraged people? Perhaps too narrow and too hard for even two or three people to negotiate, illustrated by the experiences from the Walks and Talks research activities. It should be noted that the Walk and Talk locations were already places that some participants were comfortable with (non-triggering), so the problem with the pavement is likely to be much greater than observed.

In addition, sloped pavement, uneven pavements and/or blister slabs have been mentioned by or observed to have a destabilising effect for participants who are “wobbly” (self-described), use a walking stick or have prams to manage.

On the pavement of a busy A-Road, a passer-by physically and literally pushed past a pedestrian, where 2 researchers and 1 participant stood on a fairly wide pavement next to a row of busy shops.

In a quiet residential street, either the participant or researcher had to walk over patches of soil or onto the carriageway.

In busy city centres, passers-by have been walking onto the bicycle lanes (not sloped in comparison to the pavement) and, on other occasions, onto the carriageways to bypass us.

In a road towards the river, there was a pavement section that was barely wide enough for a participant with a walking stick to walk through, it is cobbled and sloped too making it difficult to navigate. It definitely did not lend itself to anyone lending a helping hand from the same pavement.

10. Unpredictability is frightening because of its consequences

Unpredictability is strongly undesirable but it is the consequences that are most unwanted by the participants.

Because it will take up energy. Because you don't know how you might react in the face of unexpected situations. Possibly, showing behaviours that are seen as unacceptable and attract unwanted attention. Sometimes, it means getting into dangerous situations and not being able to judge the risk and adjust in time.

The quotes below illustrate the different meanings of the word unpredictability.

"Unpredictability. Like, you don't know what's going to happen then, that you're kind of just speculating certain outcomes in your head [...] You know that sort of, um, nervy feeling of unpredictability and speculating, you know, what ifs and various possibilities and you kind of don't want to get too drawn into that. [...] I think just sometimes you could be panicky, especially if it's since you start predicting an outcome, it might not be okay."

"So this is a one way system, the whole of Kingston [...] And that's what people think of when they're in Kingston. There's this weird exception. [...] Buses can go that way (left) and that way (right) on a single lane [...] So when you're crossing that you wouldn't predict a bus to be coming from that way, going the wrong side of the road."

Unwanted attention is also experienced when waiting. It can also be experienced even if there is no particular unexpected event, which could be related to trauma. Trauma is an experience that has been brought up by several participants.

"I guess you kind of just don't want to be the centre of attention, like on the street falling over. Then you probably have lots of people looking in your direction. That could be quite and that could be quite daunting for me [...] it's (about) not drawing attention to myself."

"I hate that feeling of people stopping in their cars or like they're waiting in traffic and they're looking and like people look at you [...] I feel like people are looking at me, which I hate, makes me feel uncomfortable [...] I know I'd do it if I was on a bus, I'd look out the window. [...] It's probably an anxiety thing, a safety thing."

11. Dealing with unpredictability has two paths

Creating Familiarity

To de-risk unpredictability with predictability, unambiguous rules and perfect communication has its merits at conflict points. In practice, to de-risk unpredictability, familiarity is often created through routine and rehearsing routes (mentally or physically). Familiarity is learnable.

Routines for some are about going to the same places, using the same routes. For others, it's about having a network of routes, knowing the alternatives. Familiarity is created also through the use of phones, clothings, headphones - to create sounds (including music) and sensory environment that feels familiar.

Creating Resilience

No amount of preparation and planning could anticipate every possibility in dynamic and diverse streets. Creating resilience on the street creates freedom from unpredictability whilst familiarity aims to contain unpredictability.

Resilience can be created, for example, by providing for sensory stations and advice on the streets.

During the workshop, there was a group of participants who shared their experience of over-thinking the journey to the workshop, to the point of wanting to cancel. They came to the conclusion that a solution was to create a shop on the streets that provides them with things that they forgot to bring- more water refilling and phone charging points. To provide for what over thinking did not cover. Resilience is what gives participants freedom to not over-think before the journey.

Reliance on predictability can be a source of stress

The side effect of addressing unpredictability through counting on reliability is that it sometimes backfires. The stress of needing to get back onto the same plan or timing - especially when the route involved a lot of preparation.

"...if you use the street often enough and then you get used to it, then yeah, it just kind of becomes a bit more... pleasant [...] Because you kind of know what to expect and know where you are [...] so I figure it's just more the more familiar I am with then, you know, the less kind of daunting it feels. So I'm not like just alone with my thoughts [...] worrying about everything."

"I misread the map and I ended up doing 4174 steps of actually a walk of 300 steps from the station to the hotel (on a work trip in Edinburgh) [...] the internet was really bad on my phone [...] So I was like ringing up my friend, who is also autistic, and I said 'I am so sorry but it's not 5 minutes, I've been walking for 20 minutes and I'm really hot and I don't understand.' "

"... If you have been that certain street in a while and then there is something different about it [...] it's nothing really that kind of deters me from walking down it [...] there are some streets where [...] certain short cuts are taken (away), then there are roadworks that are kind of in the way. So you kind of have to take a long way round and that's a bit difficult, but you know, you just learn to manage [...] (it's difficult) just because it takes longer to get to get back to plan the time."

12. Safety at conflict point must be learnable

What is a conflict point?

Conflict point is a word used by one expert to describe a location where vehicles, cyclists and pedestrians have to contest for space and/or right of way. Such can be crossing points, or around construction sites and other places where it is no longer clear how not to avoid getting run-over.

Over the next couple of pages, a conflict point has been illustrated - as observed during one Walk and Talk with a participant.

On the pavement, the cycle lane stops and starts. By design, the cycle lane is on a trajectory to impact the blister slab section in front of the pelican crossing. Cyclists and other electric-powered micro-mobility drivers can either continue on the pavement or on the road. At the other end of the crossing is a traffic island with 2 sections of missing bricks - the participant surmised that it was scraped off when a vehicle swerved into it. It is designs like this that make people angry.

In this crossing, the participant and researcher (we) observed a cyclist cycling along the cycle path. We heard dinging and saw a father and a child coming out of the shopping mall (behind where the pram is in the photo) and the cyclist cut in front of them. The father and child missed the green light and proceeded to cross at the red light as they were clearly expecting to make the crossing if it weren't for the cyclist. Conflict is designed into this junction.

The cascade of danger & shared spaces

A participant articulated their perception of the streets: motorist above cyclist and other electric micro-mobility modes, who are above pedestrians. It is this hierarchy that inflicts danger onto the next level and leads to irresponsible behaviour.

There are participants who found alternative ways to cross the road by walking, for example, between moving vehicles ('you just have to be facing the cars') or by using the cycle path instead of the pavement because it is smoother and flatter.

The conflict points and places of danger then become the shared street -a large "free-for-all" crossing.

"You're piling on the danger to the next [...] They've created that now, a hierarchical system for everybody using the roads, and the bicycle is seen as above the pedestrian. And it does need to be seen as, you know, responsible. [...] They don't get prosecuted if they knock someone down dead. They're getting away with actual murder at the moment [...] like cyclists without brakes [...] the sport cyclists like for Olympic racing."

"Pavements aren't as high as they used to be as they keep resurfacing the road and the road surface gets higher so now car tyres which are bigger than before can more easily drive on the pavement."

Crossings and the necessity of a green man

Some participants stand at the edge of the pavement waiting to cross or have other ways to cross. One participant would stand at least a metre from the carriageway and cross a pelican crossing only when the green man shows, and has specifically attributed this to dyspraxia (Dyspraxia means people cannot judge distances and speed correctly). The green man at a crossing is the judge to rely on.

Experts also mentioned that making right hand turns while driving is difficult for people who find it hard to judge speed and distance from both directions.

"I prefer the crossings where the green man is in front of you so you can see it the whole time you're crossing. I don't like the ones where it is next to the button you press. You have no idea if its still green once you start crossing."

"...if there's no Green man, I am 100% anxious about crossing that crossing. Any kind of intersection where you've got to judge a gap and then you've got to walk, that's like my worst nightmare. And I spend like 10 or 15 minutes working out when to cross. So it's really essential to have a green man for me, even a zebra crossing."

"Heart palpitations, eyes all over the place, overstimulate in order to take everything in to try to be safe. Following all the moving traffic and people at once and not processing it properly."

Learning the safe use of the road

It is particularly frustrating to make an effort to learn how to safely use the road independently, but end up being in positions that feel dangerous and not being able to adjust in time.

Navigating the crowd can be triggering but navigating motorists, cyclists and other electric mobility modes can be fatal.

Colourful crossings, which were criticised by the experts, were also seen as a problem by a participant: "The whole thing (a crossing) should just be clear and safe. There is no beauty over function in this." Learning the safe use of roads has been made difficult by "beauty over function", by exceptions and over-stimulation.

But its also important to recognise that learn-ability alone does not make a street safe. It can also be made safer by reducing vehicle speeds, by high quality and regular crossings and refuge islands and by simplifying crossings so people can make decisions one lane of traffic at a time.

"Decorate the lamp posts. Like the lamp posts could be rainbow. You know what I mean? Just not the safety features, that's all. Just anything other than the bits to save your life."

"It's good to have someone who understands the challenges with me. In particular when crossing the road, which I find difficult, especially when it's noisy."

"... Because of the ASD, she, my daughter, just doesn't see danger [...] We need to be able to teach children that black and white crossing. If I told my daughter that a rainbow means that you can cross, that's applicable here and only here. So what if she saw a rainbow somewhere else and she thought she could cross it?"

13. Green and blue spaces are replenishing

Green and blue spaces are often mentioned by participants as more relaxing.

Blue spaces in particular created a desirable distance from heat and pollution. Walks or sitting in parks were often mentioned.

This builds on earlier insights around sensory environments, pavement issues, walking and claustrophobic places. These green and blue spaces are more open, less hot and less polluted, less crowded and they help to reduce noise and smells from traffic.

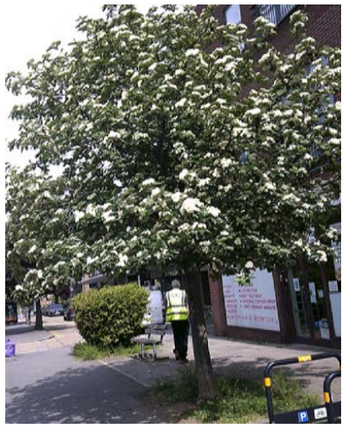
Planters, trees and people's front gardens are often the subject of participants' photographs.

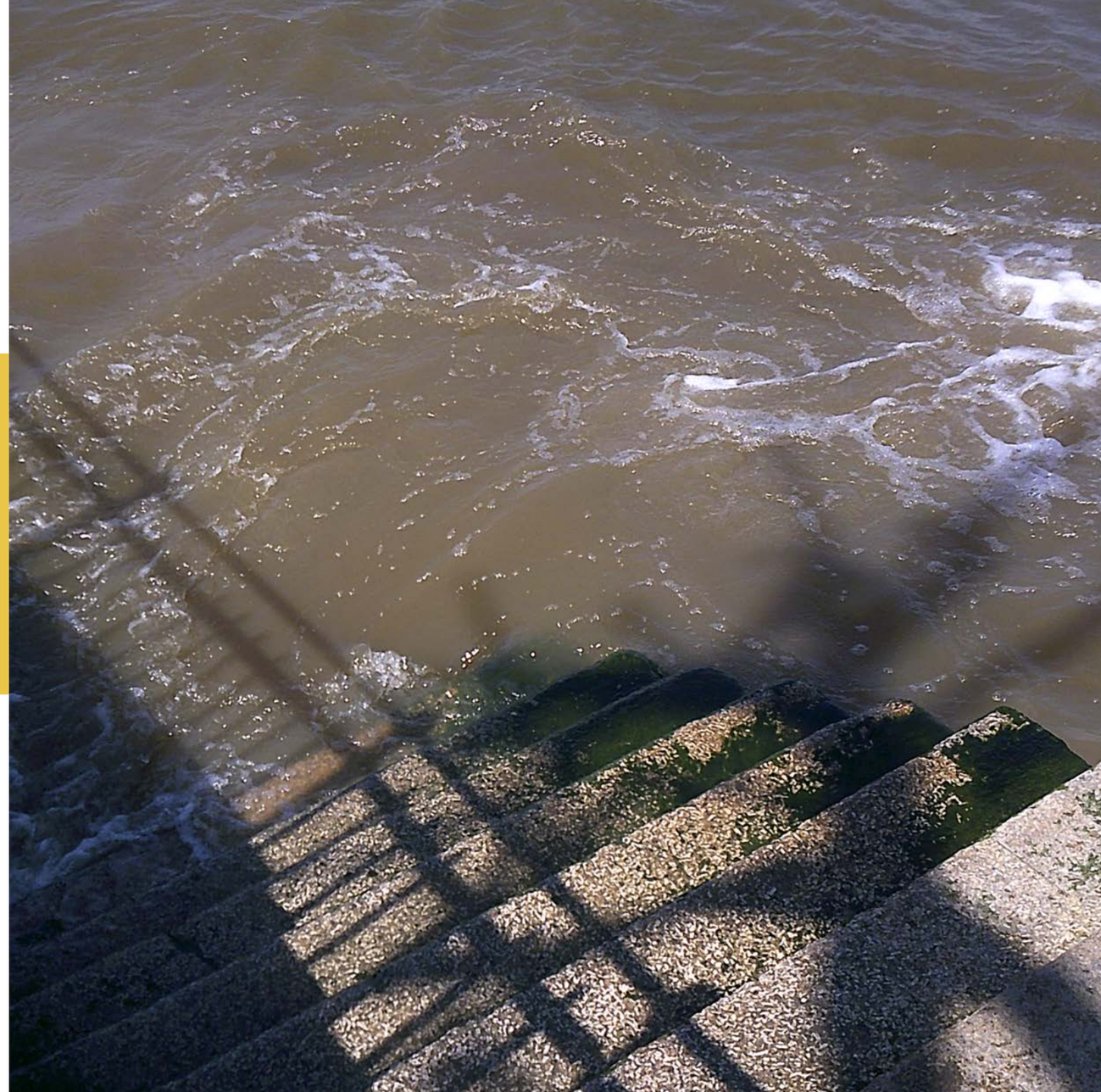
We took a nice walk via a park, as photographed. The walk and talk was a good opportunity to walk, after not being able to walk much since pregnancy.

"Large pavements where the road is separated with natural planters. Calming and takes the stress away from walking next to the road. My kids don't stay on the pavement very well and that separation makes it a much safer experience for ASD kids."

"Although I'm sensitive, this is what I like about London, seeing the juxtaposed oceans of, like, old buildings, buses, bridges, boats, water, concrete. It's kind of. It's all here. Like it's not on top of me [...] and I feel like I can engage in it how I want to do. So the river is definitely like a space. It makes me feel slightly calmer because of the water."

"I usually do that at the middle of the day (sit at the bench and watch the river), it's very calming. Because I am inside my head all the time, I usually have an inner dialogue in my head. I usually try to block it out. [...] because it is very distracting."





14. The joys of street experiences are not to be overlooked

Pleasant journeys are highly valued, as they generate a sense of accomplishment and foster positive self-perception. While some participants are over-stimulated by noise and busy spaces, other participants told us that they liked them as they required the sensation to stay focused. The quotes highlighted scenes on the streets that helped to make a pleasant journey. Moreover, it also means the street is functioning to connect, rather than isolate, people and places.

Every single shop has a history and people, knowing them and telling stories about them is about taking an interest in and actively being part of the neighbourhood. One participant told us the number of charity shops, explain where all the banks were located and recount the history of a fish and chip shop, and so on.

"Strolling always calms me down and I love going to arts and textiles shops for quiet sensory stimulation."

"I come across awesome street art that helps me deal with the anxiety of navigating past strangers."

"I like it when my usual road is flooded or if there is snow because it is the same but looks different."

The participant enjoys exploring the history and maps of our streets.

4.
TWELVE DESIGN OPPORTUNITIES

Insights and findings were compiled and analysed, which informed the development of 12 design opportunities, which are considered to be important when designing or adapting a street with neurodivergent people in mind.

This section explores each design opportunity using first hand quotes from the research participants, with an illustration and summary of each design opportunity.

We split the design opportunities into four sections:

1. Through improvements to the physical environment (1 - 6)
2. Through information and communication systems related to journeys and navigation (7-8)
3. Through supporting ourselves on the street (9)
4. Through opportunities to connect and celebrate our different minds and create a sense of belonging (10 - 12)

TO CONTENT

1 Quiet Space

Design more quiet spaces on our streets to create opportunities for neurodivergent people to pause, recalibrate and breathe. For example, design street spaces that provide a sense of privacy and minimise visual and auditory distractions from the surrounding environment through, for example, natural partitioning i.e. hedges and planters. Incorporate natural elements to provide a sense of calm and connection with nature. Greenery can help reduce noise pollution, improve air quality, and create a soothing environment.

2 Sensory Stations

Introduce sensory stations with interactive elements, such as calming water features, textured walls or fidget-friendly objects.

These stations can offer a range of sensory experiences to aid in relaxation, self-regulation and create opportunities for joyful experiences.

3 Seating and Comfortable Furniture

Provide more comfortable seating options whilst out and about, such as benches or making walls more bench like. Consider using materials that absorb sound to reduce noise levels. Consider adjustable or modular seating that can cater to individual preferences.

Try, as much as possible, to design conflict out of street environments - both between pedestrians, by providing wide enough footways and also between pedestrians and other street users by avoiding design features that put them in conflict, particularly where it's not clear who has priority.

4 Rest Rooms

Provide more public toilets and rest rooms where neurodivergent people (and others) can gather their energy and retreat from crowded streets. These spaces can serve as a refuge where people can find respite, reduce anxiety levels and recharge their social energy.

People who may feel isolated or marginalised in public spaces can find solace in knowing that there is a designated space where they are understood and accepted. It could provide an opportunity for individuals to connect with others who share similar experiences and form support networks.

5 More Nature on Our Streets

"Walking is really important for my mental health. I walk at least once a day either by myself, with my dog or with friends. My favourite walks are along low or no-traffic paths overlooked by trees and nature."

Integrate greenery into streets to create a more inviting environment for neurodivergent people. Introduce nature trails or green walkways along the streets, connecting different areas and providing a more natural and serene pathway for pedestrians.

Incorporate vertical gardens or living walls on buildings or infrastructure along the streets and create small pocket parks or gardens along the streets where people can take a break, relax, or engage with nature.

6 Create Safer Streets

"Feeling the sinking feeling that the sun is already down and I've got to walk in the dark and anxiety kicks in when I feel like I might miss the bus and may have a seizure."

The sense of safety on the streets is a vital concern for everyone but is particularly challenging for neurodivergent people who may experience heightened anxiety and difficulty in navigating certain situations. Crossing streets and navigating shared spaces can be challenging and creating safe environments that prevent the cascade of danger and promote inclusivity is important.

Designing safety on our streets can be achieved through slowing traffic down, segregation of different transport modes, using planting and paving to create better delineation, using lighting and overlooking to help people feel safe, providing well-marked pedestrian-friendly crossings that give people time to cross one lane at a time, and by providing well lit, comfortable and sheltered seating at bus stops and other public transportation points.

7 Tools to Address the Unpredictable

Design tools with neurodivergent individuals to address unpredictable aspects of the street environment, such as weather, crowds, and traffic, that can support their navigation and decision-making. For example, develop crowd density indicators or apps that utilise real-time data to tell people about crowd levels in different areas. These indicators can use colour-coded systems or symbols to visually represent crowd intensity, enabling people to choose less crowded routes or times to navigate the streets.

Create or collaborate with local authorities to establish street event calendars that provide information about upcoming events, festivals, parades, or demonstrations. By offering advance notice of such events, neurodivergent people can plan their routes to avoid these areas or prepare for potential noise and sensory challenges. Sight line systems for street works can add layers of tactile, high-contrast visual and digital information, helping people become aware of and make sense of temporary changes to the street environment.

8 Tools to Help Navigate

Design better tools to support neurodivergent individuals in navigating the streets to improve their mobility, independence, confidence, and overall street experience.

For example, enhance existing mapping tools by incorporating sensory information about the streets. They can include crowd density, noise levels, lighting conditions, and other relevant sensory factors but also provide digital way-finding assistants that offer guidance and support to neurodivergent individuals.

Novel GPS devices or apps could also provide audio instructions in conjunction with calming background sounds or soothing music to provide a more comfortable navigation experience.

Digital assistants can also be supplemented by real world neighbourhood guides that provide ‘lollypop’ style street support on busy streets and at transport interchanges.

9 Individual Sensory Supports

Design portable and ad-hoc sensory supports with neurodivergent people to enhance their street experience and help them to self-regulate as needed. For example, design compact sensory kits that people can carry with them and refill at neighbourhood pharmacies. These could include noise-cancelling headphones, stress balls, fidget toys and tactile objects. The kits should be designed to be easily accessible and lightweight, allowing people to select the sensory tools they need to manage their specific sensory needs while on the go.

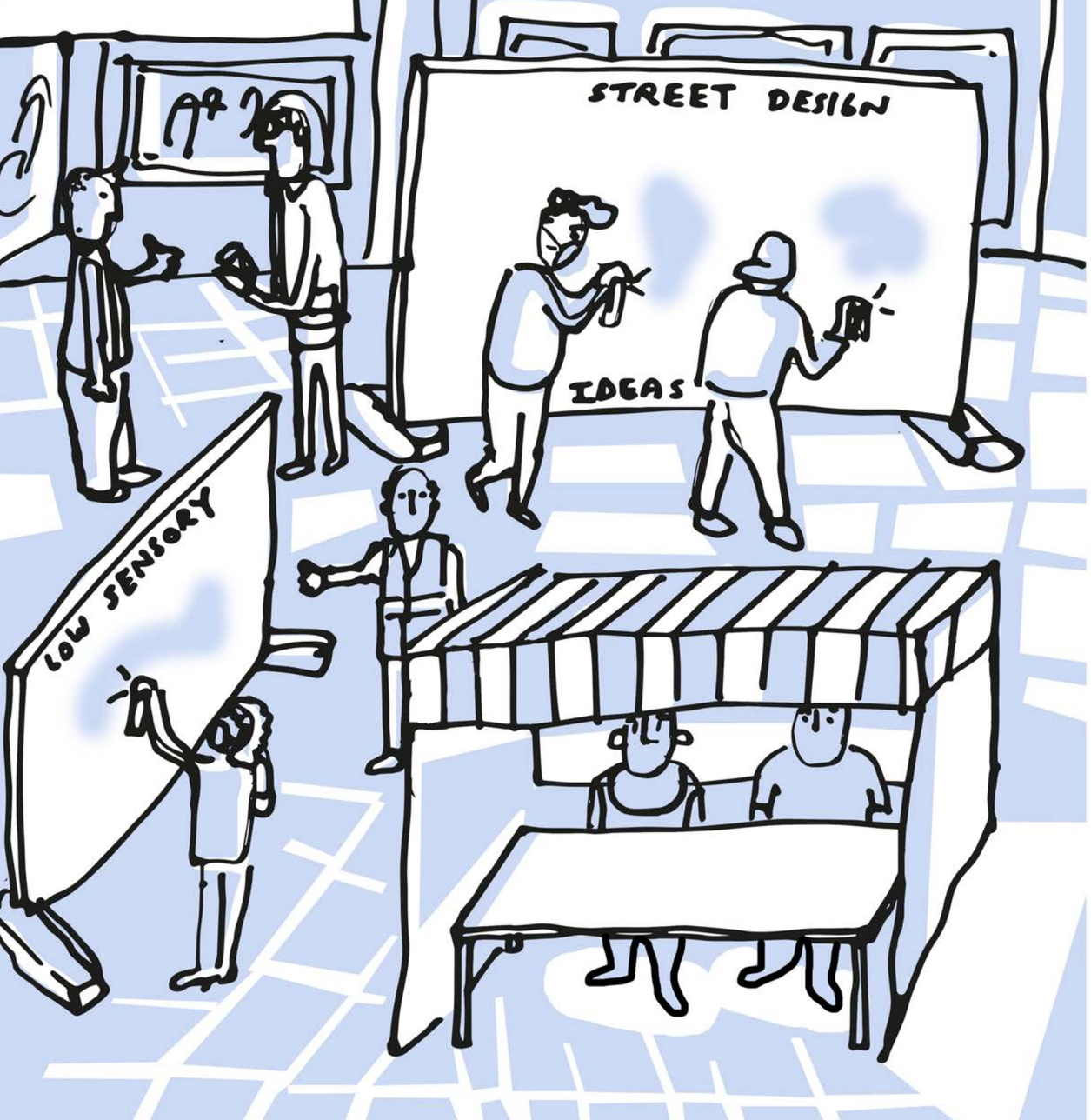
Explore the development of wearable devices that can provide sensory feedback or support and design portable devices or apps that provide gentle reminders or timers to help individuals pace themselves or take sensory breaks when needed.

10 Community Street Initiatives

"Once a month, have a low sensory couple of hours: no cars, no peeps, low lights, no loud music, no waiting at the cashier."

Implement street initiatives that cater to the needs of neurodivergent individuals, such as low-sensory hours, which could greatly enhance comfort and participation in community spaces.

By implementing low-sensory hours, local high street services such as shops, banks, healthcare facilities and transport hubs can cater for people who would like to access their services without feeling overwhelmed or anxious.



11 Opportunities to Connect

Create a range of opportunities for neurodivergent people to connect with others on the street to foster a sense of community, reduce isolation, and promote social inclusion.

Provide choice and different levels of engagement such as community events, support groups and meet-ups, peer mentoring programmes, volunteer opportunities, street-based art or expression, awareness campaigns, and collaboration with local businesses.

12 Raising Awareness and Understanding

By raising awareness and understanding about neurodivergent experiences on the streets, we can create a more inclusive and compassionate society that values and supports the diverse needs of all its members. This can be achieved by organising events, discussions or forums where neurodivergent individuals, their families and advocates can share their experiences and perspectives. This would help to foster empathy, dispel misconceptions, and create a platform for open dialogue.

To support this we created an animation to share some of the experiences that neurodivergent people told us about (see next page).

This animation was created to show people some of the stressful situations experienced by neurodivergent participants discovered in the research. Animation credit: Rachael Olga Lloyd.

5.
FURTHER RESEARCH OPPORTUNITIES

TO CONTENT

ESTABLISH A FOUNDATION OF GOOD STREET DESIGN

Building on age (young and old) / disability / chronic pain / new-comer / trauma-friendly places and more.

As we have little formal research around how neurodivergent people experience streets, experts started by connecting their needs to those of people with mental health conditions, trauma and physical disabilities. Stress and anxiety management was a primary focus of these discussions. Stress can be caused by various factors, including concerns about safety, unpredictability, personal traumas and other mental health conditions.

However, experts also recognised that designing for neurodivergent people isn't just about addressing stress. It's also about offering choice and considering other factors like the quality of the sensory environment.

Navigating busy urban environments poses challenges for a wide range of people, including those with physical differences, buggies, luggage, eyesight and hearing difficulties, as well as children and older people, and there are many overlaps between the experience and the potential solutions.

This presents an opportunity to create street environments (and educational programs) that are safe and friendly for people of all ages, abilities, bodies and minds which together will support both existing residents and visitors too.

HAVE YOU GOT A JUNCTION?

Developing an open-sourced methodology for street design with neurodivergent people though testing the creation and feedback loop of implementing an intervention.

The research revealed examples of interventions that were implemented for one group of street users that has resulted in being challenging for other people. Examples include colourful crossings, shared space, blister paving slabs, redesign of bollards and school street schemes. Many of these resonated strongly with a neurodivergent participant, who called it "beauty over function". Many challenges have been highlighted by participants due to the complexity of the stakeholder landscape, haphazard knowledge base and lack of feedback loop post intervention.

A street intervention, if unsuccessful, is largely left to the people who use the street to workaround, or has to wait until alarms start going because injuries records are established.

To develop a methodology for inclusive street design it must be created in practice, alongside the real development of a real junction and with a range of local people, including neurodivergent members of the community.

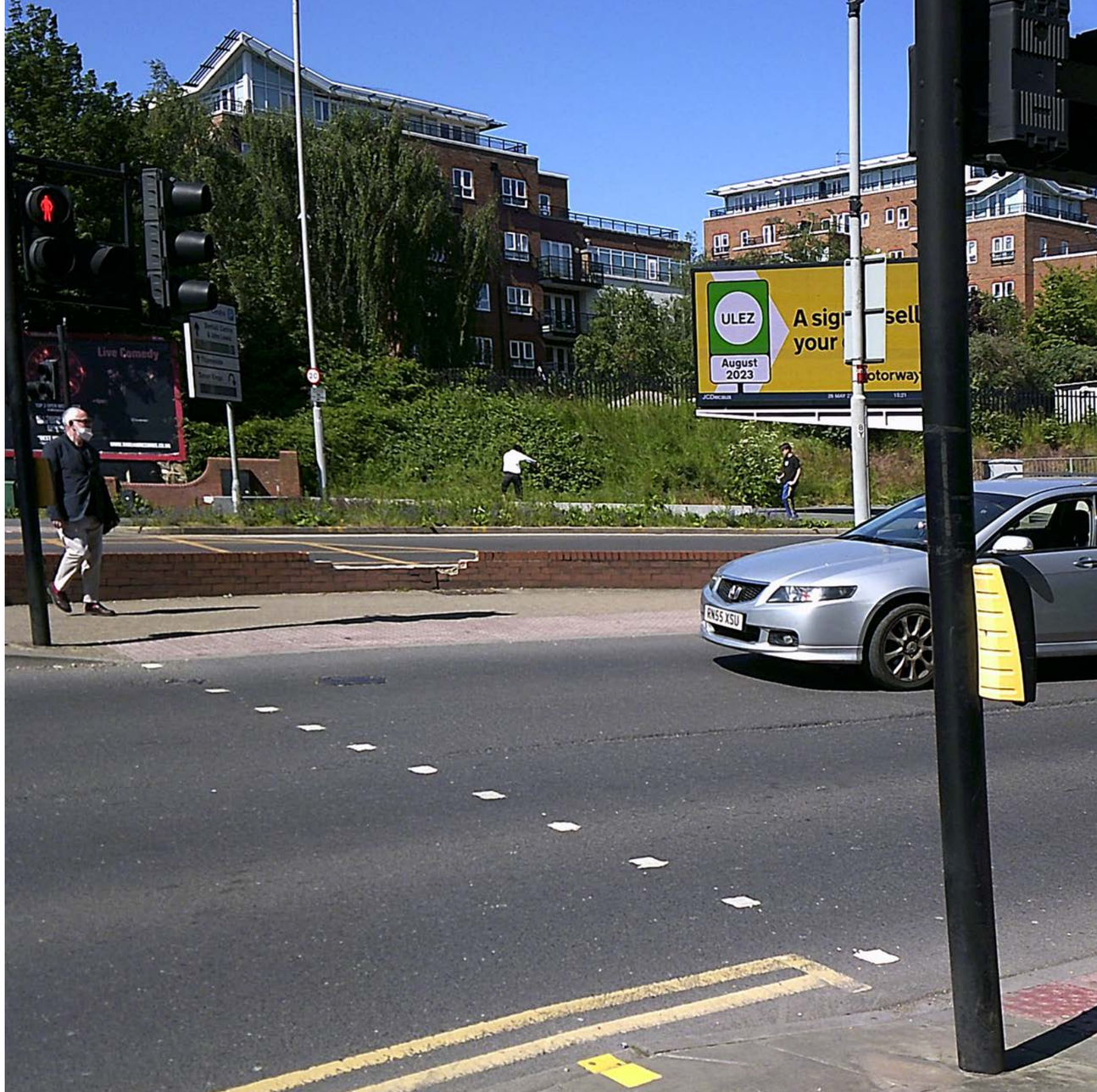
MAKE ANOTHER STEP TOWARDS AN INCLUSIVE STREET MANUAL

Researching with broader stakeholder groups, including carers and people who operate the streets, etc.

In order to fully understand inclusive street design, researching with a wider stakeholder group is important as highlighted in the limitations of this study, where the participants reached were mainly non-disabled and older neurodivergent people.

Many challenges have been highlighted by experts due to the complexity of stakeholder landscape and not understanding where the inclusive knowledge is held. A fuller study in mapping out the stakeholder landscape would therefore be informative.

A broader study could also be an opportunity to explore and focus on other conceptualisations of the street beyond the ‘street as an unpredictable environment’ to the ‘street as a connective fabric’. This would address a combination of physical and social isolation challenges as well as opportunities for more inclusive physical and social mobility.

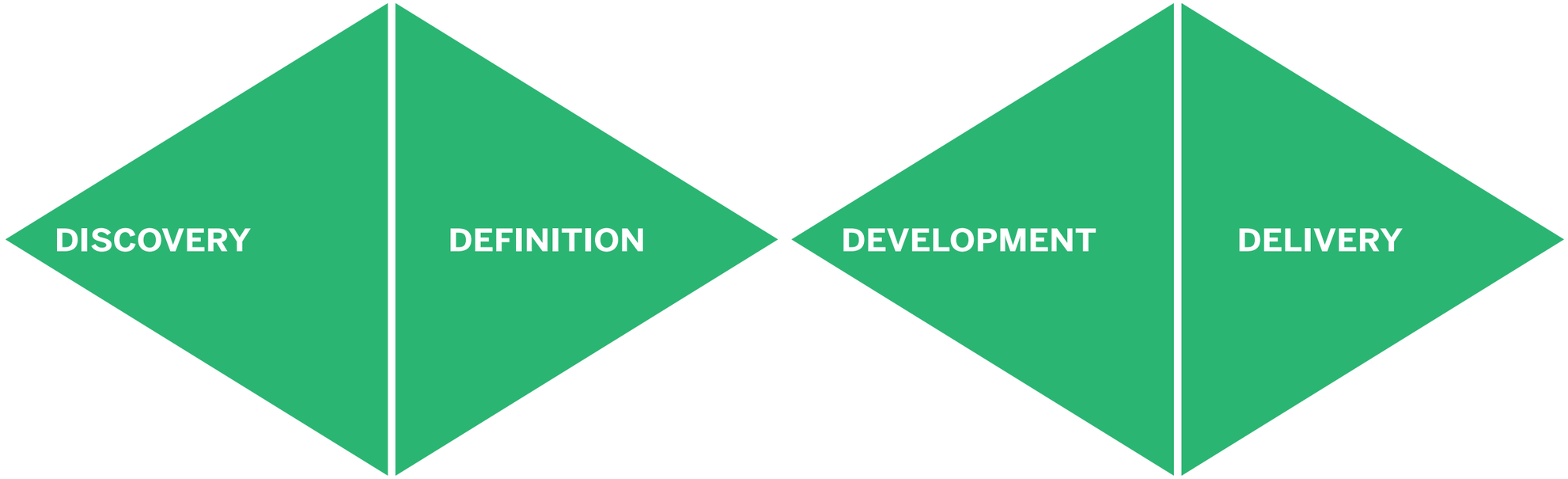


6. RESEARCH APPROACH AND METHODS

TO CONTENT

PROJECT PROGRAMME

The four-month project followed the double-diamond design process developed by the Design Council



APRIL

- Participant and expert call to action
- Participant recruitment
- Video recruitment
- Design and submit online survey
- Schedule walks and talks
- Literature review
- Participant and expert interviews

MAY

- 2nd Advisory Group meeting
- Conduct walk and talk journey mapping
- Expert journey mapping workshop x2
- Analyse online survey
- Analysis and insight report

JUNE

- 3rd Advisory group meeting
- Develop video collage/ animation
- Design ideation and visualisation of 'street futures'
- Write project report

JULY / AUGUST

- Finalise Report
- Visual digital montage
- 4th Advisory board delivery review
- Project launch event (tbc)

RESEARCH APPROACH AND METHODS

The study adopted an inclusive design methodology to enable neurodivergent people to participate in the study and share their experience of their local streets. The researchers also sought insights from people who experience sensory and information differences, professionals who champion the neurodivergent community, transport experts and people who support neurodivergent people.

The study included a literature review and four streams of research activities. The research activities included:

- Online surveys
- Expert interviews
- Walk and talk
- Workshop

ETHICS

The project was conducted in compliance with the code of practice for research ethics at the Royal College of Art as well as guidance for ethical procedures compiled by The Helen Hamlyn Centre for Design for involving people in the design process, documented in its EPSRC-funded project i~design (2011, see www.designingwithpeople.org). The Centre's key principles and good practice extends the model of the three 'Cs' in user research developed by Higgins (1992) by adding contact and context:

- Contact – how do you recruit people for your project?
- Consent – how do you obtain their consent to participate?
- Confidentiality – how must you treat the information you are given?
- Conduct – how should you behave when engaging with people?
- Context – how should you conduct yourself in

All participants received a consent form outlining the project, and were given provision to confirm consent for the recording and sharing of information and photographs with the opportunity to pull out of the project should they need to.

ONLINE SURVEY

31 respondents from open invitation targetted at people who are neurodivergent and/or have sensory/processing differences, their carers and family members.

* Some survey participants have also additionally participated other streams of research activities.

EXPERT INTERVIEWS

14 professionals who champion the neurodivergent community, transport experts and people who support neurodivergent people, some of whom are neurodivergent.

* mostly part of the advisory group of the project.

WALK AND TALK

9 people who are neurodivergent and/or have sensory/processing differences

WORKSHOP

9 people who are neurodivergent and/or have sensory/processing differences

An overview of participants in each research activity

6.1 EXPERT INTERVIEWS

TO CONTENT

Expert Interviews were conducted in the form of facilitated conversations. These lasted one hour and were held online. A set of interview questions were designed to cover the following topics:

- Hopes - ideas to improve/wishes
- Concerns - barriers to inclusion
- Relevant research and suggestions on state-of-the-art design outcomes
- How could this design research make a difference and have a bigger impact?

The design researcher did not ask all of the questions in the same order to each interviewee.

In recognition of the diversity in expertise, the design researcher started the conversation generally and listened out for opportunities to ask as many of the design questions as possible, following the natural flow of the conversation with each interviewee. The interviewees were encouraged to share any first-hand personal experiences as a neurodivergent person which may or may not have been publicly disclosed.

In addition to interviews, the advisory meeting that has taken place monthly, has contributed to the insights, method/model, recommendations, references and further readings. As well as practical guidance and being an invaluable sounding board throughout this research.

The advisory group have offered many case studies which are referenced in this document. In particular, issues at conflict points, rainbow crossings and shared spaces, such as the Exhibition Road. As well as case studies, the advisory group also shared guidelines used to design streets. These are organised and shared in the bibliography section.

The issue of creating impactful guidelines, implementing and feeding back on guidelines was discussed at length, which led to an understanding that creating a guideline ought to take place in tandem with the practice of implementing and operating an intervention.

The lack of feedback to designers was highlighted as a major challenge in creating and operating an intervention in a complex environment where many projects take a long time to realise and are expensive to revert. This is reflected in the recommendation for further research: “Have you got a junction?”.

Guidelines are one of the many tools designers have at their disposal to engage in the development of streets which support neurodiversity. Education of designers and creating awareness with the public are also seen as significant tools to make the streets more inclusive. One of the reasons for the importance of guidelines was the complex stakeholder landscape.

Knowledge is often left uncompiled and in different people’s hands and the consequences of an intervention are remain with the people who operate the streets. This leads to the recommendation for further research on research with wider stakeholder groups.

Experts have different views on street design and there are further opportunities to explore and develop a more inclusive perspective by looking at these different conceptualisations. In addition to interviews, the monthly advisory meetings contributed to the insights, method/model, recommendations, references and further readings. They also provided practical guidance and were an invaluable sounding board throughout this research.

6.2
WALK AND TALKS

TO CONTENT

Walk and Talk is a research method whereby a researcher walks with a participant in a place and uses the place as inspiration for the research.

In this study, the Walk and Talks took place at a time and location chosen by the participant who also took the lead on where they would like to walk and when they would like to stop and rest. Each Walk and Talk lasted no longer than 1 hour and it was up to the participant on how they would like to approach this.

LOCATION

Some participants chose to pre-plan and share the route, whilst other participants took the lead on the day without any pre-planning.

It was important to the research team that the participants did not select places that were triggering. Most participants chose to take the researcher through places that are easier to walk and talk rather than in their very local streets.

1 RESEARCHER
1 PARTICIPANT

Walk and talks were conducted as one participant, one route and one researcher with the exception of two walks. One walk involved two participants and two researchers doing the same walk simultaneously as a group. A second walk involved two researchers and one participant but only one researcher interacted with the participant at a time. These exceptions were due to circumstances rather than a specific research objective.

THE SET UP

Each participant wore a wireless microphone to capture audio recordings. They were given a simple camera to enable them to visually capture their street experience through photographs and videos if they wished. Each participant was given one instruction:

“Take me through how you experience the street using your own words and using the camera to capture whatever you’d like to share.” Sometimes the researcher would add “think of me as your shadow” if it seemed helpful to the participant and / or offer, “you can also give me the camera and tell me to take photos”.

FRAME OF REPRESENTATION

The Walk and Talk was extremely insightful and many of the insights would not have formed without the Walk and Talk activity including the need for sitting and the impact of shared pavements. They also provided contextualisation to understand the results of the online survey. Unlike other research activities, the Walk and Talk allowed the participants to share their expertise and experience in their own frame and representations.

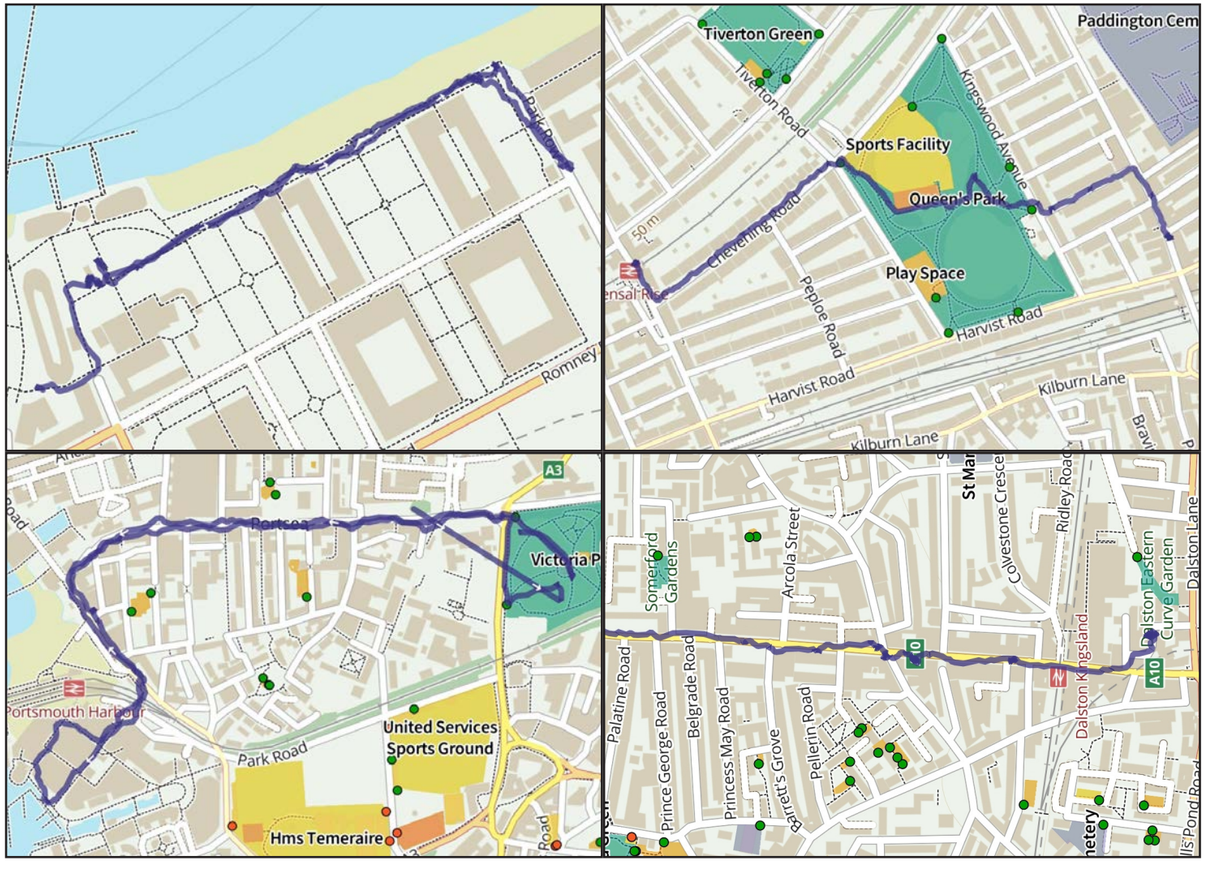
MARY POPPINS’ BAG

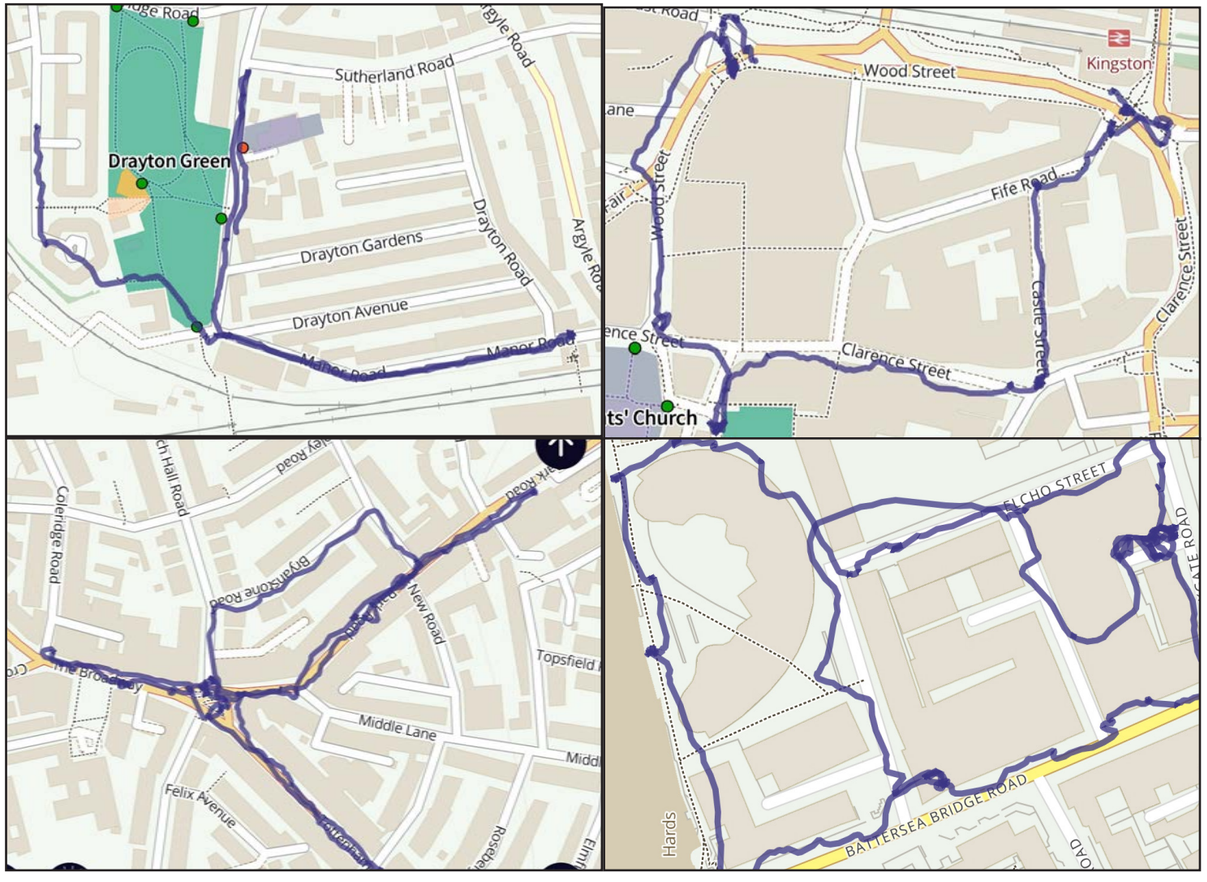
There were times when a participant was carrying things which meant it was difficult for them to handle the camera or wear a pair of headphones, which physically interfered with the microphones operation.

In such circumstances, the researcher offered to carry extra items. Upon reflection, this act of service gave the researcher an opportunity to share the “Mary Poppins’ bag” situation that was described in the creative workshop.

THE TERRAIN

The Walk and Talks took place in various locations around London, Portsmouth and Brighton. The maps illustrate some of the different walks that took place and different terrains.





6.3 ONLINE SURVEY

TO CONTENT

ONLINE SURVEY

The research team created an online survey to create another option for neurodivergent people to participate in the project (see Appendix). The survey went through iterations of design through testing and sought guidance from the advisory group. Easy Read principles were used, within the limitation of Google Forms, to help format the questions using simple emoji's to visually support each question.

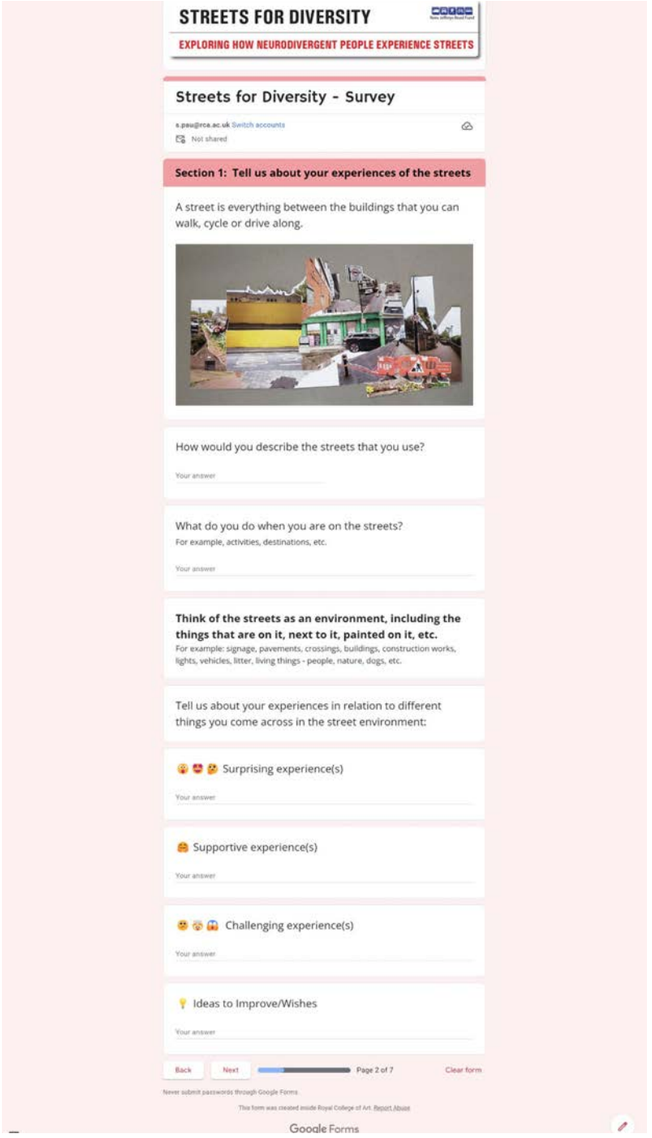
The survey received 31 responses, of which 81% of participants identified as neurodivergent and 58% experienced sensory and information differences. We also received 19% of responses from people who support someone who is neurodivergent and 33% who champion the neurodivergent community. Conditions participants disclosed include autism, dyslexia, dyspraxia, ADHD, anxiety disorder, psychosis and body dysmorphia.

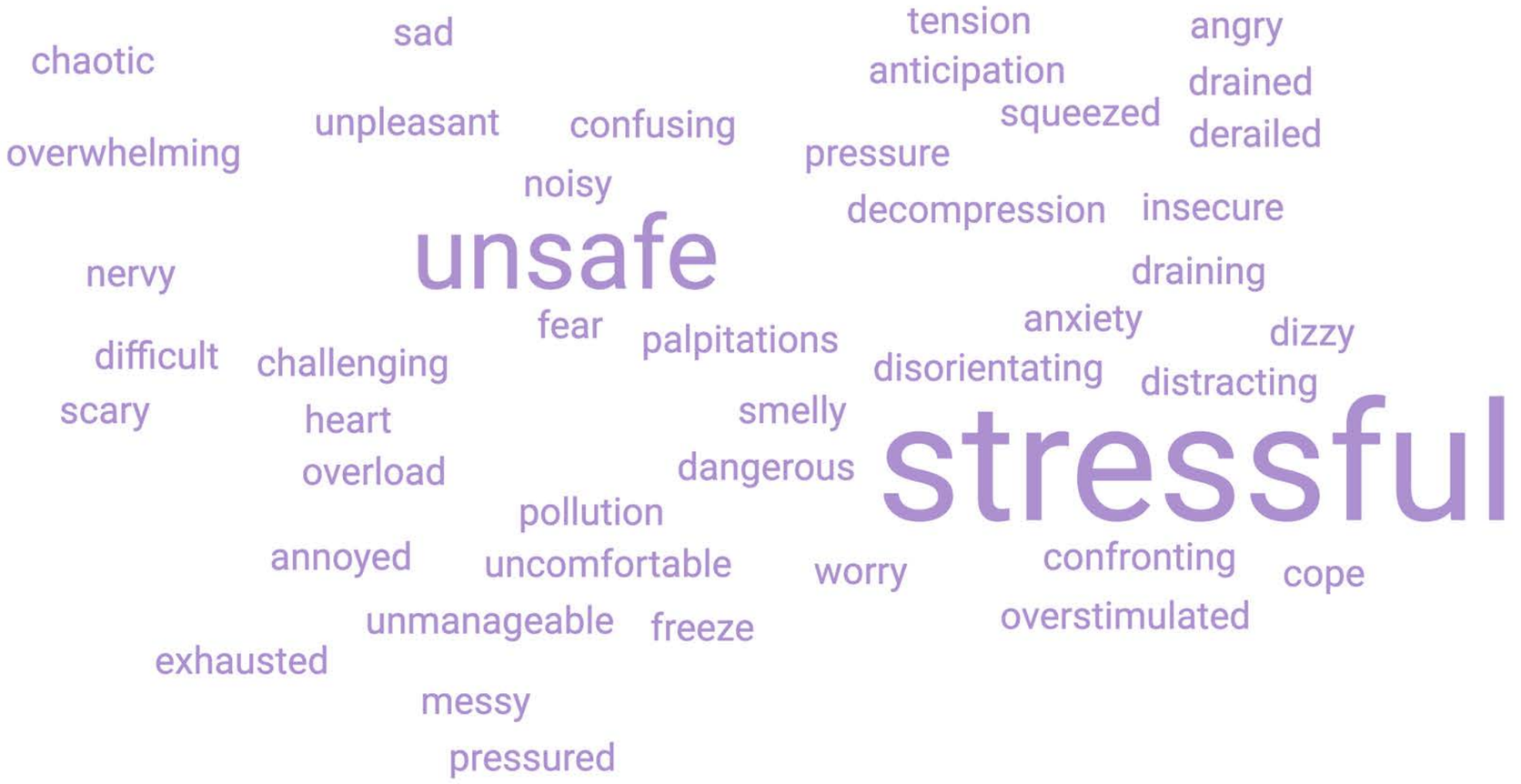
The survey was designed primarily as a discovery tool rather than a statistical data-gathering tool.

A balance was struck between ticking boxes pre-determined by pre-existing knowledge with the extra option "other" and most were open-ended questions to allow for insights to surface.

The word "other" is out of the limitations of the survey tool, rather than by choice.

Considerations was also given to the potential challenge of open-ended questions. The research team approached this without wanting to perpetuate any stereotypical ideas but also wanted provision for the possibility. Open-ended questions were supplemented with examples - which could be considered a potential source of bias. The research team carefully considered every word and emotion to ensure they were useful tips and introduced as little bias as possible.





A word cloud generated from the survey in response to the question: How do streets make you feel?

6.4 CREATIVE WORKSHOP

TO CONTENT

The creative workshop was a two-hour session with 9 neurodivergent participants, hosted at the project space of the Intelligent Mobility Design Centre in London.

Before the workshop, the design research team took great care to ensure the arrival experience and the workshop space was well designed, given what is already known about the complexity of planning a journey and their experience of collaborating with autistic people.

The pre-workshop experience, including the welcome pack and reception/arrival activities were designed to create options and on-board a range of neurodivergent people with ADHD, Autism, noise and light sensitivity, dyspraxia, dyslexia, visual processing differences, anxiety and depression.

Participants were invited to bring sensory objects. The reception opened 30 minutes before the workshop started and most participants arrived on or just before the doors opened.

The arrival process was designed to create head-space rather than networking time and participants were invited to create name tags, choose interaction options and sign physical copies of the consent form in their own time.

There were options for refreshments and a warm-up activity.

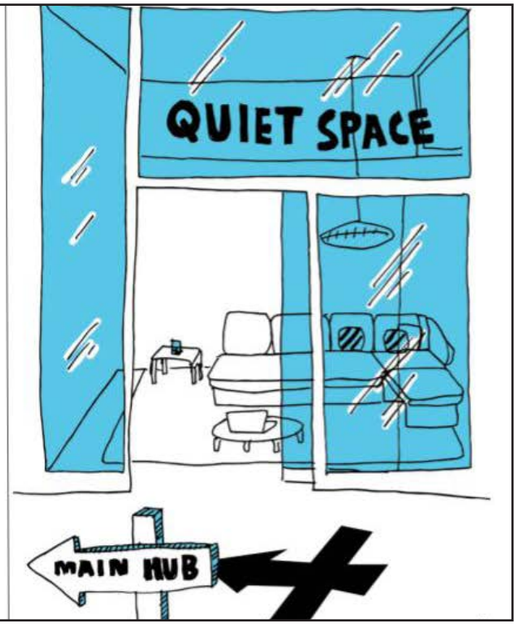
Photograph of a visual representation by one participants showing how their stress levels changed during their journey to the workshop.

Seats were arranged so that people could choose to work together, alone or in small groups.

Sensory considerations: We will do our best to make the workshop space as comfortable as possible, but we recognise that we all have different sensory likes and dislikes. You are more than welcome to bring along any sensory aids if this will help you feel more comfortable – ear defenders, tinted glasses, objects for stimming or any other aids.

Be mindful of what you are wearing – some people can be sensitive to smells so avoid wearing/ using anything with strong scent for the workshop.

Quiet space: We have created a quiet corner, where you can go to relax if things get too much. It is okay to go to this space at any time during the workshop if you need some time out.



A page taken from the welcome pack for the creative workshop

Photograph of one participant working in the quiet space.

In the creative workshop, participants were given three design briefs as options.

A. Design a more inclusive street-scape through rethinking moments in a journey.

B. Design for more familiarity in the street-scape by rethinking moments before and after a journey.

C. My sensing/processing differences are wonderful. Design a way for people to join you in your way of experiencing the street.

The three design briefs were created to test/evolve some of the in-progress analysis from the other research streams available at the time, as well as to create space for ideas about inclusion and awareness to emerge.

There were two strongly related themes: the challenge of unpredictability and a journey through a street is a street experience that starts before the journey.

Solutions, however, were more contentious. For example, Is the opposite of unpredictability, familiarity? Is monitoring and data a proxy to predictability?

"... wouldn't it be, like, destroyed by people peeing in it or being sick in it when they're drunk? [...] I wouldn't use it because it would be a ground for sexual abuse or make people vulnerable. Do you know what I mean? Like, it depends on what it is. How do you gain access to it? And if it was a room like a disabled wheelchair people have special keys for the disabled toilets, would there be a special key given to autistic people? How do you decide who needs it? There's lots of things there [...]"

Without host coordination, there was uptake on all three briefs. Participants also self-organised into one larger group, and individual working alone and a small cluster (where participants choose the same brief but worked on their own).

Throughout the workshop, participants were invited to use tactile materials, as well as words to think and/or express their ideas.

The workshop timings and activities sheets were designed for people to work individually or in groups and/or to change briefs, ideas or groups.

Materials available on the day of the creative workshop

Interaction with others - Round Interaction badges will be available on arrival. These badges include 4 colour-coded interaction messages to communicate to others the desired level and mode of interaction (please see below).

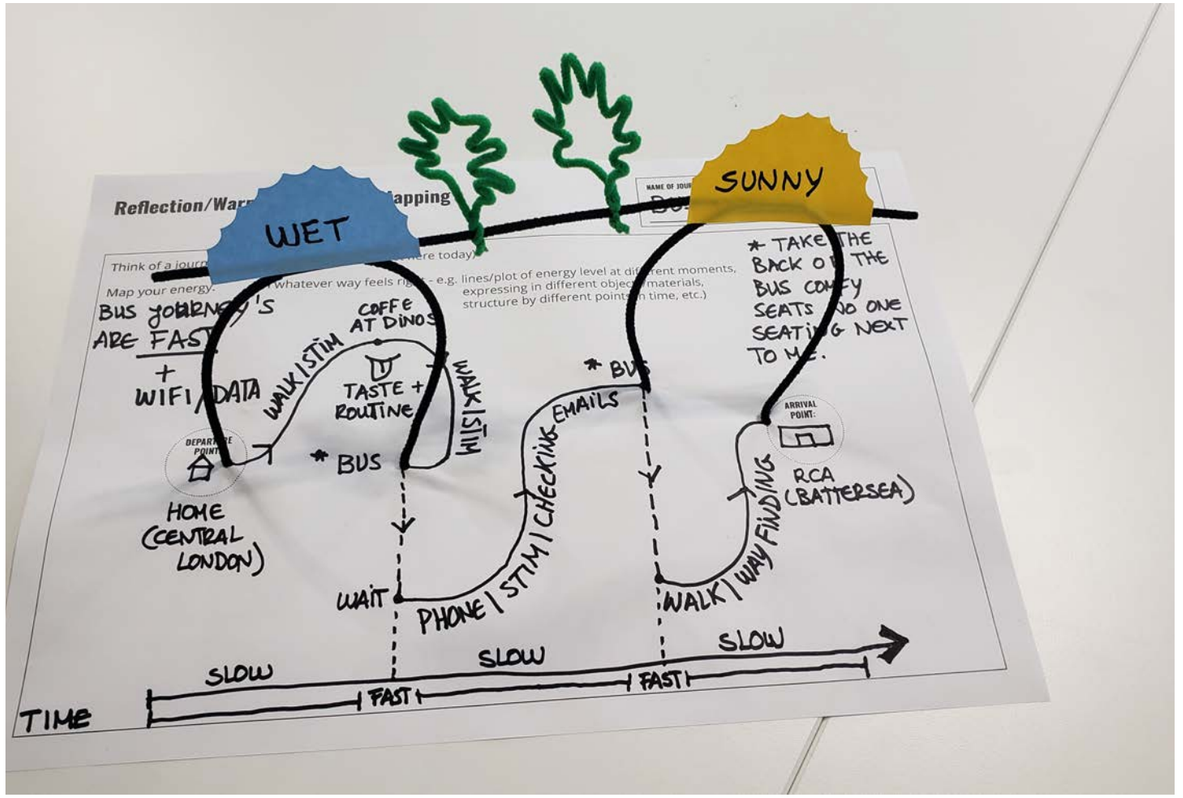
RED - Please do not initiate any interaction with me

YELLOW - Please do not initiate unless I have already given you permission

GREEN - I have difficulty initiating conversation, but I want to talk so please initiate.

NO BADGE - Happy to talk

A page taken from the welcome pack for the creative workshop



Photograph of one participant's reflection on their journey to the workshop

7. LITERATURE REVIEW

TO CONTENT

In recent years, there has been a notable increase in the creation and recognition of autism-friendly environments. These are spaces, establishments, and initiatives that are designed to accommodate and support individuals on the autistic spectrum. The growing understanding and awareness of autism has led to a greater emphasis on inclusivity and providing environments that cater to the unique needs of autistic people.

Hence, there is a growing number of designers working in this space within a range of environmental contexts, such as schools (Beaver, 2011; McAllistera and Maguire, 2012; Mostafa, 2008; Tufvesson and Tufvesson, 2009; Vogel, 2008; Khare and Mullick, 2008, 2009; Scott, 2009) and multi-sensory environments (Gaudion, 2015, Gumtau et al., 2005) housing (Ahrentzen and Steele, 2009; Brand, 2010; Lopez and Gaines, 2012; Woodcock et al., 2013, Gaudion, 2015).

There are also a few projects that explore outdoor spaces (Linehan, 2008; Hussein, 2010; Menear et al., 2006; Sachs and Vincenta, 2011; Yuill et al., 2007, Gaudion & McGinley, 2012)) and an urban design project (Decker, 2014) that used a theoretical urban systems toolkit to evaluate how inclusive the city of Nashville, Tennessee, was for autistic people. Their evaluation looked at services such as health, education and work, and the findings informed the design of a visual proposal that described how to make the city more inclusive for autistic adults.

There is much we can learn from existing research and design guidance associated with autism and the built environment which can also be considered within streets and outdoor spaces in relation to colour, pattern, way finding, sensory considerations, sound, flooring, texture, lighting, transitions, and social interactions. Whilst there are parallels that can be drawn between how a person experiences indoor and outdoor spaces, the important distinction between these is that the indoors can be more predictable and personalised with an element of control over much of the sensory quality of the space.

For example, we can change the volume on a television or pull down a blind if the sun gets too bright. Streets and outdoor spaces, however, comprise of multiple unpredictable sensory components where we might have little control; weather, traffic and people moving are experienced together; and these components can be explored both individually or as a whole spatial organisation.

Foreground, middle ground, background, and the sky above make streets a three-dimensional space that can be experienced from different viewpoints, perspectives and angles. The street is therefore a dynamic space, somewhere that can stimulate the mind and body to action or encourage relaxation.

It is critical to note that much existing research on the built environment has yet to consider neurodivergence beyond autism, therefore the perspective and experiences of other conditions associated with neurodivergence remains under-reported. A positive step forward, however, was the development and launch of the PAS 6463:2022 (Publicly available specification), where the British Standards Institution now has guidance for the built environment that considers the needs of neurodivergent people and those who experience sensory and information processing differences.

Whilst the focus is on the built environment, the PAS provides some design principles for an inclusive and safe public realm, which explores road crossings, pedestrian routes, surface materials, sensory feedback and spaces to relax and rest.

With regards to public spaces we are witnessing a gradual emergence of design cues aimed at fostering understanding and empathy. These subtle yet impactful modifications to our surroundings can have a profound impact on individuals who are neurodivergent, those with hidden disabilities, or have sensory sensitivities. For example, the implementation of the “Please offer me a seat” badge on public transportation in the UK. This simple measure assists individuals who require seating but may not exhibit visible signs of disability. Additionally, Tesco supermarket’s “quiet hour” initiative provides a more soothing shopping environment for customers who may feel overwhelmed by intense illumination and loud noises.

More understanding and consideration of neurodivergent individuals in streets and outdoor spaces are crucial due to the added sensory complexity and unpredictability. Parmer et al. (2021) conducted a study highlighting that some individuals on the autism spectrum prefer staying at home due to visual hypersensitivities. In the exploration of the sensory city, Davidson and Henderson (2017) analysed 45 autobiographical texts and observed that many autistic authors frequently express feelings of being 'out of place' or alienated. This has led to a growing recognition of the need for "sensory sensitive" urban spaces that accommodate individuals with autism and other sensitivities. Kenna's research (2022) delves into the intricate geographies of neurodiversity in urban environments, revealing how these spaces can either foster a sense of belonging or exclusion for neurodivergent individuals. These findings provide valuable insights for urban planning and policy, emphasising the importance of a comprehensive understanding of neurodiversity and its implications for inclusion and exclusion within the public realm.

In summary, these studies underscore the significance of creating sensory sensitive and inclusive outdoor spaces that cater to the diverse needs of neurodivergent people. They highlight the necessity of considering the experiences of these individuals in urban planning and policy-making to establish environments that promote inclusivity that considers our different bodies and our different minds.

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8.
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9.
LIMITATIONS

TO CONTENT

LIMITATIONS

The following project limitations should be acknowledged and addressed to ensure a more inclusive and comprehensive understanding of the subject matter in future research:

Exclusivity of Neurodivergent Perspectives: The research did not include neurodivergent people with significant learning difficulties who will have additional experiences and needs that have not been captured in this research. By actively involving these voices in the design process, we can broaden our understanding of neurodiversity.

Limited Participant Diversity: The composition of the participants in the creative workshop leaned heavily towards individuals who identified as female. While the workshop benefited from the unique perspectives and talents of these participants, it is crucial to acknowledge that this demographic imbalance may have significant implications for the project's outcomes, narrowing the scope for drawing broader conclusions.

Accessibility Constraints: The effectiveness of the walk and talk sessions and face-to-face creative workshop were constrained by the requirement for participants to be capable of leaving their homes. This limitation excludes individuals who may have mobility issues or other circumstances preventing them from attending in-person sessions, potentially resulting in a skewed representation of the target population. Anecdotally we heard that some neurodivergent people heard about the project but were not able to participate in the walk and talks and workshop due to the extreme anxiety they experience leaving their home. These are the people we would really like to hear from and explore ways to improve their street experience. Moving forward alternative ways to engage with people remotely or in-person needs to be considered so we do not exclude anyone.

Consent Forms: The current format of consent forms may pose limitations on participation. The need for printed forms to be read out and physically signed can create additional barriers for individuals, potentially affecting their willingness or ability to participate fully.

Information Sheets: The easy-read walk and talk information sheets provided in PDF format were not effectively utilised. Feedback from our research suggests that PDFs may not be easily readable by machines, making it difficult for individuals who rely on text-to-speech technology.

In contrast, participants showed better engagement with slide-formatted workshop invitations, indicating a preference for more accessible and visually led information formats.

Online Survey: Neurodivergent people may have different communication styles or difficulties with language processing. Whilst we received 31 responses from the online survey which provided some rich feedback, we were hoping for more respondents. The limitation of the survey response is that they are de-contextualised.

Time was spent on the design and wording of the online survey, with images to reflect each question to make it as clear and understandable as possible, however the online survey did rely heavily on written language without providing alternative formats, such as visual or auditory options. This may have presented obstacles for individuals with conditions like dyslexia. Whilst the benefit of the survey is it can be accessed anywhere, it appears that the survey mainly reached non-disabled people. There is a need to explore alternative survey formats so they reach out to be people who have a diverse way of communicating.

We cannot generalise: Recognising the diverse needs of neurodivergent people is important, as what benefits one person might not work for another.

Some design features could be stressful for one neurodivergent person but relaxing for another, it is also important to understand that some design recommendations can also have a negative impact on other (overlapping) sections of society. For example the recommendation of spaces which provide a sense of privacy and minimise visual and auditory distractions from the surrounding environment through natural partitioning might clash with gender-based design recommendations that discourage hidden areas for safety reasons

Inclusive designs for environments, products, or experiences need to be flexible and personalised to accommodate these differences. Customising designs to suit specific preferences is more likely to lead to successful and meaningful results.

10. ACKNOWLEDGE-MENTS

TO CONTENT

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We would like to thank the advisory group members whose experience and expertise supported us throughout the design and development of the project.

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