

IMPACT OF THE BUILT ENVIRONMENT ON THE PERCEPTION OF CAREGIVERS OF CHILDREN WITH MICROCEPHALY IN SPECIALIZED OUTPATIENT CLINICS: A NARRATIVE REVIEW

Renata Maria Silva Alves¹, Laura Bezerra Martins², Vinícius Albuquerque Fulgêncio³

¹Master's student at the Federal University of Pernambuco. Email: renata.salves@ufpe.br

²PhD, Federal University of Pernambuco. Email: laura.martins@ufpe.br

³PhD, Federal University of Pernambuco. Email: vinicius.fulgencio@ufpe.br

Abstract: In recent years, Brazil has been the epicenter of an outbreak of the Zika virus, significantly increasing cases of microcephaly and affecting the development of many children. These patients require continuous and specialized care, with caregivers playing a key role in daily activities. The question then arises: how does the built environment impact the perception of caregivers of children with microcephaly in specialized outpatient clinics? A narrative review was carried out to organize the sources and strengthen the theoretical basis of the research, consulting the Web of Science, Scopus and CAPES Journal Portal databases, with articles published between 2020 and 2025, from November 2024 to February 2025. As a result, two dissertations were found, which explore how environments can be more accessible and inclusive, meeting the specific needs of people with physical disabilities and children with Zika Congenital Syndrome. The literature points to the scarcity of specific studies on the perception of caregivers in relation to these spaces, highlighting the need for further research into ergonomics in healthcare environments.

Keywords: Environmental perception; Microcephaly; Caregiver; Environmental ergonomics.

Introduction

In the last ten years, a congenital infection has emerged as a global concern (WHO, 2016a), affecting countries such as France, the United States, El Salvador and, more intensely, Brazil, which has established itself as the epicenter of the Zika virus outbreak (Brazil, 2023). This outbreak was directly associated with a significant increase in cases of microcephaly in these regions.

According to the World Health Organization (WHO), microcephaly is defined as a clinical condition characterized by a baby's head being smaller than expected for its age and sex (WHO, 2016b). Depending on the degree of brain impairment, they present neurological, motor or respiratory alterations, requiring multidisciplinary monitoring in specialized outpatient clinics (Brazil, 2016a).

Given this clinical condition, these children depend on a caregiver to carry out their activities of daily living, as well as to support their development. According to the Brazilian Ministry of Health, a caregiver is someone with exceptional characteristics, such as love for humanity, solidarity and commitment. This role can be carried out by family members or members of the community, providing support to people of any age with physical or mental limitations, either on a paid or voluntary basis (Brazil, 2008).

According to Elali (2009), when visiting different environments, it is important to consider that each sector has variables that influence human behavior. These variables include “objective” aspects, such as lighting, temperature and noise, as well as “subjective” elements, such as the feeling of being crowded, welcomed, appropriated and the social climate.

The Brazilian Ministry of Health's National Humanization Policy adds that factors such as lighting, morphology, aromas, sounds, synesthesia, colors, art, care for external areas, privacy and comfort, when combined, favour the creation of more welcoming and harmonious environments. This contributes to well-being and challenges the idea that healthcare spaces are cold and impersonal (Brazil, 2013).

Lewin (1965) helps us to understand that individuals interpret the environment around them based on their experiences, needs and personal characteristics. He emphasizes that perception is not simply a passive reflection of the environment, but an active interaction between the individual and their context, influenced by psychological and social factors.

The way people interact with the environment around them, specially built spaces, influences various attitudes and behaviors, generating different perceptions. These perceptions originate from our sensations (Silva, 2023). Perception is an essential concept for understanding ambience, understood as the set of sensations, experiences, memories and emotions related to the social, physical, cultural and temporal context experienced by the person in each place (Tuan, 1980).

Environmental stimuli play a crucial role in explaining the sensations experienced by individuals. Therefore, when evaluating built environments, it is essential to consider the users' perception of the space to gain a deeper understanding of this interaction (Villarouco, 2011), allowing us to identify how these environments positively influence the performance of activities and the promotion of well-being (Ribeiro & Mont'Alvão, 2004).

Studying and understanding this interaction allows us to investigate the experiences of patients and their caregivers. These elements are essential for designing an environment that meets the specific needs of these users, promoting both functionality and well-being.

Indicating an approach that considers the diversity of people, their characteristics, interests and needs, aiming to create a comprehensive vision of how the environment can be properly adapted to them (Felippe *et al.*, 2024). In this way, the research in this study will use the principles of Environmental Ergonomics, based on understanding the interactions between human beings and the other elements of a system (IEA, 2020), considering the interaction between space, individuals and the activities to be carried out (Lobo & Villarouco, 2020).

This analysis presents an overview of the environmental perception of caregivers in an outpatient setting, based on a literature review that is part of an ongoing master's research project at the Federal University of Pernambuco. The study seeks to propose improvements to space, aiming to optimize the comfort and functionality of the environment for a more efficient care experience.

The question arises when we seek answers to the following question: How does the built environment influence the perception of caregivers of children with microcephaly in a specialized outpatient setting?

The narrative literature review was structured to connect the keywords of the topic under investigation, with the aim of improving the integration between Built Environment Ergonomics and the focus of the research, facilitating the understanding of the concepts and their interactions with the study. The results of this review present findings that illustrate the current state of the art, highlighting the connection between the built environment and the perception of the caregiver of children with microcephaly.

A brief review

Caregivers of patients with microcephaly

In 1960, microcephaly was a hot topic. During a lecture in London, Valerie Cowie explained that the term has Greek origins and means “small head” (Cowie, 1960).

The World Health Organization defines microcephaly as a condition in which the size of the baby's head is smaller than the standard for age and sex (WHO, 2016a). The diagnosis is made by measuring the cephalic perimeter, an anthropometric parameter that correlates the size of the head to that of the brain (Brazil, 2017a). Microcephaly can be caused by various factors that affect brain development before or after birth. According to the Centers for Disease Control and Prevention (CDC, 2024), its causes include exposure to alcohol and drugs, maternal or infant malnutrition and congenital infections.

In the last decade, a congenital infection has received worldwide attention (WHO, 2016b), affecting several nations, especially Brazil, the epicenter of the Zika virus outbreak (Brazil, 2023). This outbreak has led to a significant increase in cases of microcephaly in these regions.

Several research studies and guidelines have been developed and published in Brazil (Brazil, 2016a, 2016b, 2017a) to highlight concerns about the impact of the microcephaly outbreak on infected babies. The studies confirmed that the Zika virus not only causes microcephaly, but also causes other serious brain damage, characterizing Zika Virus Congenital Syndrome.

Although the Ministry of Health ended the Public Health Emergency of National Concern in 2017, following the reduction in cases of microcephaly in Brazil (Brazil, 2017b), these children still need specialized care to minimize sequelae and promote their autonomy and social inclusion (Brazil, 2016a).

Given the severity of this clinical condition, these children need a caregiver to help them with daily activities and development. The caregiver is described as “a human being with special qualities, expressed by the strong trait of love for humanity, solidarity and giving”, as quoted by the Ministry of Health (2008, p. 8).

In most cases, mothers take on the role of primary caregiver for children with microcephaly, providing constant and specialized care (Sá *et al.*, 2020).

Since 2015, with the implementation of the National Plan to Combat Microcephaly by the Ministry of Health, early stimulation has become a fundamental strategy in monitoring children with disabilities. This is carried out in specialized clinics and outpatient clinics, with the aim of improving children's functionality and supporting their development (Brazil, 2016c).

These mothers face a stressful routine, taking their children in wheelchairs to appointments and therapies that are essential for their development, moving around different environments (Valim, 2021).

Ambulatories Specializes

In 1944, the Brazilian Ministry of Health published *História e Evolução dos Hospitais* (History and Evolution of Hospitals), which was reissued in 1965. In it, the outpatient clinic is described as a service aimed at the diagnosis or treatment of patients who do not require hospitalization, serving people outside the hospital without the regular occupation of beds. Some hospitals were specialized, focusing on specific medical areas, such as tuberculosis, leprosy and nervous and mental illnesses, with their management being predominantly the responsibility of governments.

With the implementation of the Unified Health System (SUS), its organization became based on the creation of a regionalized and hierarchical network of services. This model encompasses different levels of care: basic care, which corresponds to the primary level; medium care, the secondary level; and high-complexity care, the tertiary level (Solla & Chioro, 2012).

According to these authors, to define the field of specialized care, which encompasses the areas of secondary care (medium complexity) and tertiary care (high complexity), we can mention medical specialties recognized in Brazil, such as allergy and immunology, gastroenterology, neurosurgery, anesthesiology, cardiology, pediatrics, among others.

In Brazil, these and other specialties are present in various institutions, such as Teaching Hospitals, which are health establishments linked to or affiliated with Higher Education Institutions. These hospitals serve as a field of practice for teaching activities in the health area and meet the established certification criteria (Brazil, 2015).

The architecture of these hospitals reflects the changes over time, with each phase requiring specific physical adaptations and progressive changes to the facilities. As this process is continuous and occurs unevenly, old and modern elements are interspersed, as shown in Figure 1, highlighting the need to understand this transformation (EBSERH, 2022).



Figure 1. Evolution of the architecture of the Oswaldo Cruz University Hospital (HUOC)
Source: University of Pernambuco, 2018b.

According to the Design Parameters for Teaching and Research Hospitals of the EBSEH Network (Brazilian Hospital Services Company), projects should include covered areas to house many people and offer protection from the weather, spatial orientation elements to facilitate access to health services, as well as comfortable and clean waiting rooms that meet the needs of different profiles, including pediatric patients and their caregivers. The Ministry of Health's Ambience document (Brazil, 2010) emphasizes the importance of the physical environment in healthcare facilities as an essential factor in ensuring welcoming, effective and humanized care. Its guidelines promote the creation of a more welcoming hospital space that favors the well-being of all participants in the care process.

The National Humanization Policy in Brazil highlights elements such as lighting, morphology, aromas, sounds, colors and privacy as factors that influence hospital ambience. Integrating these aspects creates welcoming and harmonious environments, promoting well-being and challenging the idea that healthcare spaces are impersonal (Brazil, 2013).

Environmental Ergonomics

According to the International Ergonomics Association (IEA, 2020), Ergonomics is a scientific discipline that studies the interactions between human beings and the various components of a system. In addition, it is a profession that uses theories, principles, data and methods in design, aiming to improve human well-being and the performance of the system.

Iida and Buarque (2016) add that Ergonomics, also called Human Factors, is the study of how to adapt work to the human being, with the aim of reducing negative impacts on the worker.

Ergonomics applied to the Built Environment is a field of Ergonomics that focuses on the study of environments in use, with the aim of identifying and implementing improvements, considering how these spaces affect human activities. It adopts an approach that considers the diversity of people, their characteristics, interests and needs, with the aim of adapting the environment more effectively (Felippe *et al.*, 2024).

In this context, where the human being is seen as the focus of all ergonomic actions, it is unthinkable to study the built environment without considering the user's perception of that space. This makes it essential to include environmental perception in any ergonomic assessment of the environment (Villarouco, 2011).

Tuan (1980) examines the connection between human beings and space, highlighting the crucial role of personal experience in the perception of the environment. He states that space goes beyond a geometric abstraction, acquiring meaning through individual experiences and interactions. Tuan explains how people experience and perceive places based on their emotions, memories and sensory stimuli.

Environmental perception is fundamental to understanding the interactions between individuals and the built environment. It goes beyond subjective experience and is a key element that directly impacts the performance and well-being of users in architectural spaces (Bins Ely, 2003 *apud* Moraes, 2004).

Results and discussions

During the literature review, it was difficult to find documents that addressed the environmental perception of caregivers in hospital environments, specifically in specialized outpatient clinics. Most of the research focused on the quality of life of caregivers.

The analysis was based on data from the Web of Science and Scopus platforms from November 2024 to February 2025, considering articles published between 2020 and 2025. Given the difficulty in finding specific materials, we expanded the search to the CAPES Journal Portal, including dissertations and theses in the search.

The search resulted in only two dissertations that specifically addressed the environmental perception of the built environment, as can be seen in Table 1.

Table 1. Description of the literature review.

Dissertation	Authors	Year	Title	Objective	Results
Dissertation 1	Farias, Marcella Vívian Chaves Lôbo Leitão de	2021	Ergonomic analysis of the built environment of physiotherapy rooms for patients with cerebral palsy: the case of the Pepita Duran clinic, Recife - PE	Propose ergonomic recommendations for physiotherapy rooms for patients with cerebral palsy.	The research concludes that the layout should be spacious for wheelchair users and include areas on the floor for activities, with the possibility of equipment or free spaces. Light, acoustic and thermal comfort conditions must comply with current standards, with adequate lighting for each activity.
Dissertation 2	Coelho, Monique Leite Galvão	2022	My child is growing up and now what? Exploring the environmental needs of children with Congenital Zika Syndrome (CZS) according to the perception of their caregivers	To explore the perception of caregivers about the environmental needs of children with SCZ, differentiating between barriers and facilitators.	Recognizing the daily needs of children with SCZ is crucial to guaranteeing their rights and social integration. It is necessary to implement specific public policies and have qualified professionals for family-centered care. Inclusive environments that promote social participation are essential for their healthy development.

Both results address the importance of a suitable environment, but with different focuses. The study by Farias (2021) highlights the creation of accessible spaces for people with reduced mobility, emphasizing spacious layouts, areas for activities and light, acoustic and thermal comfort. The research also underlines the importance of integrating user perception and adopting ergonomic recommendations to optimize the environment according to users' needs.

The second result, by Coelho (2022), addresses the needs of children with Congenital Zika Syndrome, highlighting the importance of recognizing these needs to guarantee their rights and promote their social integration. The research emphasizes the creation of friendly environments that favor the social participation

and healthy development of these children. It also highlights the importance of public policies aimed at this group and the work of qualified professionals to provide family-centered care and skills development. Both results emphasize the importance of adapting environments to the needs of individuals, but while Farias' study (2021) focuses on the physical accessibility and ergonomics of spaces for people with disabilities, Coelho's study (2022) focuses on creating social and inclusive environments for children with SCZ. The research recognizes that the results therefore converge on the idea that adapting the environment to the needs of users is essential, but with different focuses: one on the physical and functional aspect and the other on the social and integration aspect.

Conclusions

The built environment plays a fundamental role in shaping individuals' perceptions, attitudes and behaviors, especially in the context of caring for children with microcephaly.

Interaction with these spaces not only influences the day-to-day experience of caregivers, but also directly affects their emotional and physical well-being.

It is therefore important to emphasize that environmental ergonomics focuses on the adaptability and suitability of space to the tasks and activities carried out in it.

The initial purpose of the research was to identify in the literature review studies on how the built environment impacts the perception of caregivers of children with microcephaly during care in specialized outpatient clinics. However, the research revealed the difficulty in finding studies in the literature that address the perception of this group in relation to the built environment. This highlights the need for more research exploring this perspective, especially in the context of care and health spaces.

References

- Bins Ely, V. *et al.* (2002). Ergonomics + Architecture: seeking a better performance of the physical environment. In: Moraes, A. (org) (2004). *Ergodesign do Ambiente Construído e Habitado*. Teresópolis: 2AB.
- Brazil (2023). Ministry of Health. *Epidemiological bulletin: Epidemiological situation of congenital syndrome associated with Zika virus infection: Brazil, 2015 to 2022*. Brasília, v. 54 (5), 3 abr. 2023. <http://plataforma.saude.gov.br/anomalias-congenitas/boletim-epidemiologico-SVSA-05-2023.pdf>
- Brazil (2017a). Ministry of Health. *Integrated guidelines for surveillance and health care in the context of the Public Health Emergency of National Importance: procedures for monitoring changes in growth and development from pregnancy to early childhood, related to Zika virus infection and other infectious etiologies within the operational capacity of the SUS*. https://bvsms.saude.gov.br/bvs/publicacoes/orientacoes_integradas_vigilancia_atencao_emergencia_saude_publica.pdf
- Brazil (2017b). *Ordinance No. 1,682, of July 30, 2017*. Federal Official Gazette, Brasília, DF, ed.128, section 1, p. 79.
- Brazil. (2016a). Ministry of Health. *Booklet- diagnosis: microcephaly. and now?* Brasília: Federal Council of Physiotherapy and Occupational Therapy - COFFITO. https://coffito.gov.br/nsite/wpcontent/uploads/comunicao/materialDownload/CartilhaMicrocephalia_Final.pdf
- Brazil. (2016b). Ministry of Health. *Health care protocol and response to the occurrence of microcephaly related to Zika virus infection*. https://bvsms.saude.gov.br/bvs/publicacoes/protocolo_resposta_microcefalia_relacionada_infeccao_virus_zika.pdf
- Brazil. (2016c). Ministry of Health. *Guidelines for early stimulation: children aged zero to three years with delayed neuropsychomotor development*. https://bvsms.saude.gov.br/bvs/publicacoes/diretrizes_estimulacao_crianças_0a3anos_neuropsicomotor.pdf
- Brazil (2015). Ministry of Health. *Interministerial Ordinance No. 285, of March 24, 2015*. Brasília, DF: Minister of State for Health. https://bvsms.saude.gov.br/bvs/saudelegis/gm/2015/prt0285_24_03_2015.html
- Brazil (2013). Ministry of Health. *Ambiência*. ed. 2(6). Brasília: Ministry of Health Publishing House https://bvsms.saude.gov.br/bvs/publicacoes/ambiencia_reimp.pdf
- Brazil. (2010). Ministry of Health. *Ambiência*. 2. ed. Brasília: Editora do Ministério da Saúde <https://redehumanizausus.net/categorias/publicacoes-da-pnh>
- Brazil (2008). Ministry of Health. *Practical guide for caregivers*. https://bvsms.saude.gov.br/bvs/publicacoes/guia_pratico_cuidador.pdf

- CDC. (2024). *Microcephaly*. Centers for Disease Control and Prevention. Consulted on November 8, 2024. <https://www.cdc.gov/birth-defects/about/microcephaly.html>
- Coelho, M. L. G. (2022). *My child is growing up and now what? Exploring the environmental needs of children with Congenital Zika Syndrome according to the perception of their caregivers*. [Master's thesis in Collective Health] Federal University of Rio Grande do Norte.
- Cowie, V. (1960). The genetics and sub-classification of microcephaly. *Journal of Intellectual Disability Research*. 4 (1), 42 - 47 <https://onlinelibrary.wiley.com/doi/10.1111/j.1365-2788.1960.tb00751.x>
- EBSERH. (2022). *Design Parameters for Teaching and Research Hospitals in the Ebserh Network*. 1st ed. Brasília: Ebserh - Empresa Brasileira de Serviços Hospitalares. <https://www.gov.br/ebserh/pt-br/aceso-a-informacao/institucional/legislacao-e-normas/legislacao-e-normas-de-infraestrutura/parametros-projetuais.pdf/view>
- Elali, G. A. (2009). *Relationships between human behavior and ambiance: a reflection based on environmental psychology*. In: Proceedings of the Shared Ambiances Colloquium. Rio de Janeiro: ProArq - UFRJ. https://0501.nccdn.net/4_2/000/000/071/260/Article-GLEICE-ELALI-FULL.pdf
- Farias, M. V. C. L. L.. (2021). *Ergonomic analysis of the built environment of physiotherapy rooms for patients with cerebral palsy: the case of the Pepita Duran clinic, Recife - PE*. [Master's Dissertation in Design] Universidade Federal de Pernambuco.
- Fellipe, M. L., et al. (2024). Cognitive and behavioral sciences applied to architecture and design for human well-being. In: Mont'Alvão, C.; Costa Filho, L.; Dorneles, V. G. (Org.) *A new look at design 6: ergonomics in the built environment*. São Paulo: Blucher.
- IEA. (2020). *What Is Ergonomics?* Consulted on 03 May 2024. <https://iea.cc/what-is-ergonomics/>
- Ilda, I. & Buarque, L. (2016). *Ergonomics: design and production*. 3rd ed. São Paulo: Blucher.
- Lewin, K. (1965). *Field Theory in Social Science*. São Paulo: Pioneira.
- Lobo, M. V.; Villarouco, V. (2020). Ergonomics of the built environment in physiotherapy rooms for children with cerebral palsy: a systematic review. *Ergodesign & HCI Journal*, v. 8(1). <https://periodicos.puc-rio.br/index.php/revistaergodesign-hci/article/view/1456>
- Ministry of Health. (1944). *History and evolution of hospitals*. Rio de Janeiro: Hospital Organization Division. https://bvsms.saude.gov.br/bvs/publicacoes/cd04_08.pdf
- Ribeiro, L. G.; Mont'Alvão, C. (2004). Ergonomics in the Built Environment: theory and practice. In: Moraes, A. (org.) *Ergodesign of the Built and Inhabited Environment: urban environment, public environment, work environment*. Rio de Janeiro: iUsEr.
- Sá, S. A. A. G. de et al. (2020). Family dynamics of a child with congenital zika virus syndrome. *Cadernos de Saúde Pública*, v. 36 (2). <https://www.scielo.br/j/csp/a/j3bsMPXjq6g7hnChJc8GrJt/?lang=pt>
- Silva, F. C. (2023). *The path of the hospitalized child patient through architecture: assessments and perceptions together with the child's perspective in the pediatric inpatient sector*. [Master's Dissertation in Architecture and Urbanism]. Universidade Federal de Pelotas.
- Solla, J.; Chioro, A. (2012). Specialized outpatient care. In: Giovanella, L.; (org) *Health policies and systems in Brazil* [online] 2nd ed. Rio de Janeiro: Editora FIOCRUZ https://www.escoladesaude.pr.gov.br/arquivos/File/ATENCAO_AMBULATORIAL_ESPECIALIZADA_Solla_e_Chioro.pdf
- Tuan, Y. (1980). *Topophilia: a study of environmental perception, attitudes and values*. SP: DIFEL. https://edisciplinas.usp.br/pluginfile.php/7471096/mod_resource/content/1/TUAN%2C%20Yi-Fu.%20Topofilia.pdf
- University of Pernambuco. (2018). *HUOC - Oswaldo Cruz University Hospital*. University of Pernambuco. Consulted on February 27, 2025. <https://www.upe.br/uh-huoc>
- Valim, T. (2021). Symptoms and treatments: phases of care for babies born with Congenital Zika Virus Syndrome. MARQUES, B. (Org.). *Micro-histories to think about macropolicies*. São Carlos: Apolo Editorial.
- Villarouco, V. (2011). Dealing with ergonomically adequate environments: would they be Ergoambientes? In: MONT'ALVÃO, C; VILLAROUCO, V. (org.). *A new look at design: Ergonomics in the built environment*. Teresópolis: 2AB.

- WHO. (2016a). *WHO statement on the first meeting of the International Health Regulations (2005) (IHR 2005) Emergency Committee on Zika virus and observed increase in neurological disorders and neonatal malformations*. World Health Organization. Consulted on November 10, 2024. [https://www.who.int/news/item/01-02-2016-who-statement-on-the-first-meeting-of-the-international-health-regulations-\(2005\)-\(ihr-2005\)-emergency-committee-on-zika-virus-and-observed-increase-in-neurological-disorders-and-neonatal-malformations](https://www.who.int/news/item/01-02-2016-who-statement-on-the-first-meeting-of-the-international-health-regulations-(2005)-(ihr-2005)-emergency-committee-on-zika-virus-and-observed-increase-in-neurological-disorders-and-neonatal-malformations)
- WHO. (2016b). *Assessment of infants with microcephaly in the context of Zika virus: interim guidance*. World Health Organization. Consulted on October 2, 2024. https://iris.who.int/bitstream/handle/10665/204475/WHO_ZIKV_MOC_16.3_por.pdf;jsessionid=AABA7A6A4ADC5057A103B3DB52C39DD6?sequence=8