DOI: 10.23817/2026.defarch.4-12

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EXPERIENCE OF SPACE AS AN INTERACTION BETWEEN THE BODY AND THE ENVIRONMENT. DIFFERENCES IN THE PERCEPTION OF ARCHITECTURE IN NEURODIVERGENT INDIVIDUALS

DOŚWIADCZANIE PRZESTRZENI JAKO INTERAKCJA ORGANIZMU I OTOCZENIA. ODMIENNOŚĆ PERCEPCJI ARCHITEKTURY U OSÓB Z NEURORÓŻNORODNOŚCIĄ

Abstract

This article explores how neurodivergent people (in particular, those on the autism spectrum and those with ADHD) experience architecture differently, and treats space as a system of interactions between the body and its surroundings, in which the built environment can either support or hinder orientation, comfort and self-regulation. The aim of this work is to translate research findings on sensory processing and cognitive load into the language of design decisions, so that architecture can enhance users' sense of well-being and agency.

Keywords: *aesthetic preferences, architectural psychology, experiencing surroundings, perception of architecture, perception of space, well-being*

Streszczenie

Artykuł podejmuje temat odmienności doświadczania architektury przez osoby neuroróżnorodne (w szczególności osoby w spektrum autyzmu oraz z ADHD) i traktuje przestrzeń jako układ interakcji organizmu i otoczenia, w którym środowisko zbudowane może wspierać albo utrudniać orientację, komfort i samoregulację. Celem pracy jest przełożenie ustaleń dotyczących przetwarzania sensorycznego i obciążenia poznawczego na język decyzji projektowych, tak aby architektura mogła zwiększać poczucie dobrostanu i sprawczości użytkownika.

Słowa kluczowe: *dobrostan, doświadczanie otoczenia, percepcja architektury, percepcja przestrzeni, preferencje estetyczne, psychologia architektury*

1. INTRODUCTION

Sensory perception defines our reality. It is the means through which we communicate with and understand both our immediate surroundings and the broader context, including the

spatial environment. Our experiences of the environment are formed through the senses. Vision, touch, hearing, and smell play particularly important roles. In the case of young children, the sense of taste may also be significant. For individuals whose senses function in a typical way, it can be assumed that their sensory reality is broadly similar to that of others whose sensory systems also operate typically. However, when sensory input is interpreted differently from the way it is by the majority of the population, the perception of an alternative sensory reality emerges.[1]

The experience of space can take many forms for its users and may be described as a continuum extending from mild and subdued impressions to intense and profound sensations. The concept of neurodiversity assumes that differences in the functioning of the human brain and nervous system are a natural expression of human diversity rather than merely deficits or disorders requiring correction. It encompasses a range of cognitive profiles, the most widely recognized of which are autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD). According to this perspective, neurodivergent individuals are not viewed through the lens of "deviation from the norm," but rather as representing different ways of thinking, learning, communicating, and perceiving sensory stimuli. The term neurodiversity was introduced in the late 1990s by the Australian sociologist Judy Singer, who emphasized the importance of recognizing and accepting neurological differences.[2]

Perception is generally considered typical when an individual's response is regarded as appropriate to a given stimulus and context within a particular social group. In contrast, the perceptual experiences of individuals on the autism spectrum or those with ADHD differ from those of the general population and are therefore often described as atypical.

2. PREVALENCE OF ATYPICAL SENSORY PERCEPTION

Growing awareness of the diverse needs of space users is becoming increasingly evident, including among designers and investors. Contemporary understandings of architectural accessibility extend beyond the elimination of physical barriers for individuals with mobility impairments. They also encompass consideration of the needs of users with diverse modes of perception, information processing, and sensory experience, whose functional limitations are not always immediately visible. This shift is reflected in design practice, influencing both the development of new projects and the modernization of existing buildings. Although these changes are occurring gradually, they represent an important step toward the creation of a more accessible and inclusive built environment.

According to statistical data, the identified prevalence of ASD has been steadily increasing.[3] This phenomenon may be attributed to several factors, including greater public

[1] T. Grandin, R. Panek, *Mózg autystyczny. Podróż w głąb niezwykłych umysłów,* Copernicus Center Press, Kraków 2024, p. 98.

[2] J. Singer, *Why can't you be normal for once in your life? From a 'problem with no name' to a new category of difference*, [in:] M. Corker, S. French (eds.), *Disability discourse*, Open University Press, Buckingham, Philadelphia 1999, pp. 59–67.

[3] K. Szafrańska, *Wybrane zaburzenia behawioralno-emocjonalne u dzieci i młodzieży (ADHD, zespół Aspergera) a niepowodzenia szkolne*, [w:] A. Karpińska, K. Borawska-Kalbarczyk (eds.), *Horyzonty rozwoju edukacji w dialogu i perspektywie*, Wydawnictwo Difin, Warszawa 2011, pp. 279–290.

awareness of autism, the expansion of diagnostic criteria[4], and changes in patterns of interpersonal interaction and nonverbal communication across successive generations.

One of the highest rates of autism identification has been reported in the United States. The Autism and Developmental Disabilities Monitoring (ADDM) Network, an active surveillance program operating in the country, provides estimates of the prevalence of ASD among eight-year-old children. Data published in 2023[5] indicate a prevalence rate of 27.6 per 1,000 children, equivalent to approximately one child in every 36. In Europe, the highest rate of ASD identification has been recorded in Sweden, where the prevalence is estimated at around 12 per 1,000 children. In Poland, the corresponding figure is estimated to be approximately 4 per 1,000 children. Autism is diagnosed about four times more frequently in boys than in girls[6].

For the adult population in Europe, there is no unified monitoring system for autism prevalence. According to Autism-Europe, autism affects approximately 1% of the general population, which corresponds to about one in every 100 people. At present, no nationwide epidemiological studies are available in Poland that would allow for a precise determination of the prevalence of ASD among adults. It is generally assumed, however, that the proportion of adults on the autism spectrum is similar to that observed in the general population, amounting to approximately 1%. Many researchers emphasize that the number of adults who remain without a formal diagnosis is likely to be substantial, largely due to the limited availability of diagnostic services in previous decades.

In the case of ADHD, available data indicate that it affects approximately 5–8% of children and adolescents, making it one of the most commonly diagnosed neurodevelopmental disorders. Data for adults are less precise than those for children, as most monitoring systems focus primarily on the pediatric population. Similar to ASD, a gender disparity is also evident in ADHD, with boys being twice as likely to be affected as girls.[7] Research on perception within this population has shown that spatial abilities tend to improve with age.[8]

From the perspective of architectural design, ASD and ADHD can be understood as forms of neurodiversity associated with patterns of sensory and cognitive information processing that differ from those of the general population. Individuals with these conditions may experience difficulties with filtering sensory stimuli, maintaining attention, and organizing activities within their environment, which can affect their comfort, efficiency, and sense of safety when using architectural spaces. Design that takes the needs of these users into account should aim to create environments that are predictable, spatially legible, and supportive of users' ability to regulate the intensity of sensory input.

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[4] A. Szafrańska, *Kształcenie dzieci z autyzmem i zespołem Aspergera. Wybrane problemy.* "Pedagogika. Studia i Rozprawy" 2019, no. 28, p. 183.

[5] M.J. Maenner et al., *Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years – Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2020*, "MMWR Surveillance Summaries" 2023, no. 72(2), pp. 1–14.

[6] K. Skonieczna-Żydecka et al., *The prevalence of autism spectrum disorders in West Pomeranian and Pomeranian regions of Poland*, "Journal of Applied Research in Intellectual Disabilities" 2017, no. 30(2), pp. 283–289.

[7] G. Ayano et al., *The Prevalence of Attention Deficit Hyperactivity Disorder in Children and Adolescents: An Umbrella Review of Global Evidence*, "European Psychiatry" 2024, no. 67, suppl. S1, pp. S76.

[8] V. Nejati, S. Khoshroo, F. Mirikaram, *Review of spatial disability in individuals with attention deficit-hyperactivity disorder: Toward spatial cognition theory*, "Clinical Child Psychology and Psychiatry" 2024, no. 29(1), pp. 312–337.

3. SPATIAL EXPERIENCE

The perception of space is not the same for all users, and sensory responses can be described as a continuum ranging from subdued and moderate experiences to intense and profound ones.

In the case of neurodivergent individuals, particularly those on the autism spectrum, experiences related to the perception of the built environment are often characterized by increased intensity. This may result from sensory hypersensitivity, which can lead to overload caused by stimuli commonly present in the environment, or from sensory hyposensitivity, which may create a need for additional stimulation. Difficulties in integrating information received through different sensory channels are also characteristic.

In ADHD, it is not sensory hypersensitivity that is most commonly observed, but rather difficulties with stimulus selection and the maintenance of attention. As a result, environments rich in information and sensory input can lead to distraction and cognitive overload.[9]

4. DESIGN FOR OPTIMAL USER EXPERIENCE

4.1. LIGHTING

Analyses of the preferences of individuals on the autism spectrum indicate that negative perceptual experiences are most frequently associated with the presence of intense artificial lighting, particularly lighting characterized by high brightness levels and the production of glare or reflections on horizontal and vertical surfaces. In contrast, diffuse lighting, characterized by a soft and uniform distribution of luminance, tends to be more positively received.

Light stimuli with variable characteristics, such as flickering, sudden increases in brightness, and flashes, are considered particularly unfavorable for individuals with both ASD and ADHD, as they may disrupt perceptual processes and increase sensory load. In extreme cases, such stimuli may even lead to photophobia.[10] Inappropriate lighting design may also result in difficulties in distinguishing relevant stimuli from background information, which can negatively affect spatial orientation and everyday functioning. This may pose particular challenges for individuals with heightened sensory sensitivity, potentially compromising both their comfort and their sense of security within the built environment.

4.2. SURFACE TEXTURE AND COLOR SCHEME

Environmental features that may appear insignificant, such as surface cracks, peeling coatings, dirt streaks, or accumulated dust, and which are typically overlooked by most users,

[9] F. Dellapiazza et al., *Sensory processing related to attention in children with ASD, ADHD, or typical development: results from the ELENA cohort,* "European Child and Adolescent Psychiatry" 2021, no. 30(2), p. 283–291.

[10] D. Pufund, *Doświadczanie szkolnych i pozaszkolnych przestrzeni edukacyjnych przez osoby w spektrum autyzmu* [doctoral dissertation], p. 255, https://www.ukw.edu.pl/download/64230/Pufund_D_Rozprawa_doktorska.pdf (access: 12.09.2026).

can act as salient perceptual stimuli for individuals on the autism spectrum[11]. Such factors may trigger involuntary shifts of attention and contribute to difficulties in maintaining focus. Given the heightened tendency of autistic individuals to attend to details, densely patterned surfaces, complex textures, and an abundance of visual stimuli can generate discomfort and anxiety. Walls and flooring materials play a particularly significant role in this respect, whereas ceiling surfaces appear to be of lesser importance. Visual overload caused by excessive sensory information is likewise common among individuals with ADHD. Their propensity for attentional distraction may be mitigated by reducing visual clutter, including the avoidance of strong contrasts and visually dominant patterns that compete for attention.

The perception of surface texture constitutes an important aspect of spatial experience, particularly for individuals on the autism spectrum. Due to the frequent occurrence of tactile hypersensitivity, certain material properties, such as roughness, irregularity, stickiness, or the presence of pronounced textures, may be perceived as unpleasant or overly stimulating. At the same time, responses to specific textural characteristics are highly individualized. Surface texture influences not only the perceived comfort of a space but also the level of concentration, sense of security, and overall well-being of individuals with ASD and ADHD. Consequently, texture should be regarded as an important design parameter to be considered in architectural practice.

4.3. ACOUSTICS

Environmental acoustics is one of the most critical factors affecting the comfort and functional efficiency of neurodivergent individuals. Reducing exposure to excessive noise and minimizing reverberation can help alleviate the acoustic overload commonly experienced by this group. Effective strategies include the use of sound-absorbing materials, acoustic partitions, and the isolation of noise generated by building service systems and mechanical installations. One of the characteristic challenges observed in individuals with ASD and ADHD is difficulty in the selection and filtering of auditory stimuli. The superimposition of multiple sounds and the presence of competing environmental stimuli can impede the identification and processing of relevant auditory information. Sounds that are loud or sudden are generally perceived as particularly disruptive, while those that are both loud and unexpected are regarded as especially distressing. High-frequency sounds and acoustically disorienting stimuli, such as background music or conversations, may also cause significant discomfort.

However, the objective of design should not be the complete elimination of acoustic stimuli, but rather the creation of an environment that enables gradual adaptation to naturally occurring sounds. Such an approach supports the process of sensory habituation and enhances an individual's ability to function effectively across a range of acoustic conditions.

4.4. AIR CIRCULATION

Difficulties in the integration and interpretation of visual and auditory stimuli may lead individuals on the autism spectrum to rely more heavily on information derived from other sensory modalities when perceiving their surroundings. In this context, olfactory and gustatory

[11] J. Matuszewska, *Wytyczne projektowe dla osób w spektrum autyzmu – identyfikacja potrzeb, barier i ograniczeń na przykładzie szkolnych przestrzeni edukacyjnyc*h. "Builder" 2023, no. 317(12), pp. 18–21.

stimuli can serve an important cognitive function by providing more predictable and reliable information about environmental characteristics and the changes occurring within them.[12]

Odors play an important role in the perception and evaluation of the environment, particularly in the case of heightened olfactory sensitivity, which is commonly observed among individuals on the autism spectrum. To minimize sensory burden, it is advisable to ensure effective air circulation and to clearly separate and functionally isolate areas that serve as sources of olfactory stimuli. Smell also carries a strong associative dimension, as it is closely linked to memory and has the ability to evoke past experiences. Consequently, the association between a particular scent and previous experiences can contribute to either a positive or negative perception of a place through the mechanism of emotional and cognitive associations.

4.5. VARIABILITY OF SPATIAL ARRANGEMENT

For both individuals with ASD and ADHD, excessive susceptibility to distraction by environmental stimuli represents a major challenge. In the case of autism spectrum disorder, predictability and control of the environment are of primary importance.[13] For individuals with ADHD, maintaining a clear spatial layout and minimizing distractors play a more significant role. A well-designed environment can reduce sensory overload and support cognitive processes.

Designing buildings and their surroundings as regular, orderly, and composed environments with minimal variability, while assigning consistent functions to individual zones, can create settings that are both sensory-friendly and cognitively supportive for these user groups.

5. SUMMARY

In accordance with the principle that design for the extremes we benefit the mainstream, inclusive design should not be regarded as an optional addition but rather as a standard practice aimed at reducing exclusion and enabling the comfortable use of space by the widest possible range of users.[14]

Contemporary approaches to environmental design require an expanded understanding of accessibility, which for many years focused primarily on the elimination of architectural barriers associated with physical, visual, or hearing impairments. Research findings indicate that barriers arising from differences in the ways neurodivergent individuals perceive, process information, and respond to environmental stimuli are equally significant.

The increasing prevalence of neurodevelopmental disorders, together with growing public awareness of neurodiversity, underscores the need to incorporate sensory and cognitive considerations into the design process.

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[12] J.J. Błeszyński, *Co osoby z autyzmem mówią nam o sobie. Raport z badań,* Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, Toruń 2020, p. 120.

[13] For more information on this topic, see: Magda Mostafa, *ASPECTSS™ Design Index*, "Architecture for Autism", https://www.autism.archi/ (access: 12.10.2026).

[14] K.A. Finningan, *Sensory Responsive Environments: A Qualitative Study on Perceived Relationships between Outdoor Built Environments and Sensory Sensitivities*, "Land" 2024, no. 13(5), art. 136.

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[1] Ayano G. et al., *The Prevalence of Attention Deficit Hyperactivity Disorder in Children and Adolescents: An Umbrella Review of Global Evidence*, "European Psychiatry" 2024, no. 67, suppl. S1, pp. S76.

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[3] Dellapiazza F. et al., *Sensory processing related to attention in children with ASD, ADHD, or typical development: results from the ELENA cohort*, "European Child and Adolescent Psychiatry" 2021, no. 30(2), pp. 283–291.

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[5] Grandin T., Panek R., *Mózg autystyczny. Podróż w głąb niezwykłych umysłów*, Copernicus Center Press, Kraków 2024.

[6] Maenner M.J. et al., *Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years – Autism and Developmental Disabilities Monitoring Network*, 11 Sites, United States, 2020, "MMWR Surveillance Summaries" 2023, no. 72(2), pp. 1–14.

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[10] Singer J., *Why can't you be normal for once in your life? From a 'problem with no name' to a new category of difference*, [in:] M. Corker, S. French (eds.), *Disability discourse*, Open University Press, Buckingham, Philadelphia 1999, pp. 59–67.

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[13] Szafrańska K., *Wybrane zaburzenia behawioralno-emocjonalne u dzieci i młodzieży (ADHD, zespół Aspergera) a niepowodzenia szkolne*, [in:] A. Karpińska, K. Borawska-Kalbarczyk (eds.), *Horyzonty rozwoju edukacji w dialogu i perspektywie*, Wydawnictwo Difin, Warszawa 2011, pp. 279–291.

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