

# ENHANCING PLAY ENVIRONMENTS FOR AUTISTIC CHILDREN IN SPECIAL EDUCATION SCHOOLS: INSIGHTS FROM THE YANGTZE RIVER DELTA REGION

Chen Jingjing<sup>1,2</sup> & Alice Sabrina Ismail<sup>1\*</sup>

\*Corresponding Author

<sup>1</sup>Faculty of Built Environment and Surveying,  
University Technology Malaysia, UTM Skudai, 81310, Johor Malaysia.

<sup>2</sup>Nanjing Audit University Jinshen College, 210023, Nanjing, China.

<sup>1,2</sup>chenjingjing@graduate.utm.my

\*<sup>1</sup>b-alice@utm.my

Received: 18 June 2024

Accepted: 02 August 2024

Published: 31 March 2025

## ABSTRACT

*This study explores the optimization of spatial and play environments for autistic children in special education schools within the Yangtze River Delta Region of China. Using a combination of the Mosaic Approach and case studies, the research investigated the sensory, cognitive, and social needs of autistic children, focusing on how specific design elements can support their development. Key findings highlight the importance of zoning, layout, sensory-friendly features, and interactive elements in creating effective play environments. The study emphasizes the need for a holistic design approach that integrates these elements to enhance the well-being and engagement of autistic children. Recommendations for policymakers, designers, and educators underscore the significance of collaborative efforts in designing inclusive educational spaces that cater to the unique needs of autistic children.*

**Keywords:** *Autistic children, Play environment, Spatial design, Yangtze River Delta, Inclusivity*



## **INTRODUCTION**

The design of play environments for children with Autism Spectrum Disorder (ASD) is crucial for their development, social interaction, and overall well-being of the children (Mostafa, 2018; Robertson & Baron-Cohen, 2017). Play is essential for learning, social interaction, and emotional expression (Gibson, 1979; Hughes, 2010). Tailored play environments can significantly enhance the learning experiences and provide therapeutic benefits for autistic children. However, designing such environments requires a deep understanding of their unique sensory and social challenges (Robertson & Baron-Cohen, 2017; Black et al., 2022).

In the Yangtze River Delta Region of China, special education for children with autism has advanced, focusing on inclusivity and tailored strategies. This region reflects broader national trends driven by policies aimed at integrating children with disabilities into mainstream settings (Ministry of Education of the People's Republic of China, 2021). Despite these efforts, optimizing play environments to support autistic children's perceptual and social needs remains a challenge.

This study addressed three main research gaps in China's special education schools: the lack of awareness and understanding of autism-friendly environments among policymakers and educators (Zhou et al., 2017), insufficient expertise in designing such environments (Chen & Li, 2018), and inadequate incorporation of autistic children's and teachers' perspectives in the design process (Liu & Feng, 2019). These gaps result in spaces that fail to meet autistic children's sensory, spatial, and developmental needs, affecting their learning and development.

This study aims to fill these gaps by focusing on three objectives:

- i. To identify the distinctive spatial and play environment requirements for lower-grade autistic children in the context of special education schools within the Yangtze River Delta Region from the perspectives of students and teachers.
- ii. To analyze and synthesize how and to what extent the existing spatial and play environment affects the behavior of lower-grade autistic children in these schools.
- iii. To provide recommendations for improving spatial and play environments

to better accommodate the needs of autistic children, based on insights from students and teachers.

## **LITERATURE REVIEW**

### **Definition, Category, and Play Behaviour of Children with Autism**

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by challenges in social communication, restricted interests, and repetitive behaviors (American Psychiatric Association, 2013). The term "autism" was first introduced by Kanner (1943), and Asperger (1944) identified similar traits in children with high cognitive abilities. Wing and Gould (1979) coined "autism spectrum" to encompass varying degrees of autism and intellectual functioning.

ASD includes disorders such as Asperger Syndrome, Atypical Autism, Pervasive Developmental Disorder not otherwise specified (PDD-NOS), Childhood Disintegrative Disorder, and Autism Syndrome. Individuals on the spectrum experience difficulties with social skills, empathy, communication, and flexible behaviors, varying from mild to severe, affecting sensory perception and social interaction differently (Maloney, Gilmour, & Kuhn, 2017).

Autism can be categorized into three types based on social interaction difficulties: active, passive, and isolated (Li, 2005). Mild Autism (Active Type) involves individuals with normal or above-average intellect who struggle with social reciprocity. Moderate Autism (Passive Type) shows noticeable delays in language and social skills. Severe Autism (Isolated Type) involves significant developmental delays and minimal verbal skills (Guo, 2022).

Children with autism often exhibit repetitive movements, rigid adherence to routines, and sensitivity to sensory stimuli like sounds, lights, or textures (Baranek, 2013; Bogdashina, 2007). They prefer solitary activities, repetitive play patterns, and predictable routines (Conn, 2015). These behaviors necessitate educational and play environments that mitigate sensory overload and support their developmental needs.

Structured play activities with clear routines can reduce anxiety and make play more accessible for autistic children. Incorporating sensory-friendly features in play environments addresses sensory processing challenges, enhancing their engagement in play (Robertson & Baron-Cohen, 2017).

This study focused on children with mild to moderate autism, who are more likely to benefit from structured play environments. This targeted approach aims to provide practical design guidelines to enhance the educational and developmental experiences of autistic children in special education schools, particularly in the Yangtze River Delta Region.

### **Perception Theory of Children with Autism**

Perception theory, particularly in autism, provides critical insights into how autistic children interact with and interpret their environment. Perception involves organizing and interpreting sensory information to understand the world (Gibson, n.d.). For autistic children, sensory processing and perception can differ significantly from neurotypical peers, leading to unique challenges and behaviors (Robertson & Baron-Cohen, 2017).

Theories such as Gestalt, ecological, and information processing offer frameworks for understanding these differences. Gestalt theory emphasizes holistic processing, which can be challenging for autistic children who may focus more on details than the overall context (Hadad et al., 2019). This can impact their ability to interpret social cues and understand social interactions (Wong & Kasari, 2012).

Research indicates many autistic children experience sensory sensitivities, including hyper- and hypo-sensitivity to light, sound, and touch (Robertson & Baron-Cohen, 2017). These differences can lead to behaviors such as avoiding certain sensory experiences or seeking specific sensory input (Evers et al., 2011).

To support autistic children's perceptual needs, educational environments should minimize sensory overload and maximize engagement. This includes using neutral colors, providing quiet zones, and arranging flexible seating to accommodate motor sensitivities (Baron-Cohen et al.,

2009). Incorporating Gestalt principles can create clear and predictable visual patterns (Gibson, 1979). In addition, key indicators for designing play environments include visual perception (colour usage and spatial layout), auditory perception (managing volume and background noise), tactile perception (comfortable textures and materials), spatial perception (clear boundaries and navigable spaces), and social perception (facilitating social interactions) (Dautenhahn, 2000; Balasco, 2020; Marco, 2012; Bogdanova, 2022).

## **Definition, Design Elements of Play Environment for Children with Autism**

A play environment is defined as a physical space designed to facilitate play activities, providing opportunities for children to engage in imaginative, social, and physical play. For children with Autism Spectrum Disorder (ASD), these environments must be tailored to their unique sensory, cognitive, and social needs to support their development effectively (Bölte et al., 2019).

Design principles for play environments for children with autism focus on their specific needs and challenges. Besides, safety and accessibility are paramount, with features ensuring hazard-free spaces and clear pathways (Robertson & Baron-Cohen, 2017). In addition, sensory integration addresses sensory processing issues, incorporating soft lighting, soundproofing, and varied textures (Khalifa et al., 2004; Mostafa, 2018). Furthermore, inclusivity and flexibility involve adaptable spaces with movable furniture (Senda, 1992). Hence, promoting social interaction through structured play areas supports social skills (Wong & Kasari, 2012; Black et al., 2022). Moreover, incorporating educational elements fosters cognitive development, while natural elements and outdoor play reduce stress and improve mood (Ghazali et al., 2018; Bagot et al., 2015; Wu et al., 2022). Additionally, technological integration offers interactive experiences and personalized play (Cosentino et al., 2023).

To synthesize these principles into practical design elements, several key elements have been identified for creating effective play environments for children with autism. These elements include zoning, layout, size, sensory-friendly features, safety features, facilities, cultural symbols,

personalization, and interactive elements. The selection of these elements is grounded in comprehensive theoretical frameworks and empirical research. Henri Lefebvre's concept of the social production of space underscores the importance of spatial practices and their impact on social relations, highlighting the need for well-defined zones and layouts that facilitate navigation and reduce anxiety (Lefebvre, 1991). Mitsuru Senda's game construction theory emphasizes the role of the physical environment in stimulating creativity and exploration, justifying the inclusion of interactive elements and flexibility in design (Senda, 1992). Magda Mostafa's ASPECTSS™ Design Index provides a structured approach to addressing the sensory and safety needs of autistic children, supporting the incorporation of sensory-friendly features, safety measures, and personalized spaces to accommodate individual preferences and sensory processing patterns (Mostafa, 2018). By integrating these theoretical insights, the identified design elements collectively address the multifaceted needs of autistic children, ensuring that the play environments are not only safe and accessible but also enriching and supportive of their overall development.

## **Education, Curriculum and Pedagogy for Children with Autism in the Yangtze River Delta Region**

In the Yangtze River Delta Region of China, special education for children with autism has advanced significantly in policy, curriculum development, and pedagogical practices, reflecting broader national trends towards inclusivity and tailored educational strategies (Ministry of Education of the People's Republic of China, 2021). Special education schools in the region implement curricula integrating academic, social, and life skills through methods like task analysis, conversation-based teaching, and situational teaching (Yang et al., 2018). In addition, "individualized class schedules" have been introduced to meet the unique needs of autistic children, allowing for personalized education while integrating them into mainstream classrooms (Jiangsu Provincial People's Government, 2019).

Shanghai has shown a strong commitment to resource guarantee and accessibility, revising guidelines for special education resource rooms and establishing a digital "one student, one plan" initiative to integrate rehabilitation and health services into each student's educational plan (Shanghai Municipal People's Government, 2020). The educational

approaches emphasize holistic development, incorporating sensory integration, play-based learning, and technology to enhance the educational experiences of autistic children (Mostafa, 2014; Solomon, 2005; Guo et al., 2019). These practices reflect a growing recognition of the unique needs of autistic children. By implementing individualized education plans, sensory-friendly environments, and leveraging technology, these schools aim to provide a supportive and inclusive educational experience. However, challenges remain, including the need for more trained professionals and improved resources.

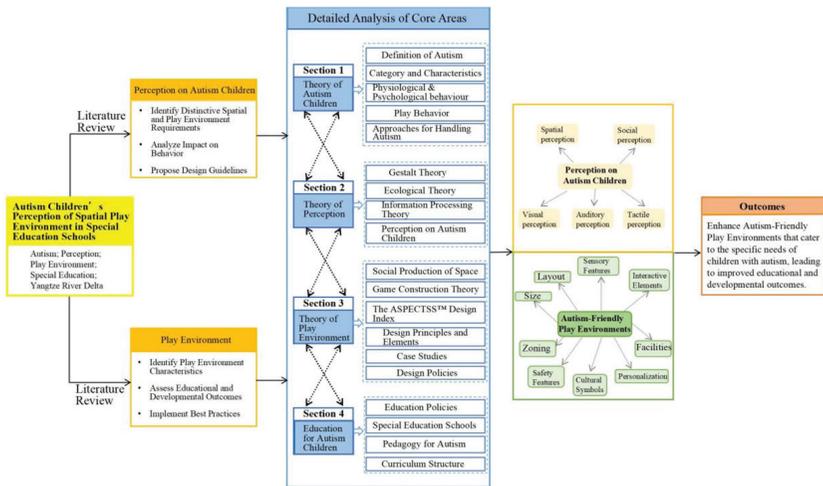


Figure 1. Conceptual Framework of this Study

Source: Author

## METHODOLOGY

This study used a qualitative methodology to explore and optimize play environments for autistic children in special education schools within the Yangtze River Delta Region of China. A phenomenological approach was employed to understand the lived experiences of autistic children, focusing on their perceptions and interactions with their environments (Creswell 2013; Gallagher & Zahavi 2008).

The case study was conducted at Qixia Special Education School in Nanjing, Jiangsu Province, established in 2020, serving 113 students, 47 of

whom have autism. This school was chosen due to its focus on integrating special needs students into mainstream activities, aligning with the research goal of improving play environments for autistic children.

The Mosaic Approach, a participatory, multimethod framework combining verbal and non-verbal tools like drawings, photographs, role plays, and observations, was employed to understand children's perspectives, aligning with Universal Design for Learning (UDL) principles (Clark & Moss, 2001; CAST, 2011). This approach is effective for autistic children, accommodating their communication difficulties and leveraging their strengths (Nind, 2008; Ellis, 2017). It reduces barriers to participation and allows children to express themselves comfortably and naturally.

Respondents were selected based on specific criteria: a confirmed diagnosis of moderate autism, age 6-12 years, and enrolment in a special education school in the Yangtze River Delta region. The participant, Queena, a 12-year-old girl, was selected for her unique developmental profile, including developmental delays, sensory processing disorder, sensory sensitivities, and social impairments.

Queena was provided with drawing materials to depict her play environment. Drawing sessions were held in a quiet room, and her behavior was observed for focus, enjoyment, and frustration. Discussions followed each session to understand her drawings and provide insights into her perceptions (Clark & Moss, 2001).

The observations gathered contextual data on Queena's interactions within different playground zones. Initially unobtrusive, these observations noted her movements and responses, using a structured checklist based on visual, auditory, tactile, spatial, and social perception. Focused observations were later conducted in specific playground areas to understand her engagement, sensory overload, and avoidance, recorded over several weeks (Beresford et al., 2004).

Data collection methods included field investigations and document reviews, focusing on zoning, layout, size, sensory-friendly features, safety features, facilities, cultural symbols, personalization, and interactive elements. To validate the findings, a focus group discussion was conducted

with Queena's teachers (the school principal, one academic director, and three subject teachers) to validate the perception data, a discussion on her school performance, and gather insights on the school's play environment. The interview guide covered the research objectives, Queena's typical day, her engagement with peers, strengths, support needs, interpretation of her drawings, review of observation data, sensory preferences, thoughts on the play environment, and suggestions for improvements.

Ethical considerations are paramount in this study, given the vulnerable population involved. Informed consent was obtained from all the participants and their guardians, and all data were anonymized to protect the participants' privacy. The study adheres to the ethical guidelines for research with children and vulnerable populations, ensuring that the participants' rights and well-being are safeguarded throughout the research process (BERA, 2018).

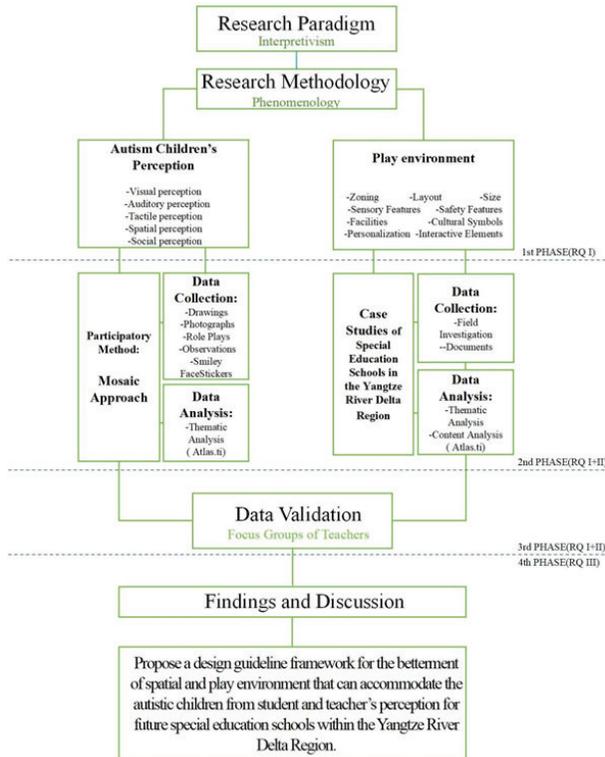


Figure 2. Research Design Framework in this Study

Source: Author

## **FINDINGS**

This section presents the findings based on the study conducted at Nanjing Qixia Special Education School, focus group discussions with teachers, and the broader analysis of three special education schools in the Yangtze River Delta region. The findings were organized based on the nine design elements: zoning, layout, size, sensory-friendly features, safety features, facilities, cultural symbols, personalization, and interactive elements. Additionally, the findings related to the perception of the autistic child, Queena, were integrated to provide a comprehensive understanding of the current state and potential improvements for play environments.

### **Queena's Perception**

Using the Mosaic Approach, the data were collected from Queena through drawings and structured observations. Queena's drawings predominantly featured green hues, indicating a preference for green spaces and natural elements. Observations revealed her comfort in open spaces like the playground but hesitation in narrow, enclosed areas. She used simple words and facial expressions to communicate her preferences, such as feeling anxious in confined spaces and enjoying freedom of movement in open areas.

In addition, the findings showed Queena's preference for well-defined zones with clear pathways, larger open play areas, and sensory-friendly features like soft textures and muted colors. Furthermore, safe, cushioned surfaces and clear boundaries reduced her anxiety, while interactive elements like sensory walls and water play engaged her with controlled sensory experiences. While Queena's case provided valuable insights, the study acknowledged the need for a more diverse sample in future research to obtain broader perspectives.

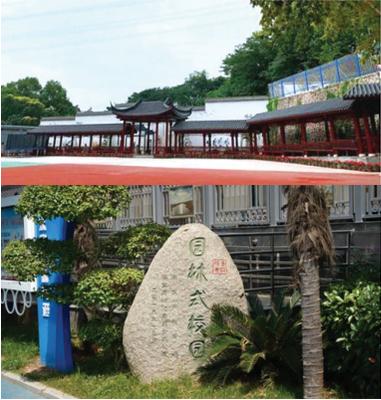
### **Play Environment Space in Qixia Special Education School**

Field investigations and document analysis were conducted at Qixia Special Education School. The school comprises two main buildings connected by a covered walkway, with a small playground and outdoor activity spaces equipped with slides, climbing nets, and trampolines.

Despite the thoughtful layout, the facilities appear outdated and lack modern sensory-friendly features.

**Table 1. Design Elements of Play Environment in Qixia Special Education School**

Elements	Analysis	Images
Zoning and Layout	Well-organized layout with accessible designs. Clear separation of play areas, but more defined zones for different activities needed.	
Size	Adequate size for the number of students, but some areas underutilized.	
Sensory-Friendly Features	Incorporates sensory rooms and equipment, but playground could benefit from additional sensory elements.	
Safety Features	Good safety measures, but some facilities need modernization.	

<p>Facilities</p>	<p>Comprehensive but outdated, with a need for more modern, intelligent applications.</p>	
<p>Cultural Symbols</p>	<p>Strong cultural elements through traditional Chinese garden design.</p>	

<p>Personalization</p>	<p>Limited opportunities for children to personalize play spaces.</p>	
<p>Interactive Elements</p>	<p>Existing elements like slides and trampolines, but need for more interactive and modern play equipment.</p>	

**Figure 3-16: Qixia Special Education**

Source: Author

The findings shown in Table 1 indicated that the school has clear activity zones but could benefit from more intuitive pathways and better-defined quiet zones. Play areas are adequate but could be expanded to offer more diverse options. Current sensory-friendly features are insufficient, highlighting the need for more sensory-friendly materials and designs like soft textures and controlled lighting. Equipment modernization is necessary to ensure higher safety standards. Existing interactive elements like climbing nets and trampolines are beneficial but could be enhanced with more diverse features to cater to different sensory needs.

## Focus Groups Discussion

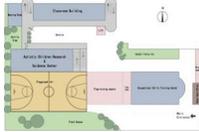
Focus group discussions with Queena’s teachers, including the principal, educational director, and three classroom teachers, provided detailed insights into the educational and play environment.

The discussions highlighted several aspects of the play environment. Teachers confirmed Queena’s preferences for certain colors and spatial settings, emphasizing her avoidance of overstimulating environments. They noted discrepancies in the initial data capture regarding Queena’s reactions to spaces, providing additional insights into her sensory sensitivities, particularly to noise and visual clutter. The teachers acknowledged the current deficiencies in the play environment, emphasizing the need for enhanced sensory accommodations and more interactive, flexible play spaces that support both educational and therapeutic outcomes for autistic children. Hence, recommendations were included investing in specialized play equipment, improving sensory zoning, and seeking professional guidance to create a more supportive environment aligned with the school’s educational philosophy.

## Broader Analysis of Special Education Schools in the Yangtze River Delta Region

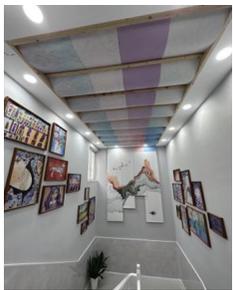
The study extended the analysis to three special education schools in the Yangtze River Delta region: Qinhuai Special Education School, Yuejianglou Special Education School, and Erbanqiao Special Education School. Field investigations and document analyses were conducted to evaluate their play environments based on the nine design elements.

**Table 2. Design Elements of Play Environment in Special Education Schools in the Yangtze River Delta Region**

Elements	Qinhuai Special Education School	Yuejianglou Special Education School	Erbanqiao Special Education School
Zoning Layout Size			

	<p>The school is well-zoned with clear distinctions between learning, rehabilitation, and activity spaces. This clear zoning helps in minimizing sensory overload by providing predictable and organized spaces.</p>	<p>The school is well-zoned with distinct functional areas, aiding in sensory zoning and reducing overstimulation. The layout promotes easy navigation and efficient circulation. However, the variety of activity spaces could be improved.</p>	<p>The school zones are clear but limited in variety, reflecting space constraints. The layout is rational and straightforward, optimizing available space for various activities.</p>
<p>+Sensory-Friendly Features</p>	 <p>The use of projections and thematic scenes in corridors enhances sensory experiences. However, more dynamic and interactive features could be added.</p>	 <p>The campus uses a unified color scheme and natural elements to create a calming environment. Additional sensory-friendly features could be added.</p>	 <p>The use of a unified color scheme and smooth pathways contributes to a calming environment. More sensory-friendly features could enhance this.</p>
<p>Safety Features</p>	 <p>Safety is ensured with thoughtful design and appropriate safety measures in classrooms and activity areas.</p>	 <p>Adequate safety measures are in place, ensuring a secure environment for students.</p>	 <p>Safety measures are well-implemented, ensuring a secure environment for students.</p>

<p>Facilities</p>	 <p>The facilities, including the rehabilitation and training rooms, are well-equipped to meet the needs of children with ASD.</p>	 <p>The facilities are well-equipped but some areas lack modern amenities and dynamic features.</p>	 <p>While the facilities meet basic needs, there is a lack of dynamic and modern amenities.</p>
<p>Cultural Symbols</p>	 <p>Incorporation of local traditional culture and natural elements provides a calming and familiar environment.</p>	 <p>The garden-like environment and incorporation of natural elements provide a cultural and calming atmosphere.</p>	 <p>The school environment is straightforward but lacks significant cultural symbols.</p>

<p>Personalization</p>	 <p>Thematic scenes and interactive displays allow for some degree of personalization. More dynamic elements could further enhance this.</p>	 <p>While the school offers a variety of functional spaces, more opportunities for personalization could enhance the learning experience.</p>	 <p>Opportunities for personalization are limited due to space constraints.</p>
<p>Interactive Elements</p>	 <p>The interactive projection equipment and various activity areas provide engagement opportunities, though further enhancements could be beneficial.</p>	 <p>The existing interactive elements are limited. More engaging and dynamic features could be beneficial.</p>	 <p>The interactive elements are minimal. More engaging and dynamic features could be beneficial.</p>

**Figure 17-49. The Description of Three Special Education Schools' Play Environment in the Description**

The findings in Table 3 showed that all the three schools demonstrated effective zoning and layout strategies, creating distinct areas for different activities and ensuring easy navigation for autistic children. The play areas are generally adequate in size, but there is a need for more expansive and varied spaces to cater to diverse play activities. There is a consistent lack of advanced sensory-friendly features; introducing more sensory integration elements, such as soft textures, neutral colors, and controlled lighting, would

benefit the children. In addition, safety measures are well-implemented, but modernizing equipment and using hypoallergenic materials would enhance safety. Besides, facilities are well-maintained but could include more interactive and engaging equipment. Furthermore, incorporating local cultural elements in the design helps children connect with their heritage, seen in the use of traditional motifs and designs. Moreover, schools involve children in personalizing their play spaces, which helps create a sense of ownership and engagement. Therefore, interactive features like sensory walls and water play stations are beneficial but could be further diversified to cater to different sensory preferences.

## **DISCUSSION AND RECOMMENDATIONS**

The findings of this study provide a detailed understanding of the current state and potential improvements for play environments in special education schools for autistic children in the Yangtze River Delta region.

### **Discussion**

Effective zoning and layout strategies are crucial for providing structured and navigable environments for autistic children. Distinct separation of activity areas allows for varied play without overwhelming the children. Improvements can be made by creating more intuitive pathways and better-defined quiet zones to reduce anxiety and support routine, as evidenced by Queena's preference for clear, structured spaces.

While play areas are generally adequate, expanding them to offer more diverse options can cater to the varying needs and preferences of autistic children. Larger, open play areas provide freedom to explore and engage in various activities, promoting physical and cognitive development.

The consistent lack of advanced sensory-friendly features across schools highlights the need for more sensory integration elements. However, using soft textures, neutral colors, and controlled lighting can create calming environments that reduce sensory overload, as shown by Queena's comfort in such spaces. Thus, modernizing safety features with hypoallergenic materials and cushioned surfaces can further enhance the safety and reduce

anxiety in play environments.

Well-maintained facilities can be updated to include more interactive and engaging equipment like sensory walls and water play stations. These features provide stimulating yet controlled sensory experiences, promoting engagement and creativity. In addition, incorporating local cultural elements in the design fosters a sense of belonging and connection to heritage through traditional motifs and designs.

Besides, involving children in personalizing their play spaces enhances their connection to the environment and reflects their individual preferences and needs. Furthermore, interactive features are essential for engaging autistic children and supporting their sensory and cognitive development. Moreover, diversifying these elements can cater to different sensory preferences and promote exploration and learning.

Findings from the focus group discussions emphasized the importance of integrating educational and therapeutic goals in play environments. The teachers highlighted the need for spaces that support both learning and therapy, suggesting a holistic approach to designing play environments that enhance overall development.

## **RECOMMENDATIONS**

### **Enhance Zoning and Layout**

To further support the needs of autistic children, schools should implement more intuitive zoning and layout strategies. This includes creating clear pathways, well-defined quiet zones, and designated areas for different types of play activities. Ensuring that these zones are easily navigable can help reduce anxiety and support the children's need for routine.

### **Expand Play Areas**

Expanding the size of play areas to offer more diverse play options can cater to the varying needs of autistic children. Larger, open spaces should be designed to allow for a range of activities that promote physical

and cognitive development.

### **Incorporate Advanced Sensory-Friendly Features**

Schools should incorporate advanced sensory-friendly features such as soft textures, neutral colors, and controlled lighting. These elements can create a calming environment that reduces sensory overload and supports the well-being of autistic children.

### **Modernize Safety Features**

Updating equipment and using hypoallergenic materials can enhance the safety of play environments. Ensuring the presence of safe, cushioned surfaces and clear boundaries can help prevent injuries and reduce anxiety among children.

### **Update and Diversify Facilities**

Updating facilities to include more interactive and engaging equipment can enhance the play experience for autistic children. Schools should consider adding features like sensory walls, water play stations, and other interactive elements to cater to different sensory needs and promote exploration and creativity.

### **Incorporate Cultural Symbols**

Integrating local cultural elements in the design of play environments can help children connect with their heritage and foster a sense of belonging. Schools should use traditional motifs and designs to create culturally relevant and engaging spaces for children.

### **Promote Personalization**

Involving children in personalizing their play spaces can create a sense of ownership and engagement. Schools should allow children to contribute to the design of their environments, reflecting their individual preferences and needs.

## **Enhance Interactive Elements**

Diversifying interactive features can cater to different sensory preferences and promote exploration and learning. Schools should consider adding various types of interactive equipment to engage children and support their sensory and cognitive development.

## **Integrate Educational and Therapeutic Goals**

To maximize the benefits of play environments, schools should integrate educational and therapeutic goals. Designing spaces that support both learning and therapy can enhance the overall development of autistic children, ensuring that play environments contribute to their educational and therapeutic progress.

By implementing these recommendations, special education schools in the Yangtze River Delta region can create more inclusive, safe, and stimulating play environments that cater to the unique needs of autistic children, promoting their holistic development and well-being.

## **CONCLUSION**

It can be concluded that creating effective play environments for autistic children in special education schools involves addressing both spatial and sensory aspects. Key elements such as zoning, layout, size, sensory-friendly features, safety features, facilities, cultural symbols, personalization, and interactive elements significantly contribute to the children's well-being and engagement. These elements mitigate sensory overload, foster social interaction, and support educational goals.

In addition, educational authorities, designers, and policymakers should collaborate to integrate these elements into the design of special education schools. This collaboration is crucial for promoting inclusivity and optimizing educational outcomes for autistic children in the Yangtze River Delta region.

## FUNDING

There is no funding received for this research.

## AUTHOR CONTRIBUTIONS

The design of the research, conducting interviews, and writing up the manuscript were collaborative efforts involving all authors. The corresponding author specifically handled data cleaning, and tabulation processes. All authors had thoroughly reviewed and given their approval for the final manuscript, indicating their collective agreement on its content and findings.

## CONFLICT OF INTEREST

The authors affirmed that there is no conflict of interest to disclose regarding the publication of this paper.

## REFERENCES

- Siti Rasidah Md Sakip, Khalilah Hassan & Azran Mansor. (2016). Community happiness the distinct role of environment setting relatedness. *Malaysian Journal of Sustainable Environment (MySE)*, 1, 12-27. ISSN 0128-326X. <https://ir.uitm.edu.my/id/eprint/29127>.
- Alice Sabrina Ismail, Ezlina Mohd Esa. (2022). Designing sustainable barrier-free learning facilities for community colleges. *Malaysian Journal of Sustainable Environment (MySE)*, 9 (2), 59-82. ISSN 0128-326X. <https://ir.uitm.edu.my/id/eprint/65487>.
- Ginsburg, K. R. (2007). The importance of play in promoting healthy child development and maintaining strong parent-child bonds. *Pediatrics*, 119(1), 182-191. <https://doi.org/10.1542/peds.2006-2697>.
- Barbour, A. C. (1999). The impact of playground design on the play behaviors of children with differing levels of physical competence. *Early*

- Childhood Research Quarterly*, 14(1), 75-98. [https://doi.org/10.1016/S0885-2006\(99\)80007-6](https://doi.org/10.1016/S0885-2006(99)80007-6).
- Burdette, H. L., & Whitaker, R. C. (2005). Resurrecting free play in young children: Looking beyond fitness and fatness to attention, affiliation, and affect. *Archives of Paediatrics & Adolescent Medicine*, 159(1), 46-50. <https://doi.org/10.1001/archpedi.159.1.46>.
- Fjørtoft, I. (2001). The Natural Environment as a Playground for Children: The Impact of Outdoor Play Activities in Pre-Primary School Children. *Early Childhood Education Journal*, 29(2), 111-117. <https://doi.org/10.1023/A:1012576913074>.
- Mitsuru, S. (2016). *Creating Environments for Play*. Japan Institute of Architects.
- Siti Norashikin Bashirun. [et al.] (2016). Students' green perception and behavior. *Malaysian Journal of Sustainable Environment (MySE)*, 1, 39-49. ISSN 0128-326X. <https://ir.uitm.edu.my/id/eprint/29200>.
- Clark, A., & Moss, P. (2011). *Listening to Young Children: The Mosaic Approach*. NCB.
- Bader, O., Fuchs, T. (2022). *Gestalt Perception and the Experience of the Social Space in Autism: A Case Study*, *Psychopathology*, 55, 211–218. <https://doi.org/10.1159/000525024>.
- Robertson, C.E., Baron-Cohen, S. (2017). Sensory perception in autism. *Nat Rev Neurosci*, 18, 671–684. <https://doi.org/10.1038/nrn.2017.112>.
- Papoudi, D., Kossyvaki, L. (2018). 'Play and Children with Autism: Insights from Research and Implications for Practice', in: Smith, P.K., Roopnarine, J.L. (eds.) *The Cambridge Handbook of Play*. Cambridge: Cambridge University Press, 563–579. <https://doi.org/10.1017/9781108131384.033>.
- Agosta, G., Borghese, L., Brandolese, C., Clasadonte, F., Fornaciari, W., Garzotto, F., Gelsomini, M., Grotto, M., Fra, C., Noferi, D., & Valla, M. (2015). 7. Playful Supervised Smart Spaces (P3S)—A Framework for Designing, Implementing and Deploying Multisensory Play Experiences for Children with Special Needs. *2015 Euromicro Conference on Digital*

- System Design*, 158–164. <https://doi.org/10.1109/DSD.2015.61>.
- Bagot, K. L., Allen, F. C. L., & Toukhsati, S. (2015). Perceived restorativeness of children's school playground environments: Nature, playground features and play period experiences. *Journal of Environmental Psychology*, 41, 1–9. <https://doi.org/10.1016/j.jenvp.2014.11.005>.
- Couper, L., Sutherland, D., & Van Bysterveldt, A. (2013). 5.Children with Autism Spectrum Disorder in the Mainstream Playground. *Kairaranga*, 14(1), 25–31. <https://doi.org/10.54322/kairaranga.v14i1.171>.
- Mostafa, M. (2018). Designing For Autism: An Aspects™ Post-Occupancy Evaluation of Learning Environments. *International Journal of Architectural Research: ArchNet-IJAR*, 12(3), 308. <https://doi.org/10.26687/archnet-ijar.v12i3.1589>.
- Mostafa, M., Sotelo, M., Honsberger, T., Honsberger, C., Brooker Lozott, E., & Shanok, N. (2023). The impact of ASPECTSS-based design intervention in autism school design: A case study. *Archnet-IJAR: International Journal of Architectural Research*. <https://doi.org/10.1108/ARCH-11-2022-0258>.
- Wu, S., Pan, C., Yao, L., & Wu, X. (2022). The Impact of the Urban Built Environment on the Play Behavior of Children with ASD. *International Journal of Environmental Research and Public Health*, 19(22), 14752. <https://doi.org/10.3390/ijerph192214752>.
- Yuill, N., Strieth, S., Roake, C., Aspden, R., & Todd, B. (2007). 3.Brief Report: Designing a Playground for Children with Autistic Spectrum Disorders—Effects on Playful Peer Interactions. *Journal of Autism and Developmental Disorders*, 37(6), 1192–1196. <https://doi.org/10.1007/s10803-006-0241-8>.
- Black, M., Freeman, B. J., & Montgomery, J. (1975). Systematic observation of play behavior in autistic children. *Journal of Autism and Childhood Schizophrenia*, 5(4), 363–371. <https://doi.org/10.1007/BF01540682>.
- Doody, K. R., & Mertz, J. (2013). Preferred Play Activities of Children with Autism Spectrum Disorder in Naturalistic Settings. *North American Journal of Medicine and Science*, 6.

- Elbeltagi, R., Al-Beltagi, M., Saeed, N. K., & Alhawamdeh, R. (2023). Play therapy in children with autism: Its role, implications, and limitations. *World Journal of Clinical Pediatrics, 12*(1), 1–22. <https://doi.org/10.5409/wjcp.v12.i1.1>.
- Gentil-Gutiérrez, A., Cuesta-Gómez, J. L., Rodríguez-Fernández, P., & González-Bernal, J. J. (2021). Implication of the Sensory Environment in Children with Autism Spectrum Disorder: Perspectives from School. *International Journal of Environmental Research and Public Health, 18*(14), 7670. <https://doi.org/10.3390/ijerph18147670>.
- Holmes, E., & Willoughby, T. (2005). Play behaviour of children with autism spectrum disorders. *Journal of Intellectual & Developmental Disability, 30*(3), 156–164. <https://doi.org/10.1080/13668250500204034>.
- Jung, S., & Sainato, D. M. (2013). Teaching play skills to young children with autism. *Journal of Intellectual & Developmental Disability, 38*(1), 74–90. <https://doi.org/10.3109/13668250.2012.732220>.
- Naber, F. B. A., Bakermans-Kranenburg, M. J., Van IJzendoorn, M. H., Swinkels, S. H. N., Buitelaar, J. K., Dietz, C., Van Daalen, E., & Van Engeland, H. (2008). Play Behavior and Attachment in Toddlers with Autism. *Journal of Autism and Developmental Disorders, 38*(5), 857–866. <https://doi.org/10.1007/s10803-007-0454-5>.
- Papoudi, D., & Kossyvakis, L. (2018). *Play and Children with Autism: Insights from Research and Implications for Practice*. In P. K. Smith & J. L. Roopnarine (Eds.), *The Cambridge Handbook of Play* (1st ed.) pp. 563–579. Cambridge University Press. <https://doi.org/10.1017/9781108131384.031>.
- Parés, N., Carreras, A., Durany, J., Ferrer, J., Freixa, P., Gómez, D., Kruglanski, O., Parés, R., Ribas, J. I., Soler, M., & Sanjurjo, À. (2005). Promotion of creative activity in children with severe autism through visuals in an interactive multisensory environment. *Proceedings of the 2005 Conference on Interaction Design and Children, 110–116*. <https://doi.org/10.1145/1109540.1109555>.
- Wong, C., & Kasari, C. (2012). Play and Joint Attention of Children with Autism in the Preschool Special Education Classroom. *Journal of*

- Autism and Developmental Disorders*, 42(10), 2152–2161. <https://doi.org/10.1007/s10803-012-1467-2>.
- Conn, C. (2014). Investigating the social engagement of children with autism in mainstream schools for the purpose of identifying learning targets. *Journal of Research in Special Educational Needs*, 14(3), 153–159. <https://doi.org/10.1111/1471-3802.12010>.
- Conn, C. (2015). Essential Conditions for Research with Children with Autism: Issues Raised by Two Case Studies. *Children & Society*, 29(1), 59–68. <https://doi.org/10.1111/chso.12018>.
- Eckhoff, A. (Ed.). (2019). *Participatory Research with Young Children*. 17. Springer International Publishing. <https://doi.org/10.1007/978-3-030-19365-2>.
- Ellis, J. (2017). Researching the Social Worlds of Autistic Children: An Exploration of How an Understanding of Autistic Children’s Social Worlds is Best Achieved. *Children & Society*, 31(1), 23–36. <https://doi.org/10.1111/chso.12160>.
- Macdonald, M. M. (2023). Using a mosaic-based approach to construct children’s understanding of safe space in school. *Educational and Child Psychology*, 40(3), 113–130. <https://doi.org/10.53841/bpsecp.2023.40.3.113>.
- Parsons, S., Ivil, K., Kovshoff, H., & Karakosta, E. (2021). ‘Seeing is believing’: Exploring the perspectives of young autistic children through Digital Stories. *Journal of Early Childhood Research*, 19(2), 161–178. <https://doi.org/10.1177/1476718X20951235>.
- Bader, O., & Fuchs, T. (2022). Gestalt Perception and the Experience of the Social Space in Autism: A Case Study. *Psychopathology*, 55(3–4), 211–218. <https://doi.org/10.1159/000524562>.
- Black, M. H., McGarry, S., Churchill, L., D’Arcy, E., Dalglish, J., Nash, I., Jones, A., Tse, T. Y., Gibson, J., Bölte, S., & Girdler, S. (2022). Considerations of the built environment for autistic individuals: A review of the literature. *Autism*, 26(8), 1904–1915. <https://doi.org/10.1177/13623613221102753>.

- Bölte, S., Mahdi, S., De Vries, P. J., Granlund, M., Robison, J. E., Shulman, C., Swedo, S., Tonge, B., Wong, V., Zwaigenbaum, L., Segerer, W., & Selb, M. (2019). The Gestalt of functioning in autism spectrum disorder: Results of the international conference to develop final consensus International Classification of Functioning, Disability and Health core sets. *Autism, 23*(2), 449–467. <https://doi.org/10.1177/1362361318755522>.
- Chen, C.-H., Bobzien, J., Bruhn, A., Zhang, M., & Hsu, W.-W. (2014). The first step toward reconstructing visual perception and cognition in Autism. *2014 IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, 1171–1174. <https://doi.org/10.1109/SMC.2014.6974072>.
- Evers, K., Noens, I., Steyaert, J., & Wagemans, J. (2011). Combining strengths and weaknesses in visual perception of children with an autism spectrum disorder: Perceptual matching of facial expressions. *Research in Autism Spectrum Disorders, 5*(4), 1327–1342. <https://doi.org/10.1016/j.rasd.2011.01.004>.
- Hadad, B. S., Russo, N., Kimchi, R., Babineau, V., & Burack, J. A. (2019). Typical Utilization of Gestalt Grouping Cues in Shape Perception by Persons with Autism Spectrum Disorder. *Perception, 48*(12), 1175–1196. <https://doi.org/10.1177/0301006619874681>.
- Khalifa, S., Bruneau, N., Rogé, B., Georgieff, N., Veuillet, E., Adrien, J.-L., Barthélémy, C., & Collet, L. (2004). Increased perception of loudness in autism. *Hearing Research, 198*(1–2), 87–92. <https://doi.org/10.1016/j.heares.2004.07.006>.
- Kobayashi, R. (1998). Perception metamorphosis phenomenon in autism. *Psychiatry and Clinical Neurosciences, 52*(6), 611–620. <https://doi.org/10.1111/j.1440-1819.1998.tb02709.x>.
- Research Assistant & Rehabilitation Psychologist, Department of Social Work, University of Kashmir, Hazratbal, Jammu and Kashmir, India., Sa, G., A, B., & Assistant Professor, Department of Social Work, University of Kashmir, Hazratbal, Jammu and Kashmir, India. (2014). Global Autism: Autism, Autism Etiology, Perceptions, Epistemology, Prevalence and Action. *International Journal of Clinical Therapeutics*

- and Diagnosis*, 39–47. <https://doi.org/10.19070/2332-2926-140008>.
- Robertson, C. E., & Baron-Cohen, S. (2017). Sensory perception in autism. *Nature Reviews Neuroscience*, 18(11), 671–684. <https://doi.org/10.1038/nrn.2017.112>.
- Sabatino DiCriscio, A., & Troiani, V. (2018). The Broader Autism Phenotype and Visual Perception in Children. *Journal of Autism and Developmental Disorders*, 48(8), 2809–2820. <https://doi.org/10.1007/s10803-018-3534-9>.
- Shabha, G. (2006). An assessment of the impact of the sensory environment on individuals' behaviour in special needs schools. *Facilities*, 24(1/2), 31–42. <https://doi.org/10.1108/02632770610639189>.
- Von Hofsten, C., Uhlig, H., Adell, M., & Kochukhova, O. (2009). How children with autism look at events. *Research in Autism Spectrum Disorders*, 3(2), 556–569. <https://doi.org/10.1016/j.rasd.2008.12.003>.
- Wallace, G. L., & Happé, F. (2008). Time perception in autism spectrum disorders. *Research in Autism Spectrum Disorders*, 2(3), 447–455. <https://doi.org/10.1016/j.rasd.2007.09.005>.