9-2023

Insights from a Study on Multimodal Experiences in a Plaza

Yohany Albornoz

Gladys E. Maestre
The University of Texas Rio Grande Valley, gladys.maestre@utrgv.edu

EDITORIAL COMMENTARY

A prospective empirical study titled "Insights from a Study on Multimodal Experiences in a Plaza" is presented by Yohany Albornoz, an architect and independent researcher with a focus on neurosciences applied to architectural design and specialising in commercial built environments, and Gladys Maestre, an award-winning neuroscientist renowned for her work on dementia. Albornoz and Maestre explore the perception of protection in urban space through user reactions to their environment in cities, particularly in open urban spaces.

The authors offer an intriguing interdisciplinary reading on the intersection of neuroscience, architecture, and urban planning that highlights the significance of a contemporary constraint: diminishing urban space. Examining survey attributes, reevaluating responses through user feedback, and comprehending the variability in multimodal sensory experiences will shape the development of safer cities and mitigate the fear of crime in urban settings. The research outputs provide crucial insights for the audience who is interested in understanding, creating, and reshaping cities so that metropolitan areas can be reformed to accommodate the diversity of human activities. This article will inspire further research and practical applications, ultimately enriching our understanding of how architecture and neuroscience converge to shape the essence of human perception in the built environment.

Lorí Crízel
Architect, Urban Planner and Author
Professor of Neuroarchitecture,
Instituto Politecnico di Milano, Italy, and IPOG, Brazil
ANFA Brazil Chapter Chair
(Academy of Neuroscience for Architecture)
CEO, Lorí Crízel Architecture
Brazil

Esen Gökçe Özdamar
Co-Founder and Head,
Dept. of Architecture,
Tekirdağ Namık Kemal University
Turkey

Clarissa Machado
Architect, Urbanist and
Neuroscience Design Specialist,
Italy

Elaheh Khodaei
Neuroarchitect and Researcher
Turkey

URBAN PHENOMENOLOGY

INSIGHTS FROM A STUDY ON MULTIMODAL EXPERIENCES IN A PLAZA

Yohany Albornoz
Architect, Researcher and
Consultant in Neuroscience applied to
architectural design
Founder and Creative Director,
The Marketer Architect
U.S.A.

Gladys Maestre
Neuroscientist and
Director, Alzheimer's Disease Resource Centre for
Minority Ageing Research
Professor of Neurosciences and Human Genetics,
School of Medicine, University of Texas (RGV)
U.S.A.

ABSTRACT

In the emerging field of neuroarchitecture, understanding the neurophysiological responses elicited by urban spaces is crucial for promoting sustainable development and enhancing the quality of life. This study investigates the modulation of neurophysiological responses in relation to the perception of protection in urban environments. By exploring the impact of immediate, previously visited, or contiguous spaces on the sensory experiences of individuals, we aim to uncover insights into the interplay between architectural design, multisensorial experiences, and the modulation of perceived protection.

Using a holistic phenomenological approach, we designed an experiment involving 100 participants to examine how the atmosphere of preceding spaces influences the perception of protection in subsequent spaces. The results and conclusions of this study contribute to the development of methodologies for understanding the neurophysiological responses associated with different levels of perceived protection in urban areas. Ultimately, this research provides valuable insights for architects, urban designers and planners, seeking to create urban spaces that enhance well-being and foster a sense of protection.

It provides a new approach to the design of architectural transitions and a smoother change of scale from the exterior to the interior of a building.

INTRODUCTION

In our modern world, characterised by unprecedented urbanisation, preserving human well-being within urban spaces is paramount.

Researchers such as Fred Gage, John Paul Eberhard, and Eve Edelstein advocate for neuroarchitecture, a discipline that aligns design with human neurophysiology.

Neuroarchitecture offers the potential to cultivate healthier urban ecosystems by crafting environments that nurture our well-being, foster a connection with nature, and elevate urban living. It holds great promise for creating designs that enhance the quality of life in urban areas.[1]

One important aspect of the study of the multimodal sensory experience through architecture is to better understand how the various sensory inputs of a building or a public space influence our emotions, perceptions, and behaviour.

Understanding the neurophysiological responses to these aspects is crucial for designing spaces that promote well-being, health, and sustainability[1].

We designed a study on multimodal sensory experiences in a plaza that attempts to provide valuable insights into how architectural design can promote well-being.

[1]Liu, Z.; Yang, Z.; Osmani, M. (2021). The relationship between sustainable built environment, art therapy, and therapeutic design in promoting health and well-being. *Int. J. Environ. Res. Public Health*, 18, 10906. https://doi.org/10.3390/ijerph182010906

The central question of our study was whether the neurophysiological responses in a space could be modulated or changed by the responses generated in the immediately preceding space. We wanted to understand if the perception of protection in a plaza could be modulated by the atmosphere of the preceding space.

This concept is closely related to the phenomenon known as *priming*. Priming refers to the process by which exposure to a stimulus influences an individual's subsequent perception, behaviour, or response to a related stimulus. Research in cognitive psychology has demonstrated the powerful influence of priming on various aspects of human perception and behavior[2,3]. Research has shown that prior experiences or stimuli can activate related mental constructs or expectations[2], leading to biased perceptions and responses in subsequent situations.

In our study, we hypothesised that the atmosphere and sensory inputs of the preceding space would prime individuals to perceive and evaluate the subsequent plaza space differently in terms of "Perception of Protection".

The scope of our work was to design a space and an experiment that would allow us to respond to and validate the question. The actual run of the experiment would be the next step in future research.

To accomplish our intention, we concentrated our efforts on understanding the neurophysiological responses in a plaza where a strong feeling of exposition was detected in the external area (Space #1) and a highly contrasting perception of protection in the subsequent internal arcade (Space #2).

Figure 1. View of the Plaza on Google Earth

Figure 2. Scheme of Space #1 and Space #2 and their overlap.

The current situation provides a perceived major Perception of Protection inside the Arcade.

[2]Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology*, 71(2), 230–244. https://doi.org/10.1037/0022-3514.71.2.230
[3]Higgins, E. T. (1996). Knowledge activation: Accessibility, applicability, and salience. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 133-168). Guilford Press.

THE EXPERIMENT

We designed an experiment with 100 participants using virtual reality models of the plaza and surrounding spaces, in which we will include an "informed consent form", and provide an explanation of the potential effects that may arise in participants with specific vulnerabilities. The same group of participants will experiment with both conditions. Half of them started with a control condition, and half of them started with an experimental condition. Subjects will be 50% men and 50% women between 50 and 65 years old.

The participants will be staff or faculty of the University of Texas at Rio Grande Valley who volunteer to take part in our research. This research will not examine gender differences, and both males and females will be involved.

IRB approval from the university will be obtained, and all subjects will sign appropriate informed consent. The data will be stored and encrypted by Base64 on a password-protected computer and accessed only by the research team and for approved scholarly purposes. To ensure confidentiality, participation is anonymous.

Participants will follow a protocol throughout the experiments, and they will be stationary and seated. We will first describe the procedure and technology that will be used.

We will first describe the procedure and technology that will be used.

- Participants will be seated and individually rigged up with the Oculus Rift head-mounted device for virtual reality, a portable EMOTIV EPOC EEG, earphones, and will be instructed to attach the IntelliSense Patch to the chest. Individuals with chest hair will be advised to depilate the area prior to affixing the patch.

- All participants will undergo prior exposure to a commercial VR demo environment to acquaint them with VR technology and the first-person navigation experience.

- The technical settings of the Oculus will be calibrated for each individual.

- All subjects will be exposed to two successive spaces (S1-first space and S2-second space). They will be randomly assigned to begin the experiment either in Control or Experimental S1.

  In the second set of experiments, they will be presented with exactly the same successive spaces but will be exposed to the other condition (Control or Experimental S1) that they did not experience in the first set.

- The space will be presented following a natural navigation approach to S1 and then continuing to S2. The speed of navigation will be predetermined and the same for all subjects.

We hypothesised that people's feelings and physiological responses to the perception of protection in one space can be manipulated by changing the previous space's atmosphere in terms of size, enclosedness, field of view, etc. The changes would be related to lower stress levels and higher relaxation levels on the transition from Space #1 to Space #2, and a different rate of perception of protection in Space #2.

Participants in the experimental condition would report lower stress and higher relaxation levels during the transition from the prior space to the plaza. These findings could make important contributions to the design of public spaces that promote well-being and sustainability.

The Control Condition will be a model created in virtual reality emulating the real-time conditions of the space. The Experimental Condition will also be a virtual reality model in which Space #1 has been modified to have a more protective atmosphere than in the Control Condition, with the expectation of altering the perception of Space #2, which is not being modified at all. The methods that will be used in this work have been developed for a better understanding of cognitive neuroscience[4].

Hartig, Kaiser, and Bowler conducted research that sheds light on the aspects of perceived protection and restorative potential of various environments. They developed a measure called the Perceived Restorativeness Scale (PRS) that assesses people's perceptions of the restorative qualities of their environment[5]. Their work has served as a reference for our study.

Figure 3. External Plaza, identified as Space #1

Figure 4. Internal Arcade, identified as Space #2

[4]Ward, J. (2020). *The student's guide to cognitive neuroscience.* New York, NY: Psychology Press.
[5]Hartig, T., Kaiser, F. G., & Bowler, P. A. (2001). *Further development of a measure of perceived environmental restorativeness. Working paper, Institute for Housing and Urban Research,* Uppsala University.

Our study suggests that the perception of protection in a plaza can be enhanced by modifying the atmosphere of the preceding space. By incorporating architectural elements associated with protection, such as enclosing walls, natural vegetation, outdoor benches, or water features, architects and urban planners can create a sensory transition that promotes a sense of safety and relaxation[6]. This, in turn, can encourage people to spend more time in public spaces and engage with the natural environment[7].

This study also highlights the importance of a holistic, phenomenological approach to architectural design[8]. Although it is necessary to narrow down the question and work only with one variable to get outcomes from science, it is hard to isolate architectural elements and understand their influence without a specific context. Designers would rather create atmospheres and experiences where many variables interplay. The main essence is "Protection of the Pack". The major interventions were done through protective features, sub-essences and restorative features. By setting the main essence and sub-essences and running a risk and protective factor analysis, we could identify flaws in the architectural experience. This helped us determine what elements we could include to improve it in the direction of the intended essences[9].

Figure 5. Representation of the three main elements of the architectural intervention

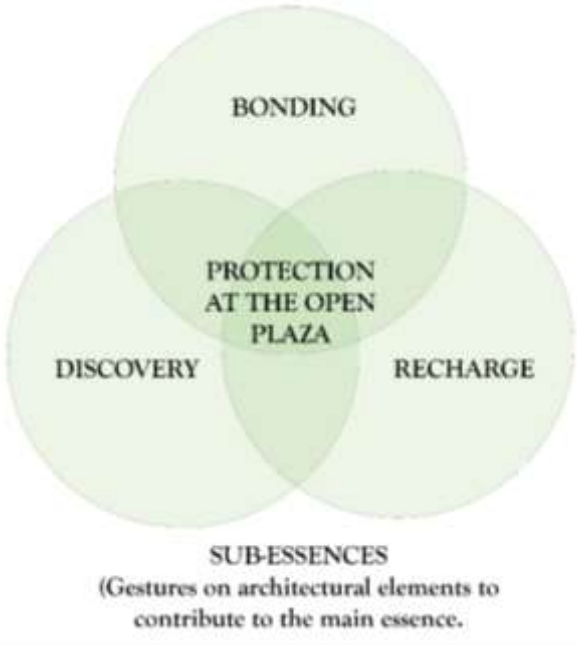

Figure 6. Essence and Sub-Essences of the Project

[6]Martínez-Soto, J., de la Fuente Suárez, L. A., & Ruiz-Correa, S. (2021). Exploring the links between biophilic and restorative qualities of exterior and interior spaces in Leon, Guanajuato, Mexico. *Frontiers in Psychology,* 12, 717116.
[7]Koohsari, M. J., Kaczynski, A. T., Mcormack, G. R., & Sugiyama, T. (2014). Using Space Syntax to assess the built environment for physical activity: Applications to research on parks and public open spaces. *Leisure Sciences*, 36(2), 206-216. DOI: 10.1080/01490400.2013.856722.
[8]Merleau-Ponty, M. (1995). *Phenomenology of perception.* London, UK: Routledge.
[9]Ruzzon, D. (2021). *Neuroscience applied to architectural design.* Tuned Publication.

By understanding the multimodal sensory experience through architecture and how it could affect our neurophysiological responses, architects and urban planners could create designs that promote well-being, health, and sustainability. By running this experiment, our findings could suggest that the perception of protection in a plaza can be enhanced by incorporating architectural elements that promote relaxation and safety and by adopting a holistic phenomenological approach to design[10].

The results of the experiment would provide specific insights into the neurophysiological responses of a space that provides different levels of perception of protection, and how this can be influenced by immediate, previously visited, or contiguous spaces. The design of our experiment, its theoretical basis, and the architectural design process proposed could serve as a methodology for upcoming researchers and designers to create spaces that are more aligned with the needs and preferences of the people who will use them, promoting a sense of ownership and belonging to the public spaces.

Figure 7. Experimental Condition (Architectural Proposal for Space #1

Figure 8. Control Condition (Original Architecture on Space #1).

Figure 9. The sequence of progressive appearances of architectural elements.

[10]Seamon, D. (2000). Phenomenology, place, environment, and architecture: A review of the literature. *Phenomenology Online*, 36, 1-29.

Elements applied to the space (Experimental Condition): Intervention on the horizontal floor and the vertical lateral plane with the introduction of Savannah Porticoes. Predominant surfaces: bricks, white textured stucco, and water[11].

Figure 10. View #2: Visualisation of Level 1

Elements applied to the space (Experimental Condition): Intervention on the horizontal floor and the vertical and lateral planes, with the introduction of a set of urban furniture. Predominant surfaces: wood, metal, vegetation, textured stucco, and water[11].

Figure 11. View #4: Visualisation of Level 2.

Elements applied to the space (Experimental Condition): Intervention on the horizontal floor, the vertical lateral and the horizontal top plane with the repetition of Savannah Porticoes, reinforcing their presence with a message, a set of urban furniture, and trees[11].

Figure 12. View #6: Visualisation of Levels 2 to 3.

Elements applied to the space (Experimental Condition): Increased density of the architectural elements of the proposal — an extension of the internal floor on the exterior[11].

Figure 13. View #8: Visualisation of Level 3

[11]Albornoz, Y., & Maestre, G. (2021). *Neurophysiological Responses to Multisensorial Experiences in a Transition in a Plaza.* (Trabajo de grado de posgrado). Università Iuav di Venezia, Annual Postgraduate Specialisation Programme of First Level in "Neuroscience Applied to Architectural Design".

Elements applied to the space (Experimental Condition): Closing of the passage shortens the distance between architectural elements on the three planes: floor, lateral, and top[11].

Figure 14. View #11: Visualization of Level 3

CONCLUSION

The meticulously crafted experimental process developed in this study can reveal how individuals respond to the spatial arrangements within urban environments. The forthcoming results of this experiment are poised to yield profound insights into the neurophysiological reactions that unfold within spaces, evoking varying degrees of perceived protection.

These findings will uncover the multifaceted factors that influence such sensory perceptions, encompassing inputs from immediate, previously visited, or contiguous spaces. The actionable insights derived from this investigation have the potential to usher in a paradigm shift in our approach to urban planning and city design.

KEY RESEARCH OUTCOMES

By highlighting the neurobiological basis of people's perception of urban spaces, this study provides a solid foundation for evidence-based design decisions. It presents a roadmap for crafting urban environments that not only accommodate the physical and social needs of people but also nurture their psychological well-being.