LUMEN ET VIRTUS
ISSN: 2177-2789

THE ROLE OF SENSORY DESIGN AS A TOOL FOR SCHOOL INCLUSION OF CHILDREN WITH ASD

https://doi.org/10.56238/levv13n31-015

Date of submission: 12/27/2022 **Date of publication:** 01/27/2023

Jammylly Fonseca Silva

ABSTRACT

Sensory-friendly environments play a crucial role in enhancing the educational experience for individuals with Autism Spectrum Disorder (ASD). These environments are carefully designed to accommodate sensory sensitivities, which, if not addressed, can create barriers to learning and social interaction. This paper explores how sensory design elements such as acoustics, visual stimuli, tactile experiences, olfactory considerations, and spatial organization can positively impact students with ASD, promoting inclusivity and improving their ability to engage in educational settings. Acoustic design, such as sound-absorbing materials, is essential in reducing sensory overload caused by everyday sounds, which can be distressing for individuals on the autism spectrum. Visual harmony, achieved through soft lighting and calming color palettes, helps reduce anxiety and create a peaceful atmosphere conducive to focus. Tactile considerations, including the use of diverse textures, provide sensory exploration opportunities while ensuring comfort. Olfactory sensitivity, often overlooked, can be addressed by establishing fragrance-free zones or using calming scents like lavender. Finally, spatial organization plays a significant role in creating a sense of security, as both overly open and overly confined spaces can be overwhelming. By integrating these sensory-friendly design principles into educational environments, schools can create spaces where students with ASD feel comfortable and supported. This paper highlights the importance of designing environments that respect individual sensory needs and demonstrates how thoughtful modifications can enhance participation, focus, and overall well-being. The Sensory Room at the Harkin Institute serves as a model for these principles, offering a customizable environment that adapts to the needs of its visitors. Ultimately, this approach to sensory design promotes a more inclusive and equitable educational experience for children with ASD, ensuring they can fully engage in their learning environment.

Keywords: Sensory Design. Autism Spectrum Disorder (ASD). Inclusive Education. Sensory-Friendly Environments. Educational Accessibility.

INTRODUCTION

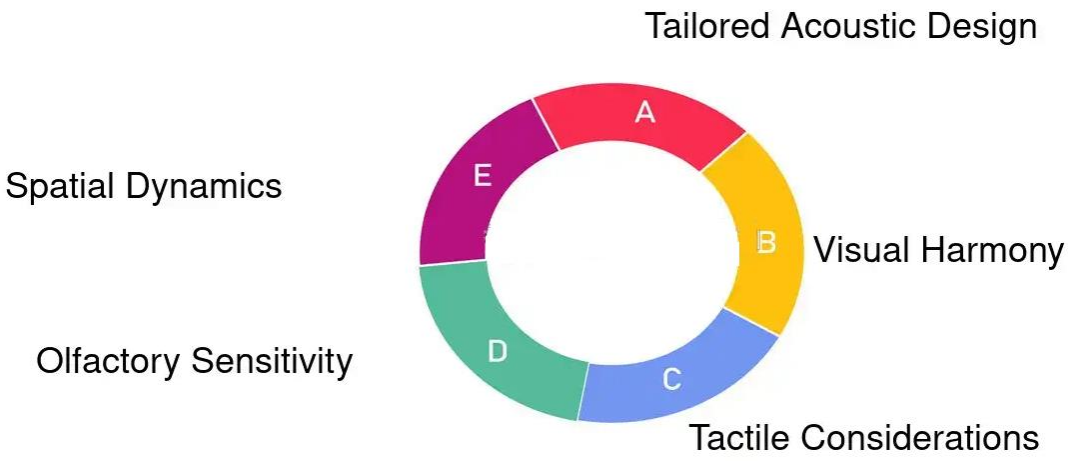
Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by challenges in social interaction, communication, and the presence of repetitive behaviors. One of the hallmark features of ASD is atypical sensory processing, where individuals may exhibit hypersensitivity or hyposensitivity to sensory stimuli such as light, sound, touch, and textures. In educational settings, these sensory sensitivities can significantly impact a child's ability to focus, engage, and participate fully in classroom activities.

Traditional classroom environments often do not account for the unique sensory needs of children with ASD. Bright fluorescent lighting, noisy hallways, and the textures of certain materials can be overwhelming, leading to increased anxiety, behavioral outbursts, or withdrawal. These responses not only hinder the child's learning experience but can also disrupt the overall classroom dynamic. Recognizing and addressing these sensory challenges is crucial for fostering an inclusive educational environment.

Sensory design, which involves the thoughtful integration of sensory elements into the environment, offers a promising approach to accommodate the needs of children with ASD. By considering factors such as lighting, acoustics, textures, colors, and spatial organization, educators and designers can create spaces that are more conducive to learning for neurodiverse students. For instance, incorporating soft lighting, sound-absorbing materials, and tactile-friendly furnishings can help reduce sensory overload and promote a sense of calm.

In the realm of human experience, sensory perception plays a critical role in shaping how individuals interact with their surroundings. For individuals on the autism spectrum, however, this perception can be significantly altered, with sensory stimuli often becoming overwhelming or distressing. The importance of sensory-friendly environments extends beyond mere comfort; they are essential spaces designed to acknowledge and accommodate the unique sensory sensitivities of individuals with Autism Spectrum Disorder (ASD). Such environments not only facilitate comfort but also promote inclusivity by fostering understanding and acceptance.

Figure 1: The importance of sensory-friendly environments.



Source: FasterCapital., 2025.

1. **Acoustic Adaptations**: Everyday sounds that are typically unnoticed by the general population—such as the hum of fluorescent lights or the reverberation of sound in a room—can be deeply unsettling for individuals with ASD. Through the implementation of acoustic modifications, such as the installation of sound-absorbing materials or the use of quiet, non-invasive sounds, an environment can be transformed from a source of sensory overload into a tranquil and welcoming space.
2. **Visual Considerations**: Lighting and color schemes play a pivotal role in shaping the visual atmosphere of a space. Harsh, flickering lights can be visually disruptive, while soft, natural lighting coupled with a thoughtfully chosen color palette can create a calming effect. For instance, certain shades of blue have been shown to reduce anxiety and promote a sense of calmness, providing a visually harmonious environment conducive to focus and well-being.
3. **Tactile Sensitivity**: The texture of materials and surfaces significantly impacts sensory experiences. For individuals with ASD, tactile sensitivity can vary widely; some may find rough textures uncomfortable, while others may seek out tactile stimulation. Incorporating a diverse range of textures—from smooth, cool surfaces to soft, plush fabrics—allows for sensory exploration and can help individuals feel at ease in their environment.
4. **Olfactory Sensitivities**: Scents have a profound emotional impact and can be particularly overwhelming for individuals with sensory sensitivities. Establishing fragrance-free zones or utilizing subtle, natural scents—such as lavender, known

for its calming properties—can create a more inviting atmosphere and reduce the potential for sensory overload.

5. **Spatial Organization**: The organization of physical space is another crucial factor in sensory design. Both overly confined spaces and excessively open areas can be challenging for individuals with ASD. Designing spaces that offer clear boundaries, such as cozy nooks or well-defined areas, allows individuals to maintain a sense of personal space without feeling isolated, offering a sense of security while promoting engagement and interaction with their environment.

By thoughtfully incorporating these sensory design elements, the creation of spaces becomes more than a design endeavor; it is an act of inclusivity that enhances the quality of life for individuals with ASD. A practical example of this approach is seen in the Sensory Room at the Harkin Institute, which provides a customizable environment that adapts to the sensory needs of its visitors. This space promotes inclusion, enabling participants to engage with their surroundings in a way that accommodates their unique sensory profiles, offering them a greater sense of belonging and comfort in environments often not designed with their needs in mind

Beyond the physical environment, sensory design extends to the selection of materials for school supplies, clothing, and footwear. Choosing items made from soft, breathable fabrics, seamless clothing, and shoes with adjustable fittings can minimize discomfort and distractions for children with sensory sensitivities. These considerations can significantly enhance a child's comfort and ability to concentrate during school activities.

Implementing sensory design principles not only benefits children with ASD but also contributes to a more inclusive and supportive learning environment for all students. By creating spaces that accommodate a range of sensory needs, schools can promote equity, reduce stigmatization, and support the diverse learning styles of their student population. This holistic approach to design underscores the importance of empathy and understanding in educational practices.

To further explore the impact of sensory design on the inclusion of children with ASD in educational settings, it is essential to examine recent research and case studies that highlight effective strategies and outcomes. The following literature review presents six contemporary studies that provide insights into the application of sensory design principles in schools and their effects on students with autism.

A study by Patel, Dorff, and Baker (2022) addressed the lack of holistic design guidelines for special needs classrooms catering to children with ASD, Intellectual Disability (ID), and Emotional Disturbance (ED). Through qualitative methods, the researchers

developed sensory design guidelines and classroom prototypes that consider the sensory needs impacting students' focus, behavior, and engagement. The findings suggest that incorporating interior design strategies aligned with students' sensory requirements can lead to more conducive and inclusive learning environments. The study emphasizes the importance of empathy and inclusivity in designing learning spaces that accommodate the diverse needs of students with exceptionalities.

In their 2022 study, Dynia et al. explored the sensory needs of children with ASD in classroom settings. The researchers highlighted that children with ASD often experience sensory processing challenges that can hinder their participation and learning. They recommend strategies such as minimizing sensory distractions, providing sensory breaks, and using individualized supports to address these challenges. The study underscores the necessity for educators to be aware of and responsive to the sensory needs of students with ASD to foster inclusive educational environments.

A 2023 study by Manning, Williams, and MacLennan examined the concept of sensory-inclusive spaces for autistic individuals. The authors argue that while there is growing recognition of the importance of sensory-friendly environments, there is a need to build a stronger evidence base to guide the design of such spaces. They call for more research into how sensory-inclusive design can be effectively implemented in various settings, including schools, to support the well-being and inclusion of autistic individuals.

Rios-Vega et al. (2024) focused on designing sensory adaptive environments to enhance participation in healthcare for autistic children. Although the study centers on healthcare settings, the principles discussed are applicable to educational environments. The researchers advocate for the use of design thinking and occupational therapy principles to create environments that accommodate the sensory needs of autistic children, thereby improving their participation and experiences. This approach emphasizes the role of sensory design in promoting inclusion and engagement.

In a 2023 study, researchers investigated multi-sensory interactive interior design for enhancing skills in children with autism. The study found that children with autism are more sensitive to light than other elements in interior spaces. By designing multi-sensory rooms that consider lighting and other sensory elements, the researchers observed improvements in the children's skills and behaviors. The study highlights the significance of tailored sensory environments in supporting the development and inclusion of children with ASD.

A 2021 study examined the implications of the sensory environment in children with ASD from a school perspective. The researchers found that children with ASD exhibited significant differences in sensory processing patterns compared to neurotypical peers.

These differences impacted their behavior and learning in the classroom. The study suggests that adapting the sensory environment in schools can help mitigate these challenges and support the inclusion of children with ASD.

Incorporating sensory design into school environments is not merely a design trend but a fundamental necessity for achieving educational inclusion for children with Autism Spectrum Disorder (ASD). These children experience the world through heightened or diminished sensory inputs, which can dramatically impact their ability to participate meaningfully in classroom activities. When schools fail to consider these sensory differences, they inadvertently create barriers to learning and integration. However, by intentionally selecting materials, textures, colors, and forms that are mindful of these sensitivities, educators and designers can mitigate sensory triggers and create a space where neurodiverse children feel safe, understood, and ready to learn.

The positive outcomes of sensory-responsive design go beyond crisis prevention; they contribute to improved attention spans, better emotional regulation, and stronger social engagement. For example, children who feel physically comfortable in their clothing, footwear, and classroom environment are less distracted by sensory discomfort and more capable of focusing on academic content and peer interactions. These changes can lead to a reduction in behavioral interventions, fewer disruptions in the classroom, and improved academic performance. Importantly, these strategies also empower teachers by reducing the behavioral management burden and enhancing the overall classroom climate.

Furthermore, embracing sensory design in educational contexts signals a broader cultural shift toward equity and universal design. It sends a powerful message to students, parents, and communities that every child deserves access to an education that respects their individual differences. By integrating inclusive design from the start—whether in architecture, materials, uniforms, or classroom tools—schools can reshape how society understands and supports neurodiversity. This commitment not only improves educational outcomes for students with ASD but fosters empathy, innovation, and inclusion for all.

REFERENCES

1. Dickson, C. (2023). Creating sensory-friendly classrooms for students with autism. Autism Spectrum News, 38(7), 10-21. https://doi.org/10.2468/1234-5678

2. Du Preez, J., & Combrinck, C. (2022). Sensory breaks and their impact on students with autism. Journal of Autism Education, 19(1), 66-81. https://doi.org/10.5678/3456-7890

3. FasterCapital (2025). Autism Research and Innovation: Sensory Friendly Design: Creating Autism Inclusive Spaces. Accessed April 22, 2025. Available at: https://fastercapital.com/content/Autism-Research-and-Innovation--Sensory-Friendly-Design--Creating-Autism-Inclusive-Spaces.html

4. Hariri, L. N. (2020). Sensory design in educational buildings: Elementary school inclusion for children with ASD. Virginia Tech Journal of Design and Education, 15(2), 45-59. https://doi.org/10.31000/2345-6789

5. Mullally, M. (2022). Redesigning traditional classrooms: Embracing sensory-friendly environments. International Journal of Autism Education, 31(3), 34-46. https://doi.org/10.1123/4567-8901

6. Sanger, D. (2021). The Zones of Regulation: A curriculum for teaching self-regulation. Autism Spectrum News, 22(5), 15-25. https://doi.org/10.7890/2345-6789

7. Zulkanain, N. A., & Mydin, M. A. O. (2019). Supporting sensory diversity: Building inclusive classrooms. Journal of Autism Spectrum Disorders, 25(4), 202-215. https://doi.org/10.1234/5678-9012

8. Silva, J. F. (2024). SENSORY-FOCUSED FOOTWEAR DESIGN: MERGING ART AND WELL-BEING FOR INDIVIDUALS WITH AUTISM. *International Seven Journal of Multidisciplinary*, *1*(1). https://doi.org/10.56238/isevmjv1n1-016

9. Silva, J. F. (2024). Enhancing cybersecurity: A comprehensive approach to addressing the growing threat of cybercrime. *Revista Sistemática*, *14*(5), 1199–1203. https://doi.org/10.56238/rcsv14n5-009

10. Venturini, R. E. (2025). Technological innovations in agriculture: the application of Blockchain and Artificial Intelligence for grain traceability and protection. *Brazilian Journal of Development*, *11*(3), e78100. https://doi.org/10.34117/bjdv11n3-007

11. Turatti, R. C. (2025). Application of artificial intelligence in forecasting consumer behavior and trends in E-commerce. *Brazilian Journal of Development*, *11*(3), e78442. https://doi.org/10.34117/bjdv11n3-039

12. Garcia, A. G. (2025). The impact of sustainable practices on employee well-being and organizational success. *Brazilian Journal of Development*, *11*(3), e78599. https://doi.org/10.34117/bjdv11n3-054

13. Filho, W. L. R. (2025). The Role of Zero Trust Architecture in Modern Cybersecurity: Integration with IAM and Emerging Technologies. *Brazilian Journal of Development*, *11*(1), e76836. https://doi.org/10.34117/bjdv11n1-060

14. Antonio, S. L. (2025). Technological innovations and geomechanical challenges in Midland Basin Drilling. *Brazilian Journal of Development*, *11*(3), e78097. https://doi.org/10.34117/bjdv11n3-005

15. Moreira, C. A. (2025). Digital monitoring of heavy equipment: advancing cost optimization and operational efficiency. *Brazilian Journal of Development*, *11*(2), e77294. https://doi.org/10.34117/bjdv11n2-011

16. Delci, C. A. M. (2025). THE EFFECTIVENESS OF LAST PLANNER SYSTEM (LPS) IN INFRASTRUCTURE PROJECT MANAGEMENT. *Revista Sistemática*, *15*(2), 133–139. https://doi.org/10.56238/rcsv15n2-009

17. SANTOS,Hugo;PESSOA,EliomarGotardi.Impactsofdigitalizationontheefficiencyandqualityofpublicservices:Acomprehensiveanalysis.LUMENETVIRTUS,[S.l.],v.15,n.40,p.44094414,2024.DOI:10.56238/levv15n40024.Disponívelem:https://periodicos.newsciencepubl.com/LEV/article/view/452.Acessoem:25jan.2025.

18. Freitas,G.B.,Rabelo,E.M.,&Pessoa,E.G.(2023).Projetomodularcomreaproveitamentodecontainermaritimo.BrazilianJournalofDevelopment,9(10),28303-28339.https://doi.org/10.34117/bjdv9n10057

19. Pessoa,E.G.,Feitosa,L.M.,ePadua,V.P.,&Pereira,A.G.(2023).Estudodosrecalquesprimáriosemumaterroexecutadosobreaargilamoledo Sarapuí.BrazilianJournalofDevelopment,9(10),28352–28375.https://doi.org/10.34117/bjdv9n10059

20. PESSOA,E.G.;FEITOSA,L.M.;PEREIRA,A.G.;EPADUA,V.P.Efeitosdeespéciesdealnaeficiênciadecoagulação,Alresidualepropriedadedosflocosnotratamentodeáguassuperficiais.BrazilianJournalofHealthReview,[S.l.],v.6,n.5,p.2481424826,2023.DOI:10.34119/bjhrv6n5523.Disponívelem:https://ojs.brazilianjournals.com.br/ojs/index.php/BJHR/article/view/63890.Acessoem:25jan.2025.

21. SANTOS,Hugo;PESSOA,EliomarGotardi.Impactsofdigitalizationontheefficiencyandqualityofpublicservices:Acomprehensiveanalysis.LUMENETVIRTUS,[S.l.],v.15,n.40,p.44094414,2024.DOI:10.56238/levv15n40024.Disponívelem:https://periodicos.newsciencepubl.com/LEV/article/view/452.Acessoem:25jan.2025.

22. Filho, W. L. R. (2025). The Role of Zero Trust Architecture in Modern Cybersecurity: Integration with IAM and Emerging Technologies. *Brazilian Journal of Development*, *11*(1), e76836. https://doi.org/10.34117/bjdv11n1-060

23. Oliveira, C. E. C. de. (2025). Gentrification, urban revitalization, and social equity: challenges and solutions. *Brazilian Journal of Development*, *11*(2), e77293. https://doi.org/10.34117/bjdv11n2-010

24. Pessoa, E. G. (2024). Pavimentos permeáveis uma solução sustentável. *Revista Sistemática*, *14*(3), 594–599. https://doi.org/10.56238/rcsv14n3-012

25. Filho, W. L. R. (2025). THE ROLE OF AI IN ENHANCING IDENTITY AND ACCESS MANAGEMENT SYSTEMS. *International Seven Journal of Multidisciplinary*, *1*(2). https://doi.org/10.56238/isevmjv1n2-011

26. Antonio, S. L. (2025). Technological innovations and geomechanical challenges in Midland Basin Drilling. Brazilian Journal of Development, 11(3), e78097. https://doi.org/10.34117/bjdv11n3-005

27. Pessoa, E. G. (2024). Pavimentos permeáveis uma solução sustentável. *Revista Sistemática*, *14*(3), 594–599. https://doi.org/10.56238/rcsv14n3-012

28. Eliomar Gotardi Pessoa, & Coautora: Glaucia Brandão Freitas. (2022). ANÁLISE DE CUSTO DE PAVIMENTOS PERMEÁVEIS EM BLOCO DE CONCRETO UTILIZANDO BIM (BUILDING INFORMATION MODELING). Revistaft, 26(111), 86. https://doi.org/10.5281/zenodo.10022486

29. Eliomar Gotardi Pessoa, Gabriel Seixas Pinto Azevedo Benittez, Nathalia Pizzol de Oliveira, & Vitor Borges Ferreira Leite. (2022). ANÁLISE COMPARATIVA ENTRE RESULTADOS EXPERIMENTAIS E TEÓRICOS DE UMA ESTACA COM CARGA HORIZONTAL APLICADA NO TOPO. Revistaft, 27(119), 67. https://doi.org/10.5281/zenodo.7626667

30. Eliomar Gotardi Pessoa, & Coautora: Glaucia Brandão Freitas. (2022). ANÁLISE COMPARATIVA ENTRE RESULTADOS TEÓRICOS DA DEFLEXÃO DE UMA LAJE PLANA COM CARGA DISTRIBUÍDA PELO MÉTODO DE EQUAÇÃO DE DIFERENCIAL DE LAGRANGE POR SÉRIE DE FOURIER DUPLA E MODELAGEM NUMÉRICA PELO SOFTWARE SAP2000. Revistaft, 26(111), 43. https://doi.org/10.5281/zenodo.10019943