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**Urban Jungle:
Making cities healthy places for Australians with neurodiversity**

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Urban Jungle: Making cities healthy places for Australians with neurodiversity

ABSTRACT: *This paper documents a preliminary investigation into the relationship between neurodiversity and the built environment using a pilot project developed with Logan City Council and engaging candidates within the Master of Urban Design at the Queensland University of Technology.*

The research begins to examine the way many places are designed and built can be alienating and inhibit accessibility to people with movement and sensory differences.

Logan Central has been used as a case study area to map the physical attributes, and identify barriers and challenges in the built environment – specifically for people with disabilities but also taking in consideration the wider population. The integration of all individuals – mainstream, those with disability, differences and multigenerational populations – strengthens the social and economic fabric of Australia, enabling its citizens to live healthy, productive, and fulfilling lives.

Keywords: Urban Design; Neurodiversity; navigation of public space; sensory mapping; universal design principles; ageing population

Introduction

Imagine this: It is 9am on a weekday and the city is crowded with people travelling to work. In Queen Street Mall, a man freezes, stuck in the midst of a sea of people – he can't move forward, turn around or sit down. It is almost 10 minutes before he manages to navigate his way across the pavement. He finds a seat to rest because he is totally exhausted and his mind and heart are racing. Just the thought of getting up and moving again, makes him feel sick and panicky.

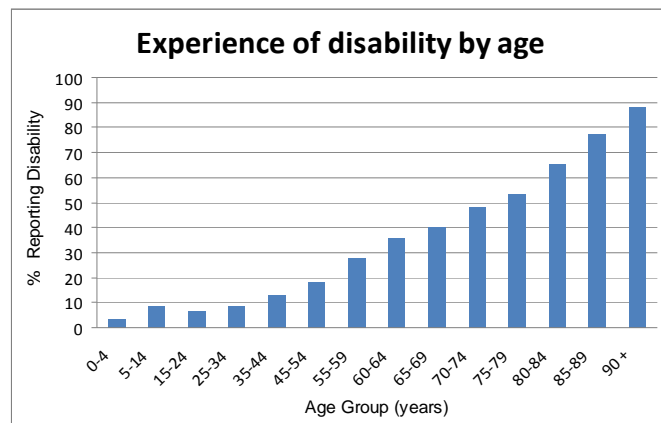
Meet Joe - he is not drunk or on drugs; he is not hallucinating; he experiences neurodiversity. To Joe, a student of journalism at university, Queen Street Mall is more like an urban jungle than a well-designed public place – a place to be avoided at all costs.

What is neurodiversity?

Neurodiversity is diversity of the neurology which changes a person's interactions with the world through their senses (McGee, 2012). A classically recognisable form of neurodiversity is autism spectrum disorder wherein people experience the world through all of their senses to varying degrees, and depending on the context (Kern et al., 2007). Sensory experiences for someone with neurodiversity are as individual as they are for the rest of the population. The significant difference for those with neurodiversity is they often do not have effective strategies to deal with sensory overload and will react to aversive sensory experiences in a

way that the majority of society would deem as ‘socially inappropriate’ (Thomas and Trude, 2013).

Neurodiversity is a reality which we all face as we age. Our thresholds of perception change in time as well as neuro-processing and sensitivity slows down with ageing (Carmeli et al., 2003). Older people generally lose skills in perceiving contrast, for example: seeing in reduced light, with smell and taste; they may also have decreased hearing, and experience changes in balance and equilibrium (Subramanian et al., 2006). Changes in the way senses are processed are directly linked to the navigation and perception of the environment; unless urban design becomes more inclusive, we too will face exclusion from public spaces (Imrie and Hall, 2001). Increasingly, we are becoming aware of the physical limitations that will restrict the everyday activities of up to 70% of the population at some point in their lives.



Experience of disability by age (Australian Bureau of Statistics, 2011, p16)

With Australia’s rapidly ageing population predicted to increase to between 23% and 25% in 2056 (Australian Bureau of Statistics, 2012), it is essential that we appraise how our cities accommodate and support their citizens. Neurodiversity holds the key to an ageing population (Carmeli et al., 2003). By increasing our knowledge and awareness of how people with neurodiversity navigate through urban spaces, we are better able to develop the design principles and guidelines to support improved universal design of public spaces (Holt-Damant, 2005, Imrie and Hall, 2001). Our assumption is that if people (including an ageing population) have better accessibility to public spaces across cities, they will enjoy greater mobility and freedom in navigating to and from home/work, in turn, making our cities more liveable and healthy.

Sensory perception

People have seven senses – **visual**, **auditory**, **gustatory** or **taste**, **olfactory** or **smell**, then there is **vestibular** which locates us in space, **proprioception** which gives a sense of all of our body parts working together to move or do things, and finally there is **tactile** which tells us about our body's interaction with our environment (Light, 2005).

Thresholds exist for all of us in terms of sensory processing the world around us (Patricia et al., 2003). Each of us has sensory preferences (Carvill, 2001). Some of us may have passive responses to high stimuli such as loud music and brightly lit environments, some of us may actively seek out high stimuli such as going to discos or rock concerts, some of us may avoid intrusive stimuli such as heavily crowded areas, and some of us may simply be distracted by it (Kern et al., 2007).

Sensory processing leads to sensory responses (Baker, 1984). When we want to be focused on a task and be able to complete it to the best of our ability, we need to be in a “just right” level of arousal. People who are under responsive could be more likely to be under aroused and need more input to get them into this “just right” state – for us that might be a cold shower, a brisk walk, or a large coffee. For some people this might be first thing in the morning, when you are still feeling sleepy and are not able to concentrate on anything complex. You could also be above this “just right” level (over aroused). For some people this might be after shopping on a busy Thursday night or after listening to bag pipes. For people who are over responsive, it can be easy for them to become over aroused; they require less input in order to stay calm and alert – such as a really organised desk, or the need to move to somewhere quieter (Van Hulle et al., 2012).

To have all of these senses working collaboratively is a substantial feat (Carvill and Marston, 2002). When we put our senses together to perform tasks, there are a number of sensory processes which occur (American Psychiatric Association and American Psychiatric, 2013). We receive sensory input, either perception or orientation, that we need to interpret (Lane et al., 2010). For example, if someone is going to cross the road safely, they must perceive the traffic situation, the indications on the road for walking, the signals and their meaning, the other people going to cross the road, potential unseen problems like holes or fast-walkers, and so on, and then they must orient themselves there at the side of the road, and know how their body will move itself from one side to the other in a safe manner. This sensory processing

requires planning and knowledge of how to execute a response, how the body will move, how to react if something unpredictable happens. In order to cross the road safely, the brain must be able to integrate all the input and then filter out the unnecessary information, such as the colour of a woman's hat, the clack clack of someone's shoes, the shininess of the pole, etc. All of these things described need to take place and these are only for something as common place as crossing the road (Dawson and Watling, 2000).

If you experience neurodiversity you may well experience the act of crossing the road differently. Essentially people with neurodiversity are wired differently (McGee, 2012). They may well experience an overload of the senses so that the simple act of crossing the road can be an insurmountable challenge. Or, they might experience an underload of the senses which makes them vulnerable when crossing the road because they are not integrating all the sensory input thoroughly. Or, they may experience all of the sensory input and not be able to filter out the unnecessary information such as the colour of a woman's hat, the tick tick of someone's shoes, the shininess of the pole, etc which puts them at considerable risk of being run over.

Amanda Baggs (2010), who experiences neurodiversity, is an activist for the recognition of neurodiversity as a distinct and valid existence. She describes how she perceives the world:

My first memories involve sensations of all kinds. Colors. Sounds. Textures. Flavors. Smells. Shapes. Tones. It is hard to explain to another person the patterns of perception that come before the ones they themselves have. Unless your brain is unusually wired, I doubt you have ever — even in infancy — perceived things the way I most readily perceive them. I don't doubt that this is the reason most people view my way of perceiving the world as an empty hole rather than every bit as rich and beautiful as their own (Baggs, 2010).

Whilst it is easy to marginalise the focus of this research, there are many examples of how the neurodiverse have generated multi-billion dollar industry adaptations. Dr Temple Grandin, a person who experiences neurodiversity, is world renowned for her design of Livestock Handling Systems, Cattle Corrals, Stockyards, and Racetracks. As an innovative animal behaviourist, she acknowledges that her neurodiversity brought her profound insights into how animals see the world, even though she is in constant battle with the world we live in:

One of my sensory problems was hearing sensitivity, where certain loud noises, such as a school bell, hurt my ears. It sounded like a dentist drill going through my ears (Grandin, 2000).

Grandin didn't speak until she was nearly four years old, and communicated her frustration by screaming and humming. In 1950, she was diagnosed with autism and her parents were told she should be institutionalised. She tells her story of "groping her way from the far side of darkness" in her book: *Emergence: Labeled Autistic* (Grandin and Scariano, 1996) – a book which stunned the world. It was during her school years that she found a mentor who recognised her special abilities of perception. In her 2010 Ted Talk entitled “The world needs all kinds of minds” Grandin declares:

One of the things that worries me is where is the younger version of those kids with [neurodiversity] going today? They are not ending up in Silicon Valley where they belong! The thing is the world is going to need all the different kinds of minds to work together. (Grandin, 2010)

Dr. Grandin, amongst her many current roles, consults for Burger King, McDonald's, Swift, amongst others.

What does neurodiversity mean for cities?

Since 2010 our research team has been investigating the inter-relationships between the public realm and people experiencing neurodiversity. We aim to answer one simple question: *What prevents public urban spaces from being inclusive of everybody?* To achieve this aim our research examines how people who perceive the world differently interact with space – especially urban and public space.

For people with a cognitive impairment [or neurodiversity], accessing the built-environment can be a debilitating experience. Misinterpretation of the built-environment, memory lapses, inability to solve problems and unsuccessful navigation of space can result in distress, temper outbursts, disorientation, dizziness, anxiety and at times fainting (Adkins et al., 2006, p7).

Pilot Project

We have partnered with Logan City Council (LCC), Queensland Health and the Queensland Police, to run a pilot study investigating these relationships. We have also worked with people who experience neurodiversity during these last two years and begun to establish an advisory group of people with neurodiversity to guide and inform our research. This particular study is embedded within a larger piece of collaborative research – called the **Urban Jungles Project** – that utilises both qualitative and quantitative data to further examine the topic. Working through a two-fold process [from psychology at one end and urban design at the other] the **Urban Jungles** project expands the knowledge base around neurodiversity through the doctoral work of Nicolle, while testing the impact of the public space systems against a profiled user-base (Kern et al., 2007).



Logan City Council – source Uwe Dederling “Location Map of Queensland, Australia”, uploaded on Wikimedia commons, Creative Commons License, https://commons.wikimedia.org/wiki/File:Australia_Queensland_relief_location_map.jpg

Logan City is located between 15 and 50 kilometres south of Brisbane occupying around 960 square kilometres (Logan City Council, 2013a). This area supports a diverse population that, according to Logan City Council (LCC) and QLD Police, includes 185 ethnicities with 192 different languages recorded, and at least 30% of the population is aged less than 44 years (Logan City Council, 2013b). Although ABS data doesn't indicate quite the same level of diversity the team acknowledge the lag in recorded census data (Australian Bureau of Statistics, 2012).

Logan City Council recognises the different levels of social disadvantage and disability across their region and has worked hard to promote greater inclusion and stability in their strategic planning vision (Logan City Council, 2010). However, although the Crime Prevention through Environmental Design (CPTED) principles have been employed by the Council there remains an increase in violent incidents across Logan particularly in public spaces like streets and pedestrian paths (Logan City Council, 2013c).

The Parks, Sport and Community Services at LCC Council were keen to understand whether or not elements in the built environment were contributing to these incidents and thereby increasing the challenges of mobility within the community (Logan City Council, 2013c). The area selected by the Council for the pilot was Logan Central – a culturally diverse yet

under-utilised, mixed-use area, anchored around the Woodridge railway station and two State schools, one of which included a special needs group.

Pilot Study

The objective of the study was to scrutinise the public space system around Logan Central while mapping the existing sensory triggers against the navigation routes through the area. A significant part of our research work is in the education and training of emerging professionals [medical, allied health professionals, and urban designers]. The study was introduced as a real world project into the Queensland University of Technology (QUT) Masters of Urban Design program [Semester 2, 2012] to raise the level of awareness of neurodiversity against their usual studies of urban space and mapping (Cooper et al., 2001). A series of lectures and seminars around designing for safety, and exploring neurodiversity were introduced during the semester. Along with site visits and briefing sessions with LCC and QLD Police, the Masters candidates have explored the physical attributes of Logan Central in a series of mapping studies.

Public space systems in Logan

Mapping is a technique used to reveal how urban spaces are functioning. By isolating individual elements of an area, each in turn, we can highlight their relationships with other elements and objects in the space (Holt-Damant and Wyeld, 2005). Then by supplementing the mapping studies with digital video clips, the movement patterns can be documented showing a sequence of user movement in time and space. By speeding up/slowing down the footage we can establish the trajectories of movement for different people, and consequently how the space actually works.

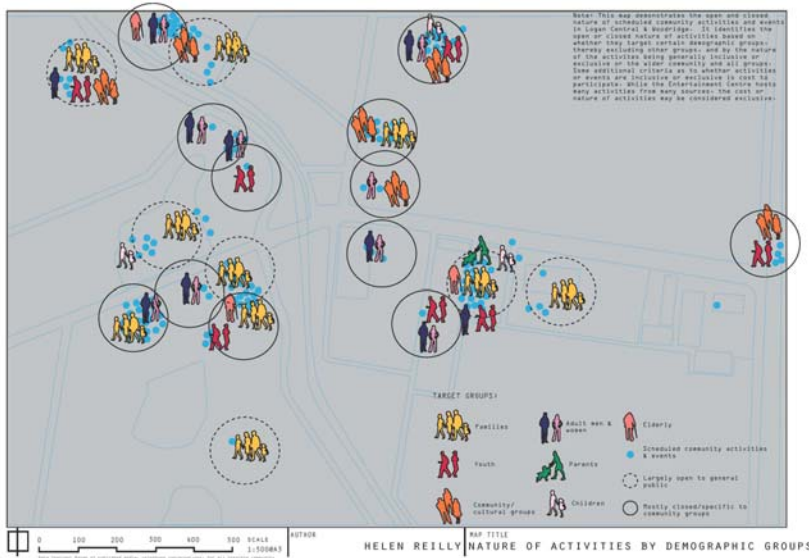
The following images show a number of different maps – each presenting a perceived physical condition of Logan Central as it exists now. These maps are an important datum for the documentation of the movement patterns and trajectories of our selected user groups. By comparing the measurable data against the patterns of movement from our user-base we can isolate those urban areas that cause those most difficulty against those which appear to facilitate their navigation. Then, through a heuristic process we can analyse each of the spaces to identify the triggers. This knowledge is essential for the second stage of the pilot where activities are focussed around designing places for people.

The first example examines how legible Logan Central is in terms of typical urban design criteria. Using Kevin Lynch's categories of city elements (Lynch, 1960), Noller, identifies the broad districts of Logan Central that are separated by main roads, the railway line, and large retail stores. Against these districts, he then marks the identifiable landmarks; key nodes; paths and edges that are widely used and understood by the community. Lastly, he places question marks in the areas of confusion that cannot be categorised. These areas will be examined more closely at later on in the study.



A. Noller, Legibility analysis, Logan Central Mapping Study, Urban Design Studio B, QUT DE50, 2012

Another candidate, Helen Reilly, surveyed the activities and events that brought the community together in Logan during the course of six months (June - December). She mapped their occurrence – daily, weekly, monthly or annual – showing the frequency of events on the map. The second map showed a breakdown of the type of activities and the demographic groups taking part within Logan Central to reveal the open and closed nature of scheduled community activities. This map indicates clearly the level of inclusivity and exclusivity to different community groups. Few of these activities were open to the whole neighbourhood.



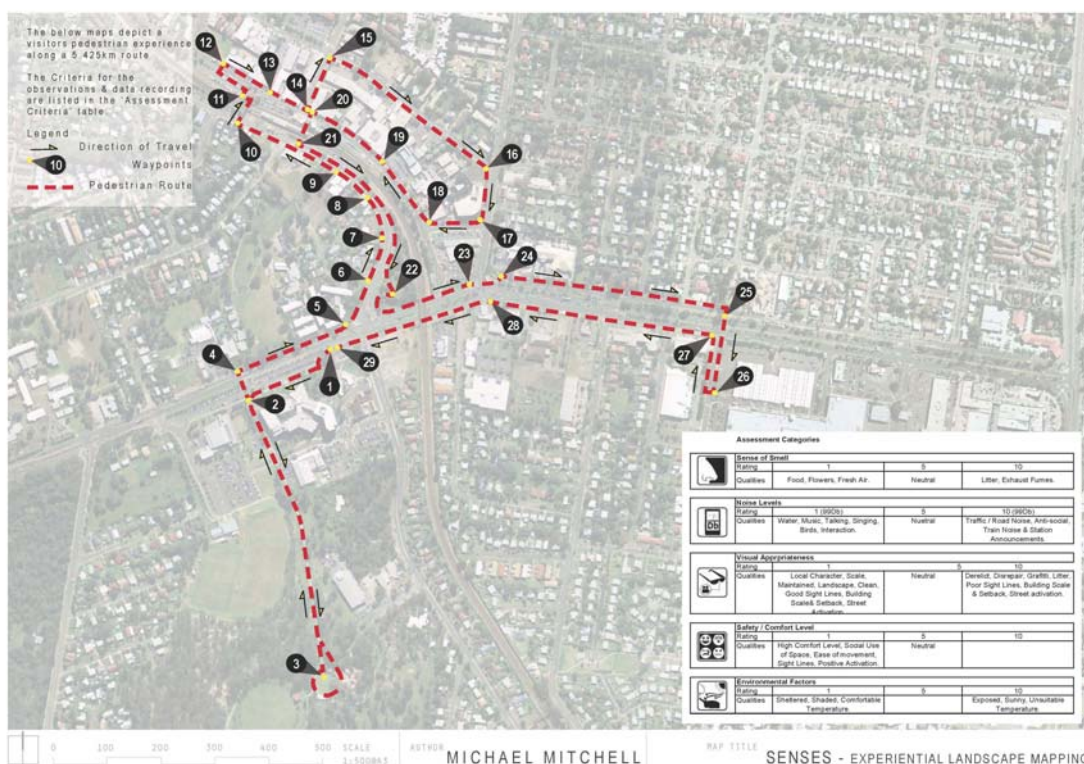
Helen Reilly, Nature of Activities by Demographic groups, Logan Central Mapping Study, Urban Design Studio B, QUT DE50, 2012

Another mapping study begins with an inventory of the physical condition of the area in question. Eddie Heron mapped three visible conditions: physical damage to buildings; excessive littering on the ground; and particular places where he observed anti-social behaviour while he was conducting the site visit. His map shows this area is limited to the zone around the railway station.

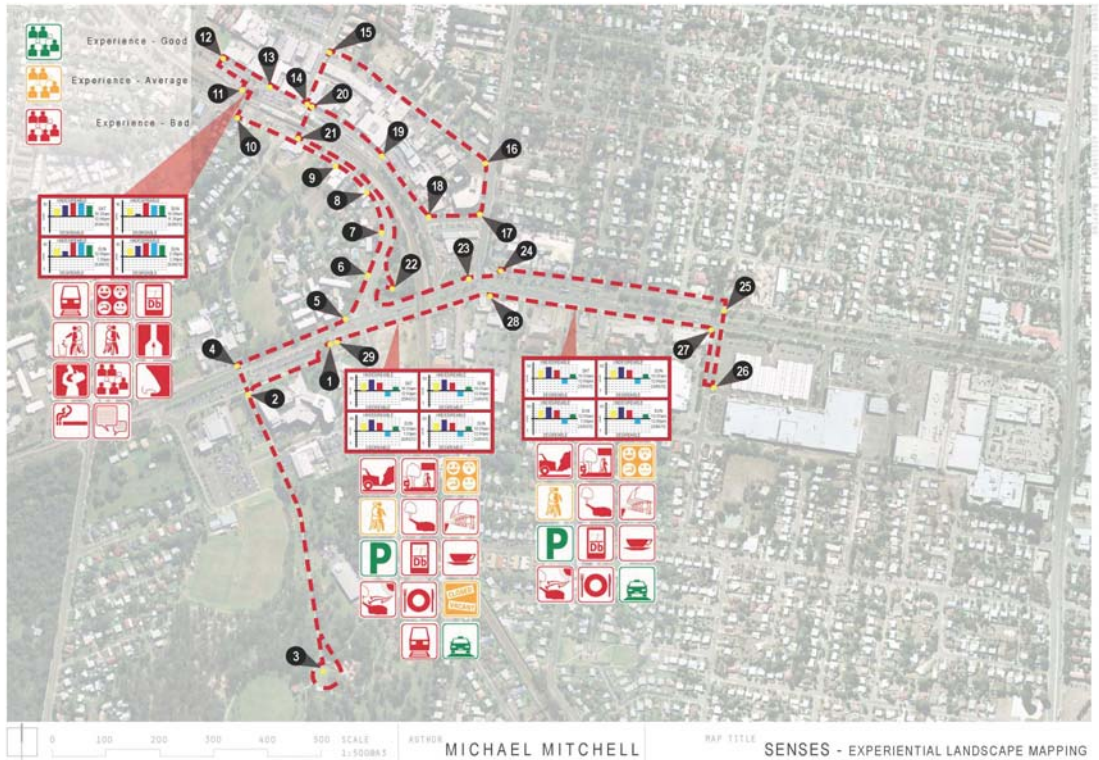


Eddie Heron, Anti-pride in Logan, Logan Central Mapping Study, Urban Design Studio B, QUT DE50, 2012

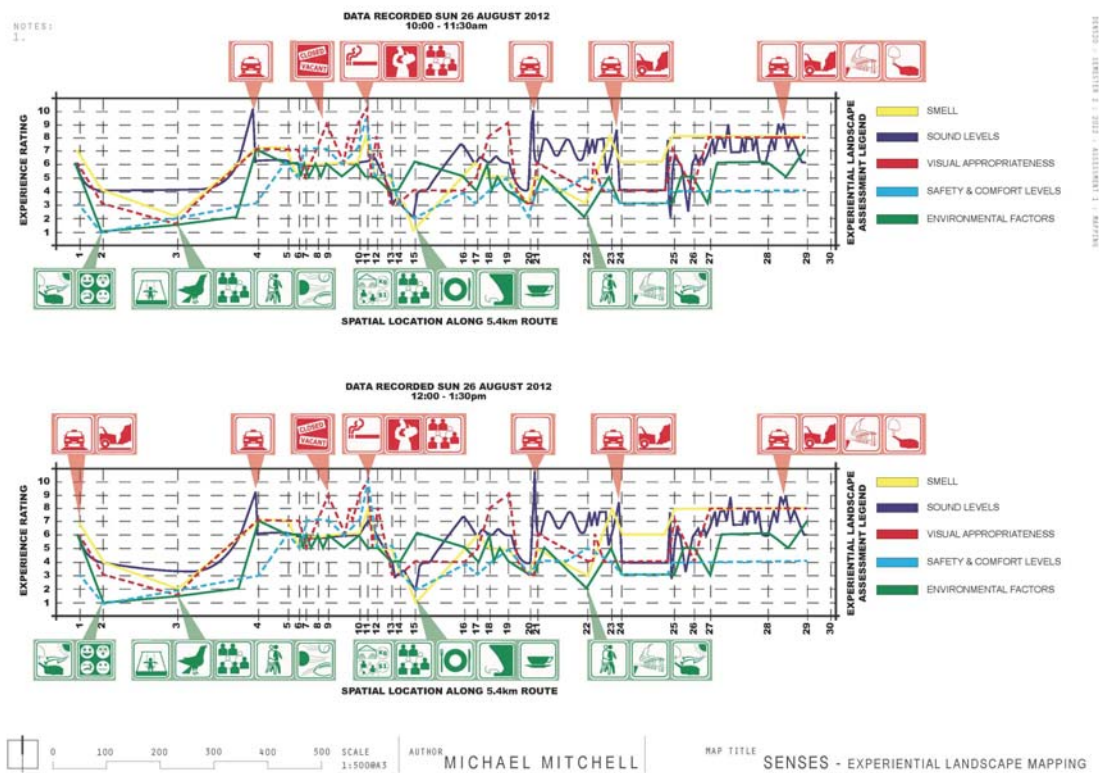
The next series of maps describe a 5.425 kilometre route (an hour and half hour walk) through Logan Central. Michael Mitchell wore a camera strapped to his head, and simultaneously observed the perception to five senses at 26 key waypoints. Mitchell used the categories: ‘sense of smell’; ‘noise levels’; ‘visual appropriateness’; safety/comfort level’; and ‘environmental factors’ to assess the area he selected. Each of these categories he rated against a scale of 1 – 10, with 1 being the highest and most enjoyable sensory experience. Mitchell then mapped these perceptions onto a series of linear graphs at three different times of day. Each graph simultaneously captures the complete experience of all categories. This enables the reader to identify the areas around the waypoints that worked well against those that didn’t. In turn this will assist the Council to prioritise which areas require immediate attention or intervention from less urgent ones. This level of sensory mapping provided a comprehensive background to the second phase of the pilot study where we will compare the experiences and perceptions of a sample neurodiverse group.



Michael Mitchell, Base Route: Senses – experiential landscape mapping, Logan Central Mapping Study, Urban Design Studio B, QUT DE50, 2012



Michael Mitchell, Red (Bad), Green (good) and Yellow (average) experiences: Senses – experiential landscape mapping, Logan Central Mapping Study, Urban Design Studio B, QUT DE50, 2012.



Michael Mitchell, Graph Sunday 26 August 2012: Senses – experiential landscape mapping, Logan Central Mapping Study, Urban Design Studio B, QUT DE50, 2012

Relationship between health and the built environment/cities

The effect of the built environment on physical and mental health is a developing field of investigation and there is clear evidence that the two are related (Kent et al., 2011, Galea et al., 2005). Design can contribute to physical and mental wellbeing; Kaplan (1987) for example recognises the need for specific spaces that restore our senses and our sense of balance. An integrated sensory experience has also been experimented in different urban design projects, like Crown Fountain in Chicago or the Red Lounge in St Gallen or even rethinking basic streetscape elements like in Kensington High Street (Moylan, 2005, Gray, 2008).

The study of the relationship between wellbeing and built environment has been investigated by several disciplines, including public health, psychology, philosophy, geography and urban design; however, there is no general consensus on the dynamics of perception and how this should influence the design of the built environment. The navigation of urban space, also known as wayfinding, has been the focus of extensive research from the 1960s (Braben and Guaralda, 2013, Cullen, 1971, Lynch, 1960, Holt-Damant, 2005) and has been tested and implemented in design and planning.

From a preventative medical perspective, the urban environment has emerged in the research as a salient determinant of how active and healthy residents' lifestyles are (Berrigan and Troiano, 2002). However, specific characteristics and processes which connect urban spaces to health remain unknown. We know little of how to measure and adapt our urban environment in order to enhance the health and well-being of the people who inhabit these places (Galea et al., 2005). We need further research to look at integrating health and the urban environment.

What remains a challenge, however, is for urban designers to be more certain about which elements and attributes of the urban environment trigger positive interactions, and for health researchers to locate these triggers and the types of interactions that improve well-being.

Since two thirds of Australians live in large cities (Australian Bureau of Statistics, 2012) and will have to navigate public space and transport systems to get to work, travel to the doctor, specialists, or to school or university – it is imperative that we better understand how these environments impact on all people. Healthy cities are inclusive cities and how we perceive and are able to move through our cities impacts on our health.

Conclusion

This pilot study has produced several findings; on a methodological level, a preliminary approach to the systematic mapping of sensory experiences has been tested. The engagement of students in the Master of Urban Design at QUT has allowed to make evident how the experience of a place can be different from person to person, even sharing similar background or in the same demographic. The methodological approach has explored different elements that can influence navigation and use of the public space; while some of the interpretations presented are quite established tools in urban design, the outcome of the pilot has highlighted how is possible to identify different patterns in terms of imageability and triggers. Different students were sensible to different elements in the environment, but areas of complexity or challenging situations interestingly overlaps in the maps allowing to identify nodes of conflict, even for people who could be classified average users. Recording sensory experiences face the issue that data always have an element of subjectivity; the fact the information collected produced maps with similar patters allow to debate the subjectivity of information and start developing tools to unravel the complex sensory experience people has in the public environment.

From the point of view of the actual case study, Logan central, the pilot study has started questioning the design of the main commercial area of this town; the space presents two central spines that have been recorded as very active, often overwhelming and extremely rich in terms of sensory trigger. Away from the central areas, districts with a more vague identity and image have been identified. Analysing the social activity in this town, it is also evident how the complex social situation produces clusters of not inclusive spaces, appropriated in time by different populations or demographics. The space is designed with signifiers dominated by commercial activities that not always allow an easy navigation for all the different social groups that use Logan Central. The pilot has also confirmed an intuition that public spaces are usually designed only in terms of visual experience and that the engagement of other senses is generally not explored. The lack of an overall strategy in the design of this town centre is evident in the fragmented experience users have of this space, as outlined in the presented maps.

In terms of neurodiversity, the pilot study has started clarifying how some environments can be challenging even for the general population; sensory trigger are generally not controlled in

the design process and this can impact on people that cannot filter input from the environment. This study suggests that by better understanding the public space systems we already have and their impact on people – especially within the neurodiverse spectrum – we can increase the benefits to the wider community by offering greater accessibility and ease of navigation for more people.

Our premise is that there will be public spaces in cities that are easier to navigate for whatever reasons. Through our unique methodology, we will become clearer as to the elements that ease navigation over those elements that increase the challenges. Our findings and knowledge will influence best practice guidelines and principles while contributing to healthier cities.

If we understand what makes our spaces safer, healthier and inclusive, then we can predict and plan for them in the future.

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