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The condition of public spaces: the role of sensory experience design

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Abstract

The urban form and the human psyche are two intrinsically linked phenomena. Urban environments are constantly stimulating the biologically embedded sensory systems that humans have. When senses are stimulated in a positive and satisfying way by public spaces, the brain registers a memory of that environment and stores that perception as a mental image that can be linked and recalled as some type of good sensorial experience. This experience is vital in to promoting pedestrianisation and the use of public spaces, in the creation of a safe and enjoyable walkable city. Examining pedestrian circulation typologies at Auckland, New Zealand's, central areas through the lens of Jan Gehl's 'Human Dimension Design Toolbox', this paper explores the science behind human sensory experience as a tool to analyse the conditions of public urban spaces and assist in making informed design decisions.

Keyword: *sensory experience design, public spaces, pedestrianisation*

Introduction

The built environment is the ever-present background to human life. Be it consciously or subconsciously, we live our day to day lives constantly interacting with buildings, structures and the 'spaces-in-between'. This built environment influences our experience of places, determining its success or failure. Literature shows that for a place to be successful it requires users to consciously connect to it, have a pleasant time and enjoy being there so that they continue to inhabit it. For this to occur, their experience of the place must be informed by a meaningful connection to it. This connection can be realised through the human body's sensory receptors (i.e.: perception). When senses are stimulated by an environment, the brain registers a perception of that environment and stores that perception as a mental image that can be recalled as some type of sensorial experience. The design of public spaces is no exception to the idea of sensory experience design. One of the main principles of city planning and urban design today is to design for the pedestrian, that is, to design spaces where the pedestrian's senses are positively stimulated whilst they carry out their activities. By enabling people to carry out their activities in enjoyable and pleasant ways, public spaces remain populated and the goal in urban design is achieved - to create lively and pedestrianized cities. Based on an investigation of the responses that human senses have to the built environment, this paper explores the science behind human sensory experience as a tool for analysing the conditions of public spaces and assisting in making informed design decisions.

Experiencing environments

Senses and perception

To perceive, is “the ability to see, hear, or become aware of something through the senses.” (OUP, 2019c). The human body contains a number of sensory organs that are constantly being stimulated by the external environment. Each sense has its own specific stimuli and so different elements of the external environment affect different senses. When the sensory receptors of sense organs are stimulated, the nervous system reacts and produces a response to the stimuli - a perception. The fact that the senses and perception are ‘hardwired’ into the human anatomy makes this an integral consideration in the design of public spaces - as Juhani Pallasmaa (2012, pp. 12) succinctly concludes: “Our contact with the world takes place at the boundary line of the self through specialised parts of our enveloping membrane.”. Ancient philosophy defined the human senses as having their own sense organ. Sight, sound, smell, taste, and touch were the five basic senses derived based on this definition. Contemporary philosophers, however, no longer consider these the only senses. John M. Henshaw (2012a; 2012b), author of *A Tour of the Senses: How your Brain Interprets the World*, redefines a sense as having a different sensory receptor (not a different organ). Based on his studies, Henshaw, proposes the inclusion of four additional senses: balance, temperature, proprioception (body awareness), and pain. These four additional senses are also included in the broader literature of other authors (e.g.: Dubin and Patapoutian, 2010; Jänig, 2018). Thus, by definition, the senses are the way that people perceive the world around them, making them closely linked to the way we experience the built environment.

Actions informing experience

While it is fact that all humans have these senses for their nervous system to respond to, it is critical to note that responses between individuals are not identical. This is because people’s responses are based on their own experiences. An experience is defined as “an event or occurrence which leaves an impression on someone.” (OUP, 2019a). Buildings, structures and the ‘spaces-in-between’ are the ever-present elements that form the cities people live in. Due to the constant interaction with these elements, every experience that a person has is influenced by this built environment. The term ‘interaction’ is important here. It is not only the presence of these elements that form experiences, but also the actions that they encourage people to perform that are the primary experience enablers (Pallasmaa and MacKeith, 2012). The elements of the built environment are not merely idle objects, they are interactive objects that people perform activities with (e.g.: benches and stairs to step on or sit on; windows enabling seeing and doors enabling threshold crossing). Juhani Pallasmaa (2011, pp. 123) discusses this idea in his text *The Embodied Image: Imagination and Imagery in Architecture*, where he concludes that people’s actions are what form their architectural experiences. Whilst there are a number of factors that influence experiences, it is ultimately a human being’s actions in a place that influence experience the most. It is therefore critical that these actions and especially the freedom to perform them are enabled in the design of successful urban spaces.

Multi-sensory design

It has been established that the way people perceive the world is through their senses. It has also been established that people's actions are what inform their experiences the most. Both perception and experience are closely linked, as they are two forms of mental imagery created by the external environment. When the architectural intent is to improve user experiences, designing a multi-sensory place that evokes positive mental imagery becomes the task. Kevin Lynch (1960, pp. 9), in his book *The Image of the City*, discusses the idea of imageability of place and states that this is possible when the physical elements of that place have a higher probability of "evoking a strong image in any given observer.". Images are a composition of all senses in operation and a strong image is vivid and coherent after the interaction with the place (Ibid., pp. 2). Vividness and coherence encourage people to enjoy a place, to connect, and then want to return to it because of this meaningful connection (Ibid., pp. 118) - this makes multi-sensory design crucial to enabling positive imageability of places. Juhani Pallasmaa and Edward Hall both discuss multi-sensory design theory. In each of their writings, they collectively describe the need for multi-sensory design in architecture because our bodies are naturally in constant dialogue with the environment. To design a place as multi-sensory, it is necessary for elements to stimulate the senses in a meaningful way. The effect that elements have on the nine senses must be considered and evaluated.

Pedestrian environments

The human dimension

Jane Jacobs' (1958) seminal article, *Downtown is for People*, suggested planners consider designing cities for how people actually use them. In *The Death and Life of Great American Cities*, Jacobs (1964, pp. 37) also advocated that people as pedestrians needed to be in the streets to give life to the city - if they didn't occupy the streets, the city would die. To get people in the streets - to make the city lively - people needed to feel safe and stimulated enough to use them because "the sight of people attracts still other people.". In *Cities for People* (2010, pp. 6), Jan Gehl states that cities need to be designed for the human dimension so that they become not only safe, but lively, sustainable and healthy for pedestrians. Both Jacobs and Gehl insist on the need for safety, but safety from what? In his book, Gehl introduces a 'Human Dimension Design Toolbox' (Table 1), where he indicates that pedestrians require protection against traffic and accidents, crime and violence, and unpleasant sensory experiences. Categorized into three sections - protection, comfort and delight - this toolbox introduces twelve human dimension criteria, as a guide to designing the urban environment. These criteria allow for the basic human psychological and safety needs to be fulfilled. In public spaces, the pedestrian should be allowed the opportunities to: walk; stand and stay; sit; see; talk and listen; and play and exercise. William H. Whyte (1980, pp. 28), in his vigorous studies of public spaces, identifies, like Gehl, sitting as an essential activity. Regardless of whether it is considered in the design or not "people tend to sit most where there are places to sit."

Table 1. Jan Gehl's Human Dimension Design Toolbox. (Source: Gehl, 2010).

Protection	Protection against traffic and accidents - Felling Safe: - Protection for pedestrians - Eliminating fear of traffic	Protection against crime and violence - Felling secure: - Lively public realm - Eyes on the street - Overlapping functions day and night - Good lighting	Protection against unpleasant sensory experiences: - Wind - Rain/snow - Cold/hear - Pollution - Dust, noise, glare
Comfort	Opportunities to walk: - Room for walking - No obstacles - Good surfaces - Accessibility for everyone - Interesting façades	Opportunities to stand/stay: - Edge effect/attractive zones for standing/staying - Supports for standing	Opportunities to sit: - Zones for sitting - Utilizing advantages: view, sun, people - Good place to sit - Benches for resting
	Opportunities to see: - Reasonable viewing distances - Unhindered sightlines - Interesting views - Lighting views - Lighting (when dark)	Opportunities to talk and listen: - Low noise levels - Street furniture that provides "talkscapes"	Opportunities for play and exercise: - Invitations for creativity, physical activity, exercise and play - By day and night - In summer and winter
Delight	Scale: - Buildings and spaces designed to human scale	Opportunities to enjoy the positive aspects of climate: - Sun/shade - Heat/coolness - Breeze	Positive sensory experiences: - Good design and detailing - Good materials - Fine views - Trees, plants, water

As a criterion, seeing is a rather complex senses because it relates to more than just what is in your field of vision - the seeing sense significantly influences your perception, experience and sense of place (Carmona *et al*, 2010). Walking is the most referenced criteria because it is what a majority of pedestrians do - they walk. Vicente del Rio (2016, pp. 67), in his article on urbanity and the flâneur, states that "we are only able to fully enjoy urbanity and a city's urban design qualities through our daily experience and explorations and, most certainly, walking.". It is therefore imperative that the activity of walking is comfortable and inclusive for everyone. Considering scale, the positive aspects of climate, and positive sensory experiences, the third section of Gehl's toolbox enables pedestrians to feel delighted in urban spaces - they should take pleasure in being there so that they continue to populate these spaces. Pedestrians experience the urban environment in the closest proximity and therefore it is important that these physical aspects are considered, because, where pedestrians do not feel protected, comfortable and delighted, they will feel as if they do not belong there; they will be unable to create positive images or meaningful connections and so they will not have the desire to return to those spaces.

Pedestrian circulation typologies

Public spaces consist of a number of different pedestrian circulation typologies that link up with each other to enable a constant flow of pedestrian activity through the urban environment. For the purpose of this study, we will examine three pedestrian circulation typologies: Streetscapes; Open Spaces; and Integrated Thoroughfares. It is important to understand what defines these typologies, so that an investigation into the existing conditions of these different types of spaces can occur: a) **Streetscapes** - are linear spaces with a flow of traffic, either vehicular and pedestrian or only pedestrian; b) **Open Spaces** - are large, public, non-

linear spaces where pedestrians can stop and stay or pass through; c) **Integrated Thoroughfares** - are pedestrian links that have been specifically designed to run through a building or development.

Research methodology and findings

The interest of this study lies in public spaces and how they can be designed to enhance pedestrians' sensory experience. This prompts the idea of investigating existing urban spaces to determine what makes some spaces more successful - more stimulating and meaningful - than others. Human dimension has been established as crucial to the design of public spaces and so, Jan Gehl's "Human Dimension Design Toolbox" becomes a valuable asset in their analysis and development. For this study, a total of 31 urban spaces located in Auckland city's CBD and fringe areas were analysed. The sites were selected based on their general 'pedestrian-friendly' identities. Each site was categorised into one of the three circulation typologies and then examined using Gehl's toolbox criteria. For the purpose of this brief article, and to illustrate the methodology used in the full study, only a small sample of the investigated sites are included here.

Streetscapes

Varying sense of enclosure was a common element found among this type of site. In a number of the streetscapes, the proportions of the space between the edges of the streetscape changed as the whole length of it was travelled. Proportions of space are linked to a person's sense of enclosure and so this variation in space allows for a person's senses to be constantly engaged and reacting to the different stimuli. It is noted that the streetscape or footpath widths are always wide enough to accommodate high pedestrian foot traffic (Table 2).

Table 2. Table Example of data collected for the streetscapes typology.

	Site 5: Fort Street	Site 8: Vulcan Lane
Walking	375m length; shared zone and sidewalk sections; flat; winding road, bend; rhythm interruptions - cars, crossings; 4 sections.	99m full length; 2 sections; pedestrians only; straight, ramped; pedestrian crossing separates two sections (breaks walking rhythm); one wide section, one narrow.
Seeing	Obstructed views width wise in some sections; can see full length of sections.	Can see full length of each section; narrow street can be obstructed when lots of people; well-lit at night.
Standing / Staying	Façade niches and walls; street furniture.	Few building niches and edges.
Sitting	Benches along edges.	Benches down centre of wide section; lots of exterior café, restaurant, bar seating along edges.
Talking / Listening	Constant vehicle traffic.	No cars through, only perpendicular at the ends; lots of chatter at café, restaurant, bar seating.
Climate Protection	Canopies on both sides almost whole length; east-west orientation, one side shaded more.	Narrowness means shading; canopies for walking under but limited because used for dining seating.
Safety & Security	Restaurants, bars, hostels activate day and night; consistent flow of people; mostly good visibility; cars.	Lighting from bars and restaurants in one section; narrow section is dark at night, light from few dining places only.
Observations	Flat and winding; interrupted walking rhythm; continuous canopies; day and night activation; outdoor dining.	Day and night activation; sense of enclosure varies; straight and ramped; outdoor dining.

Another common element was the lack of canopies or protection from undesirable weather. When the buildings that line streetscapes do not provide canopies, pedestrians need to provide their own means of protection from undesirable weather and when they do not have these means to protect themselves, they

may become restricted in the streetscapes they can use to walk. Feeling secure in streetscapes is of importance to pedestrians - where people feel safe, they will use a street. Activation of streetscapes during the day and at night was a common theme found in the sites that established a sense of security. While this is not to do with physical qualities of the streetscape itself, it highlights the importance of what the edges - the interfaces - of the streetscapes do. A mixture of different functions that have varying operating hours allow for there to be a constant people presence which attracts people to use a space.

Open spaces

Grass lawns and large trees provide places in open spaces for people to stop. Grass lawn, with or without furniture, provides a place to sit or play. Large trees provide places to sit or stand under because of their ability to shelter and provide shade. Water features were found in four of the six open spaces analysed. People like the look, sound and feels of water (Whyte, 1980, pp. 47-48), it can entice people to stop in an open space for the purpose of enjoying the sensory experiences it stimulates (Table 3).

Table 3. Example of data collected for the open space typology.

	Site 14: Takutai Square	Site 15: Freyberg Place
Walking	Wide walkway down centre and all edges; flat; only two small steps one side; purposeful and leisurely walking.	Utilised as a thoroughfare; purposeful and leisurely walking; flat, ramped.
Seeing	Generally unobstructed views; can see across whole space; furniture, trees, columns can obstruct views at times.	Trees are obstructive.
Standing / Staying	Colonnade to one edge; columns; street edges; trees.	Colonnade to one edge; columns; street edges; trees.
Sitting	Lawn with seasonal furniture; bollards; large rocks; tables with chairs.	Stepped seating; benches around trees; seating all at edges of space; performances in space encourage an audience to sit.
Talking / Listening	3 short secondary roads around (less traffic); construction noise; fountain creates intermittent sound.	2 roads to edges but are secondary/shared so have less traffic; fountain creates constant noise.
Climate Protection	Completely uncovered space; one colonnade edge for shelter; pleasant and enjoyable space in good weather.	Covered canopy / colonnade; uncovered, no use in rain, otherwise enjoyable; large trees provide shade.
Safety & Security	Lots of people in daytime; well-lit at night; restaurant, bars, clubs activate at night.	Well-lit at night; functions around area enable use at night - hotel, bars, restaurants, clubs.
Observations	Lawn; fountain; colonnade; seating and furniture; active edges.	Stepped seating; colonnade; fountain; active edges; big trees; day and night activation.

The open spaces analysed all provide seating in varying capacities and contexts, this subsequently affects the usage of the seating. Benches provided at the edges of the spaces allow people to linger in the space while not drawing attention to themselves. Stepped seating has the ability to draw crowds in open spaces. In the spaces analysed, when the weather permits, office workers flock to the steps to enjoy their lunch. This type of seating also facilitates audiences to sit when there is some form of entertainment occurring in the space. Isolated seating, that is seating in the middle of the open space, tended to be neglected, again the mentality of not wanting to draw attention plays a role in this. There was a majority across the sites in terms of how the open space was accessed by pedestrians. Almost all of the sites had edge access, only one site had point access. Where sites had edge access, a pedestrian could enter the space from any point along that edge.

Point access means that there is a point location along an edge that pedestrians must use as the threshold to enter the space. The benefit of edge access is that it can be more welcoming to pedestrians because there would be less ambiguity over how, where and by whom a space can be used. To ensure around-the-clock activation of the space, the provision of multiple functions with varying operating hours in the vicinity of the space, is necessary. Occasional pop-up events within open space were another identified means of activation.

Integrated thoroughfares

Due to the ambiguity involved in whether integrated thoroughfares are public or private, the necessity to express this visually becomes important. Where the sites were publicly accessible, entries were open and unrestrictive. This enables pedestrians to feel free to include routes through buildings or developments in their journeys. Integration with architecture enables thoroughfares to be either interior, exterior or a combination of both. The analysed sites show a majority of the thoroughfares as interior spaces - the benefit of these, is that they provide a protected circulation space for pedestrians. Where a thoroughfare was exterior, there was minimal protection from weather but the surveillance of the space by people was high due to visual connections between the building and the thoroughfare. With a majority of the thoroughfares being interior, the qualities of light in the space becomes important because of the physical separation from the natural light outside. Of the analysed spaces, some were bright and full of light whilst others were dim and dark. These qualities were found to be reflective of the functions that the architecture or developments catered for. In most cases, where there were bars and restaurants, artificial lighting was used to allow for the moody (dim) ambience of these functions to be achieved. Where the spaces were for retail and public facilities, the integrated thoroughfares were bright with natural daylight allowed to enter through glass roofs. Access to or activation of the thoroughfares was often found to end when the operating hours of the functions in the building or development were over. Retail, restaurants, and offices dictated earlier closing than thoroughfares with bars or apartments. By implementing these functions, into integrated thoroughfares, life in the city ‘after hours’ can be encouraged (Table 4).

Table 4. Example of data collection for the integrated thoroughfare typology.

	Site 25: Chancery Square	Site 30: Lot 3, Ponsonby
Walking	Stairs at one end, flat at two ends and paths; multi-choice.	Straight and flat.
Seeing	Centre is always visible; choice of paths visible.	Path entries are almost hidden and narrowness limits what can be seen from outside; can only see when inside the space.
Standing / Staying	Building edges.	Too narrow; courtyard space.
Sitting	Benches; dining seating.	Restaurant seating; bench seating in one of the paths; courtyard seating.
Climate Protection	Open to sky; some glass canopies.	Open to sky.
Safety & Security	Mixture of uses allows for around the clock activation.	Gated, closed after hours.
Observations	Changing space proportions; exterior; visible centre.	Changing space proportions; exterior; narrow, hidden; semi-public; destination and thoroughfare.

Conclusions

The study of the circulation typologies has enabled the identification of successful sensory experience design in public spaces. In this context, successful is defined as that which can enable higher levels of pedestrian activity - an urban design goal. Sense of enclosure; weather protection; sense of security; facilitating stopping; access; ambience; and mixed-functions are common design elements found in the studied sites that assist in encouraging pedestrian activity. These design elements can be used as principles upon which better pedestrian spaces in the urban environment are designed to stimulate a variety of sensory experiences. Stimulation of the senses plays an integral role in the perception pedestrians have of the urban environment. Where design elements have been able to vividly stimulate multiple senses, as the ones identified can do, the likeliness of pedestrians wanting to return to a place to sustain its liveliness and activation is increased. Therefore, architects and urban designers need to be aware of the sensory affects that these elements can have on the success of a public space and how this knowledge can assist in the design of places that stimulate the senses in a positive and memorable way.

References

1. Carmona, M. et al (2010) *Public Places, Urban Spaces: The Dimensions of Urban Design*, Elsevier, Amsterdam.
2. Del Rio, Vicente (2016) Urbanity, the Flâneur, and the Visual Qualities of Urban Design: A Walk in Lisbon, Portugal, *Focus*, Vol. 12, no. 1, Article 16, 66-72.
3. Dubin, A.E. and Patapoutian A. (2010) Nociceptors: the sensors of the pain pathway. *Journal Clin. Invest.*, n.120(11), 3760-72.
4. Gehl, J. (1987) *Life Between Buildings Using Public Space*, Van Nostrand Reinhold, New York.
5. Gehl, J. (2010) *Cities for People*, Island Press, Washington. ProQuest Ebook Central Ebook.
6. Hall, E.T. (1990) *Hidden Dimension*, Anchor Books, New York.
7. Henshaw, J.M. (2012a) *A Tour of the Senses: How your Brain Interprets the World*, The Johns Hopkins University Press, Baltimore.
8. Henshaw, J.M. (2012b) *How Many Senses do we have?* Available from: John Hopkins University Press Blog <<https://www.press.jhu.edu/news/blog/how-many-senses-do-we-have>> (accessed 1 August, 2019).
9. Jacobs, J. (1958) *Downtown is for People*. Available from Fortune Classic < <https://fortune.com/2011/09/18/downtown-is-for-people-fortune-classic-1958/>> (accessed 20 August, 2019).
10. Jacobs, J. (1964) *The Death and Life of Great American Cities*, Penguin, Harmondsworth.
11. Jänig, W. (2018) Peripheral thermoreceptors in innocuous temperature detection. *Handb Clin Neurol*, n.156, 47-56.
12. Lynch, K. (1960) *The Image of the City*, MIT Press, Cambridge.
13. Oxford University Press - OUP (2019a) *Experience*. Available from: Lexico.com <<https://www.lexico.com/definition/experience>> (accessed 7 September 2019).
14. Oxford University Press - OUP (2019c) *Perception*. Available from: Lexico.com <<https://www.lexico.com/definition/perception>> (accessed 5 September 2019).
15. Pallasmaa, J. (2011) *The Embodied Image: Imagination and Imagery in Architecture*, Willey & Sons, Chichester.
16. Pallasmaa, J. (2012) *The Eyes of the Skin: Architecture and Imagery in Architecture*, Wiley & Sons, Chichester. ProQuest Ebook Central Ebook.
17. Pallasmaa, J. and MacKeith P.B. (2012) *Encounters 2: Architectural Essays*, Rakennustieto, Helsinki.
18. Whyte, W.H. (1980) *The Social Life of Small Urban Spaces*, The Conservation Foundation, Washington.