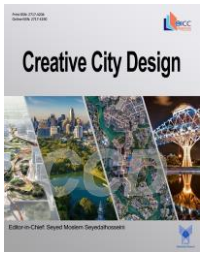

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Research Article

Developing a Model of the Impact of Urban Third Spaces on the Perception and Behavior of Children with Autism: Identifying and Analyzing Environmental, Perceptual, and Social Dimensions (Case Study of Kerman City)

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Abstract

Purpose: This study develops a conceptual model to explain the impact of urban third spaces on the perception and behavior of children with autism, with a particular emphasis on identifying influential environmental codes. As key settings for social interaction and public engagement, urban third spaces play a critical role in shaping the sensory, cognitive, and social experiences of autistic children.

Methodology: This qualitative study adopts a multi-grounded theory approach, integrating meta-synthesis and systematic grounded theory. Data were collected through non-participatory behavioral observations in selected urban spaces (including Autism Park and Ganjali Khan Square), semi-structured interviews with parents and experts, and environmental content analysis. Data were analyzed using Atlas.Ti software through open, axial, and selective coding, leading to the identification of key concepts and the development of a final explanatory model.

Findings: The results indicate that environmental predictability, spatial legibility and order, sensory modulation (including sound, light, and thermal conditions), and the quality of physical design significantly contribute to anxiety reduction and enhanced social interaction among autistic children. In addition, low-stress environments, supportive social contexts, and diverse accessible activities improve their perceptual processes and spatial experiences.

Conclusion: This study advances existing knowledge by providing an integrated analytical framework and practical design indicators for inclusive urban spaces. It highlights the importance of applying sensory, social, and perceptual design principles to enhance accessibility, improve quality of life, and facilitate meaningful social participation of children with autism in urban public environments.

Keywords: Urban Third Spaces, Autism Spectrum Disorder (ASD), Environmental Perception, Autistic Behavior, Multi-Grounded Theory, Kerman

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1. Introduction

In recent decades, urban third spaces have gained great importance in research on the environment and human behavior as places that provide opportunities for social interactions, play, and shared experiences beyond the home and workplace. These spaces, which include parks, squares, cafes, and other public places, have a significant impact on the quality of life of individuals. For certain groups of society, especially children with autism, the design and characteristics of these spaces can play a significant role in improving or reducing the quality of their perception and behavior. Children with autism typically face many challenges in urban spaces due to differences in the way they process sensory information and social interactions. Failure to pay attention to the sensory and perceptual needs of these children in the design of urban spaces can lead to unpleasant and stressful experiences for them. However, few studies have examined the impact of urban spaces on the perception and behavior of autistic children, and comprehensive models that can explain these effects have not yet been fully developed [11]. One of the main challenges in dealing with children with autism is the lack of a detailed understanding of how they interact with urban spaces. Many urban spaces are not designed to meet the specific needs of these children. On the other hand, interaction with the environment for these children can have a direct impact on their social and perceptual behaviors [16]. The lack of comprehensive conceptual models that explain the relationship between environmental content and the behavior of autistic children is an obstacle to the development of appropriate urban spaces for these children. Therefore, there is a need to develop a model that accurately examines the impact of these spaces on the perception and behavior of children with autism. The main goal of this study is to develop a comprehensive model to analyze the impact of urban third spaces on the perception and behavior of children with autism. This model is developed through the analysis of environmental codes and the investigation of factors affecting the perceptual and behavioral interactions of autistic children with urban spaces. Specifically, this research seeks to identify factors that affect the sensory stimulation, spatial perception, and social behavior of these children and uses them to provide practical suggestions for the design of urban spaces. This research, using the grounded theory method and field data analysis, including direct non-participatory observation of children's behavior in selected urban spaces, semi-structured interviews with parents and experts, and a review of previous studies, attempts to develop a model that shows how urban third spaces can affect the perception and behavior of children with autism. For this purpose, spaces such as parks, squares, and recreational centers in Kerman city have been selected as study samples. This research seeks to answer the question: "How do urban third spaces affect the perception and behavior of children with autism through environmental content codes?"

2. Theoretical foundations

In recent years, attention has increased to the impact of the environment on human behavior and perception, especially in vulnerable groups such as children with autism. Several theories have been developed regarding the relationship between urban environments and their effects on behavior and social interactions. In this study, we review studies related to the impact of urban environments, especially urban third spaces, on the perception and behavior of autistic children. This study contributes to a deeper understanding of how environmental characteristics affect these children's experience in public spaces. Third place: A third place is a public and social space where people outside the home (first place) and workplace (second place) gather and interact with others on a regular basis. These places, such as cafes, libraries, or parks, provide an opportunity for social connections, self-expression, and a sense of belonging to the community. Third place is an informal environment where people can socialize without feeling pressured and at the same time achieve a kind of relaxation and social connection [14].

2.1. Urban third spaces

The concept of urban third spaces is derived from the theories of Ray Oldenburg, which refers to places where people gather outside the home and work environment for social interactions and relaxation. Urban third spaces include parks, cafes, squares and other public spaces. Third space is a concept that refers to spaces that go beyond the usual divisions such as public/private and indoor/outdoor. These spaces, described by thinkers such as Ray Oldenburg, Edward Soja, Homily Baba and Henri Lefebvre, are environments that foster social, cultural and political interactions and allow for the creation of new identities and the exchange of ideas. Third space is defined as public places such as parks, cafes, or virtual spaces that support social and cultural interactions. These spaces are a combination of physical, imagined, and lived dimensions and are seen as transformative environments that allow individuals to transcend spatial, temporal, and cultural constraints. (Zakaros [25], Khiabani, Shahabian [4], Soja [20], Harvey [7], Lufer [13]) Research has shown that these spaces play an important role in fostering social interactions and enhancing the quality of life of individuals.

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However, to date, few studies have examined the impact of these spaces on autistic children and how they interact with these environments.

2.2. Autism spectrum disorder

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by difficulties in social skills, communication, and repetitive or restricted behaviors. The disorder usually appears in early childhood and may be accompanied by a variety of symptoms. Individuals with autism may have challenges in communication, social interactions, and understanding the emotions of others. They may also have repetitive behaviors or restricted and specific interests. Autism occurs at a prevalence rate of approximately 1.7% in children and, due to its complex nature, requires early diagnosis and evidence-based interventions. The disorder may be diagnosed differently in different genders and ethnic groups and requires comprehensive care in the areas of medical, behavioral, and social [9].

Children with autism spectrum disorder (ASD) have specific characteristics that affect their development and social interactions. Some key features include:

1. Social communication and interaction deficits:

o Difficulty communicating effectively with others.

o Decreased interest in social interactions, such as lack of eye contact or failure to recognize names.

2. Restricted and repetitive behaviors:

o Repetitive patterns of behavior, interests, or activities.

o May be particularly attached to certain objects or activities.

3. Social skill deficits:

o Difficulty learning basic social skills, such as joint attention or social referencing.

o Low likelihood of peer acceptance and increased isolation [12].

Autism spectrum disorder is characterized by persistent deficits in the ability to initiate and maintain social interaction and reciprocal social connections, and by a range of restricted, repetitive, and inflexible patterns of behavior and interests. The onset of the disorder is during the developmental period, typically in early childhood, but symptoms may not become fully apparent until social demands exceed limited capacities [17]. Autism has three levels: low, moderate, and high functioning, all of which are known as “autism spectrum disorders” [6].

Children with autism have significant difficulties in social interactions and experience the world differently from others. They often fail to understand subtle differences in facial expressions and body movements, and their responses may seem inappropriate. They have difficulty making eye contact and find group play less engaging. Other characteristics include repetitive and stereotyped behaviors, attachment to specific objects, and discomfort with environmental changes. Understanding these differences can help improve communication and support for these children [11].

2.3. Perception and behavior of children with autism

Children with autism are known for their sensory sensitivities, difficulties in social interactions, and specific behavioral patterns. Studies show that designed environments can affect the perception and behavior of these children. For example, Bader & Fuchs [2] research shows that people with autism face challenges in processing the totality of space and focus on more details. This makes the experience of social space different and sometimes unfamiliar and confusing for them. Research emphasizes that the design of social spaces should have greater structural clarity and include fewer environmental stimuli to increase the comfort and safety of autistic people. Turgay & Sarıberberoğlu [21] research examined the role of senses in children's perception of space. This study was conducted in an amusement park and showed that all senses play a role in spatial perception, not just vision. Motor stimuli have the greatest impact on memory. This research helps designers create spaces that engage all the senses and create positive and memorable experiences for children. Therefore, urban environments that are not specifically designed for these children can pose great challenges for their interaction and perception.

2.4. The impact of urban environments on autistic children

Unlike the Gestalt theory, which believes that people first look at the object as a whole and then pay attention to the details, Firth's theory shows that people with autism are more focused on details. Matron and Burak further expanded this theory and stated that these people not only focus more on details, but also show special abilities in the field of perception; including identifying, remembering, and recognizing objects and patterns. These abilities allow them to perceive environmental aspects more accurately than neurotypical people. Also, Pellicano and Bohr stated that the perception of these individuals is less influenced by previous experiences. As a result, they perceive the world more accurately and past experiences play a less important role in shaping their perceptions [10]. However, Wilkes reports that individuals with autism spectrum disorders experience built environments differently and sometimes with impaired perception. These individuals often face additional perceptual challenges that negatively affect their ability to interact and relate to the environment.

For these individuals, everyday experiences that are normal for others can become unpleasant and sometimes lead to aggressive or undesirable behaviors. This is often criticized and reinforces their social isolation [18]. Perception, action, and cognition function as interdependent systems that are influenced by motivations and shape adaptive behaviors. These processes, which are part of cognitive development, vary based on the individual's motivations, challenges, and sensory-motor limitations. In autism, brain abnormalities cause individuals to neglect important social information and instead focus more on the physical aspects of the environment. Repetitive behaviors, the severity of which is related to the severity of autism, are also common in these individuals [23].

Finally, it can be said that individuals with autism have difficulty developing a holistic, gestalt perception of social situations. This makes them unable to relate the behaviors, gazes, and movements of others to the overall situation and, as a result, do not understand the meaning of the situation correctly. This inability to connect social behaviors to overall situations leads to confusion and further difficulties in social interactions.

2.5. Behavior

Behavior is the way in which individuals perform activities, which is influenced by the needs, motivations, and perceptions of the surrounding environment. The environment plays an important role in influencing behavior, and mental patterns that arise from the interaction of the individual with the environment create specific spatial behaviors. In general, human behavior is the result of the interaction between individual characteristics and environmental factors (Goli [5], Hatami [8], Turgay & Sarıberberoğlu [21]).

2.6. Behavior of children with autism

Children with autism spectrum disorder (ASD) usually suffer from social anxiety, which can have widespread effects on their social relationships. Play behavior, especially pretend play, is one of their main behaviors that can help improve social interactions and reduce anxiety. The different stages of play include observation, participation, withdrawal, and hiding, which indicate a direct connection between play and the social behavior of these children [3].

2.7. Environmental content codes

Analysis of environmental content codes identifies and distinguishes environmental features that can have direct or indirect effects on the behavior and perception of individuals. Existing research shows that urban spaces, especially third spaces, play an important role in the social interactions and individual experiences of autistic children. However, the lack of sufficient attention to the specific characteristics of these children in the design of these spaces has caused their experience of these environments to face many challenges. In this regard, identifying and analyzing environmental content codes that affect the perception and behavior of these children can greatly help improve the design and function of these spaces.

In this study, the meta-synthesis method has been used as a qualitative approach to examine, synthesize, and analyze previous research. This approach is used to interpret and analyze in more depth the components that affect the perception and behavior of users of urban spaces and examines the concepts and results of past studies using coding. This method helps to provide a more comprehensive understanding of the subject by providing an interpretive analysis of previous findings.

The steps of implementing metasynthesis are as follows:

1. Designing the research question: The first step in metasynthesis is the detailed design of research questions. In this study, the main question was formulated with the aim of identifying the components of urban spaces that affect the perception and behavior of users. These questions seek a deeper understanding of the dimensions of the urban environment and its impact on the behavior and perception of users.
2. Systematic search of studies: The second stage includes a systematic search in reputable scientific databases. The study population was reputable English databases such as Google Scholar, Springer, PubMed, Science Direct, as well as Persian databases such as Irandoc, Normags, Seyed, and Alamnet within the time period of 2010 to 2020. The search was conducted using the specified keywords.
3. Selecting relevant studies: After searching for articles, relevant articles were selected based on precise inclusion and exclusion criteria. The selection criteria included reviewing the title, abstract, statistical population, and full text of the articles. Finally, out of a total of 201 documents, 35 documents were selected for the next stages.
4. Information extraction: In this stage, key information was extracted from the selected articles. The data included information related to various components of urban spaces, including physical, functional, social, perceptual, cultural, and environmental elements. These data were prepared for the coding stages.
5. Assessment of study quality: In order to ensure the quality of the selected studies, the Critical Assessment Skills Tool (CASP) was used. This tool helps to systematically assess the quality of studies and evaluated the studies based on five classifications (from poor to excellent).

6. Coding and analysis of findings: The extracted information was coded at three levels using Atlas.Ti software. In this stage, 64 primary codes, 19 concepts, and 6 categories were identified. These codes were then analyzed and categorized to identify the different components affecting the perception and behavior of users of urban spaces.

7. Synthesis and interpretation of results: In the final stage, the coded findings were synthesized and analyzed to identify patterns and relationships between elements of the urban environment and the perception and behavior of users (Figure 1). The findings showed that physical, functional, social, perceptual, and environmental components have important effects on the behavior and perception of individuals in urban spaces. This synthesis and interpretation led to a better understanding of the impact of urban environments on the experience of individuals [15].

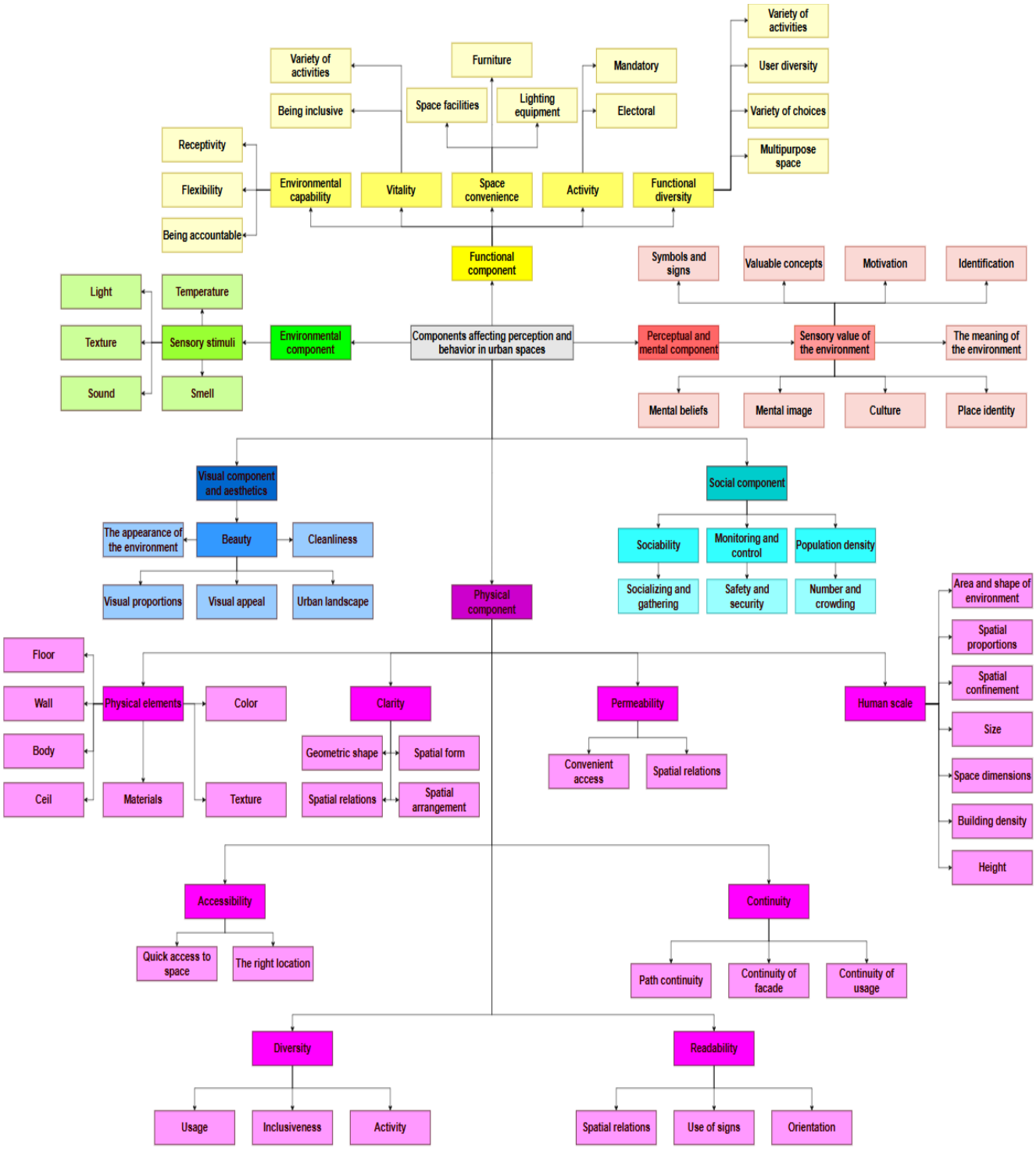

Figure 1. Factors influencing the perception and behavior of users of urban spaces (conceptual model extracted from meta-synthesis) [15]

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3. Research background

The article by Shan & Mei [19], by examining the design of multi-sensory interactive spaces for children with autism, provides solutions for improving their behavior and social interactions. This article uses a mixed approach to analyze theories and case studies in the field of sensory design.
The main findings of the article show that:
- Natural elements: such as plants and natural light help reduce stress and increase children's relaxation.
- Open and flexible spaces: improve their social and communication skills.
- Digital technologies: such as virtual reality can enhance children's social interactions.
This article emphasizes the importance of designing spaces that provide stimulation of different senses and suggests solutions to improve the quality of life of children with autism.
Wu et.al. [24] studied the impact of urban built environment factors on the social behavior of children with autism spectrum disorder (ASD). Analyzing 197 questionnaires, the results showed that urban environmental factors significantly affected the social behavior of ASD children at different stages (before departure, during travel, and after arrival). This research emphasizes the importance of considering the needs of children with autism in urban planning and improving the urban environment.
Vanolo's article "Cities of Autism" [22] explores the relationship between critical urban studies and neurodiversity. Using his personal experiences as the father of an autistic child, the author examines the effects of urban design on autistic people and offers four suggestions for improving urban spaces:
1. Inclusive and sensory-friendly design.
2. Creating inclusive social spaces.
3. Integrating the needs of autistic people into urban planning.
4. Collaboration between urban studies and neurodiversity advocates.
This article helps to improve urban conditions for autistic people.
The article [2] Bader "Gestalt perception and the experience of social space in autism" (2022) shows that people with autism focus on details rather than overall spatial understanding and experience social space as confusing and unfamiliar. Research emphasizes that the design of social spaces should take into account the perceptual needs of these people by providing structural clarity, reducing additional stimuli, and creating protected spaces.
The article "Educational spaces for autistic children from the perspective of environmental psychology" (2014) by [1] Ameri Siahoui, and Mashhadi Fathali, emphasizes the importance of designing educational spaces for autistic children. In this article, sensory differences and the way autistic children perceive the environment are examined and it is noted that attention to the design of physical spaces, such as classrooms and schools, has a direct impact on the learning of these children. Also, the importance of environmental psychology in designing a stress-free and tension-free space for these children is mentioned so that they can learn better and more comfortably. The article "Strengthening the Focus of Autistic Children with an Environmental Psychology Approach" [26] suggest that a range of constructive elements such as the color and light in space can have a significant effect on the elimination of any stimulus and stress. Therefore, the present study uses a descriptive-analytic research method to investigate the architectural features of the health-care spaces of patients with autism with the psychology of the environment.architectural features play an important role in the treatment process and enhance the focus of autistic children.
Arbab , Sanaz Saedi Monfared [27] concluded that Based on the exploratory factor analysis technique, the variables were classified into 5 factors explaining the feeling of security, including: noise pollution, favorable green space, lack of blind spots, amenities and lighting. Then, using Friedman test, Pearson test and T test, the relationship between the five factors and the feeling of security in the field was measured. It was found out that the most effective component in mental health is favorable green space, and lighting has the least effect on mental health.

4. Research methodology

This research was conducted with the aim of developing a model of the impact of urban third spaces on the perception and behavior of children with autism. To achieve this goal, a qualitative approach and various methods of data collection and analysis were used. The details of the research methodology are as follows:
Research Approach: The present research is qualitative and the multi-grounded theory method was used. This method is a combination of meta-synthesis and systematic grounded theory and allows for in-depth data analysis, discovery of patterns, and development of a comprehensive model based on environmental and behavioral data. The use of this approach was necessary due to the complexity of the subject and the need for a detailed analysis of various environmental and behavioral dimensions of children with autism in urban spaces.

Statistical Population: The statistical population included children aged 3 to 15 with autism living in Kerman. This age group was selected due to their direct interaction with urban spaces and sensitivity to environmental changes. Also, parents of these children and autism-related experts also participated in the research as complementary groups of the statistical population.

A total of 11 specialists, 25 parents, and 12 children were selected using purposive sampling. These individuals were selected based on the severity of the disease, the children's sensory and social abilities, and accessibility.

The sampling process continued until theoretical saturation was achieved, meaning that data collection was carried out until no new information emerged, and the collected data reached a level of repetition that allowed for the extraction of meaningful patterns and the development of the final model. The selection of participants ensured sufficient diversity in individual and environmental conditions, including differences in abilities, sensory responses, and social behaviors, to enhance the depth and comprehensiveness of the study findings.

Study area: The selected spaces in this study include Autism Park, Ganjali Khan Square, Kerman Bazaar, and recreational centers, chosen based on criteria such as physical characteristics, spatial diversity, and social interaction potential. These spaces were selected with the participation of parents and specialists to identify locations with the highest level of interaction for children with autism.

The proximity of these spaces to each other, in addition to facilitating accessibility, has enabled better cooperation between parents and children. Moreover, these spaces, with their appropriate scale and diverse environmental stimuli, provide ideal conditions for observing and analyzing children's behaviors in natural urban settings. In selecting these spaces, efforts were made to consider the comfort of children and their parents as a key criterion.

Public and interactive spaces in Kerman city were selected as examples of urban third spaces. These spaces included:

Autism Park: An environment designed for play and social interactions of autistic children.

Among the spaces suggested by parents and specialists, Autism Park, located on Jihad Street, is noteworthy. Most parents prefer this park due to its proximity to the clinic and the opportunity it provides for children to play freely and express their behavior in a natural setting.

Ganjali Khan Square: A historical and touristic space with the potential for social interactions.

Kerman Bazaar: A traditional and commercial space to study children's reactions to crowded environments.

City entertainment centers: Places for entertainment and recreation that provide opportunities for social interactions and play.

This study has selected the research spaces based on factors such as their proximity to each other, selection by parents, the unique characteristics of the urban square, the presence of natural elements, sufficient space for play and behavioral expression, and the availability of diverse auditory stimuli, such as the marketplace, to examine the sensitivities of children with autism.

These spaces were selected based on their physical, social, historical, and recreational characteristics to examine different dimensions of the environment's impact on the behavior and perception of autistic children.

Data Collection Methods: Research data were collected from two sources: field and library:

Library studies: Previous studies related to the impact of urban spaces on users' perceptions and behaviors were reviewed and analyzed. These studies included scientific articles, books, and reports, which were conducted through data collection and classification.

Field studies: In the field section, data were collected through the following methods:

Direct non-participatory observation: The behavior of children with autism in selected spaces, including Autism Park, Ganjali Khan Square, the market, and recreational centers, was observed and recorded in a non-participatory manner. For this purpose, behavioral checklists and analytical notes were used.

Semi-structured interviews: Interviews were conducted with parents of autistic children and relevant professionals to collect their perspectives, experiences, and challenges regarding children's interactions with urban environments.

Focus Group Interview:

Focus groups were conducted with parents and professionals to explore collective perspectives. These interviews focused on gaining a deeper understanding of the environmental influences on children’s behavior and perception.

Data Analysis Method: The collected data were analyzed using the Atlas.Ti software. The process of developing the model was carried out through coding the data based on the systematic grounded theory method. This process begins with open coding and, as the analysis progresses, moves towards axial coding and finally selective coding. The coding process is conducted in three levels, ultimately presenting the relationships among categories based on the paradigmatic model and forming the theoretical model based on contextual data.

Level One: Open Coding At this stage, 555 statements were identified, from which 144 concepts were extracted through combination and analysis. These concepts were then categorized into 47 core codes based on common characteristics, and finally, 17 theoretical codes were selected based on their shared objectives. This stage involves identifying the initial codes from observation and

interview data to extract environmental codes affecting children's behavior and perception.

level Two: Axial Coding Axial coding is conducted to establish relationships among the codes extracted during the open coding stage. In this stage, connections between different concepts and categories are identified, providing a more cohesive structure to the data. The initial codes were categorized into main themes based on the paradigmatic model (Figure 2).

level Three: Selective Coding At this final stage, the key concepts identified in the previous stages are thoroughly examined, and their relevance to the research is determined. The focus is on the main and key themes with the greatest importance and impact on the research. The data are organized and integrated based on key concepts to create a logical and coherent structure for the final model. In this stage, the final model is developed by integrating the main themes and examining the relationships between environmental elements and their impact on children's behavior and perception (Figure 3).

Evaluation of Data Reliability and Validity: This study utilized valid methods for assessing the reliability and validity of the data. Data reliability was assessed through test-retest reliability (with a rate of 82%) and inter-rater reliability (with a rate of 71%), indicating the consistency and accuracy of the coding process. For validating the results, methods such as data triangulation, peer and expert reviews, and member checking were employed. Additionally, continuous coding and comparison of new data with previous codes ensured the coherence of the coding process. These methods ensured that the results of the study are reliable and valid.

5. Research findings

The story of this research began with the observation of the problems and challenges that autistic children face in urban environments.

Parents and educators emphasized that inappropriate design of urban spaces can lead to behavioral problems, anxiety, and sensory reactions. At this stage, the core category of "the impact of urban spaces on the perception and behavior of autistic children" was identified, which linked all codes and categories.

Then, with a more detailed analysis of the data, it was determined that environmental factors such as dimensions and structural characteristics of space, safety and security of space, environmental stimuli, population density, diversity and variety in space, and clarity and structure of space accessibility as contextual conditions affect the experience of autistic children.

Also, the individual characteristics of the autistic child, social problems and interactions, and sensory sensitivities and experiences as causal conditions directly affect the behavior and reactions of children. Positive and negative emotions and sensory experiences and interactions play an important role in children's interactions with urban environments as mediating conditions.

Appropriate actions and interventions and social improvement and development as strategies can help improve conditions and reduce problems. Finally, problems and challenges, activities, and behaviors and reactions were identified as final outcomes that indicate the different effects of urban spaces on the behavior and sensory experience of children with autism.

To visually represent the relationships and interactions between categories and codes, a diagram or model was drawn in which the core category is at the center and all codes and categories are somehow related to it. This diagram shows how contextual, causal, mediating conditions and strategies are related to the core category and how final outcomes are derived from these connections.

The diagram includes the following relationships (Figure 2):

- Contextual conditions → Impact on the perception and behavior of autistic children
- Causal conditions → Direct impact on the behavior and reactions of autistic children
- Mediating conditions → Impact on the sensory and emotional interactions of autistic children
- Strategies → Social improvement and development actions
- Consequences → Final results of conditions and strategies

Figure 3 helps to visually understand the complex relationships between different factors and arrive at a comprehensive and coherent theory that shows the different effects of urban third spaces on the perception and behavior of children with autism.

The research findings show that urban third spaces have significant effects on the perception and behavior of children with autism. The results obtained from observational analyses and interviews indicate that environmental, perceptual, and social factors directly affect the behavior of these children in urban spaces.

In terms of the environment, factors such as the structural clarity of spaces, the presence of understandable visual cues, and the reduction of unnecessary sensory stimuli such as light and sound help improve interactions and reduce children's stress. These children show better social interactions in spaces that are well organized and environmental stimuli are controlled to a desirable extent.

In the perceptual dimension, autistic children focus more on the details of the environment rather than the overall perception of spaces.

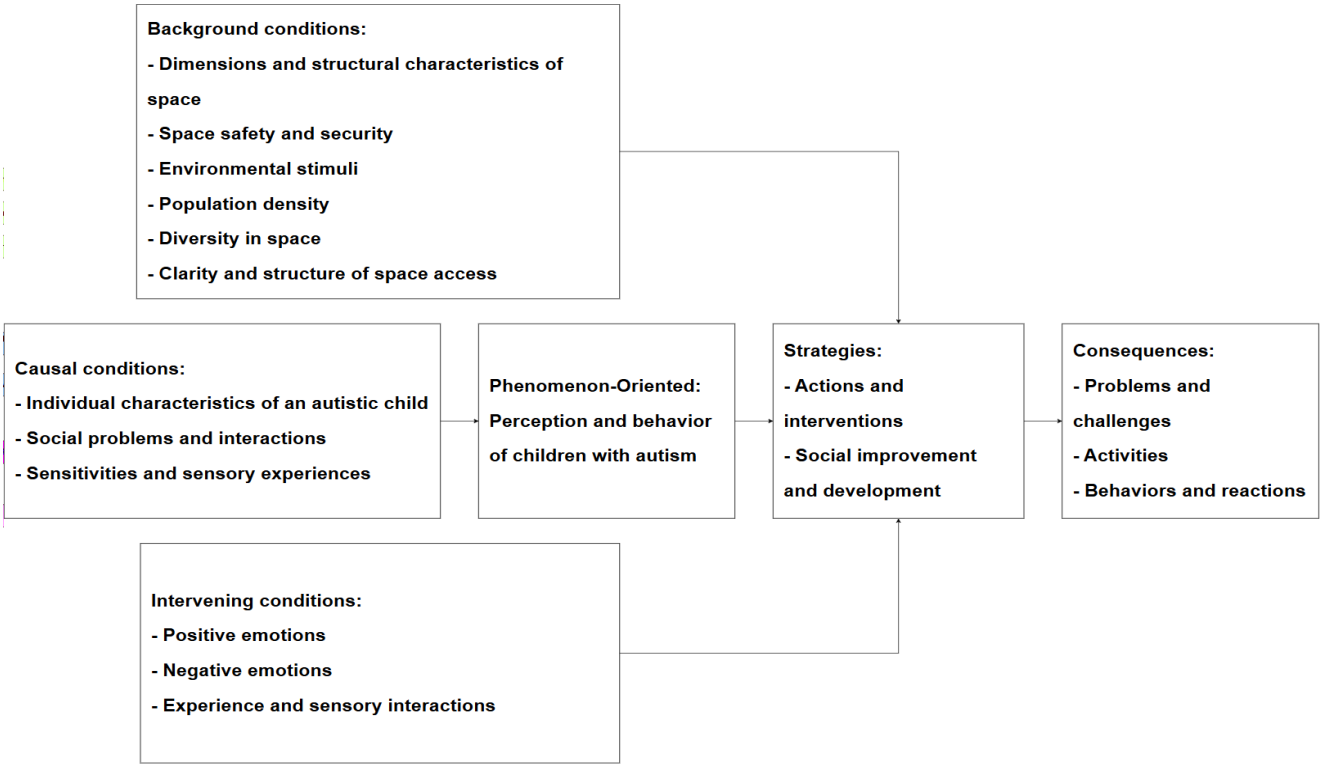

Figure 2. Research paradigm model [15]

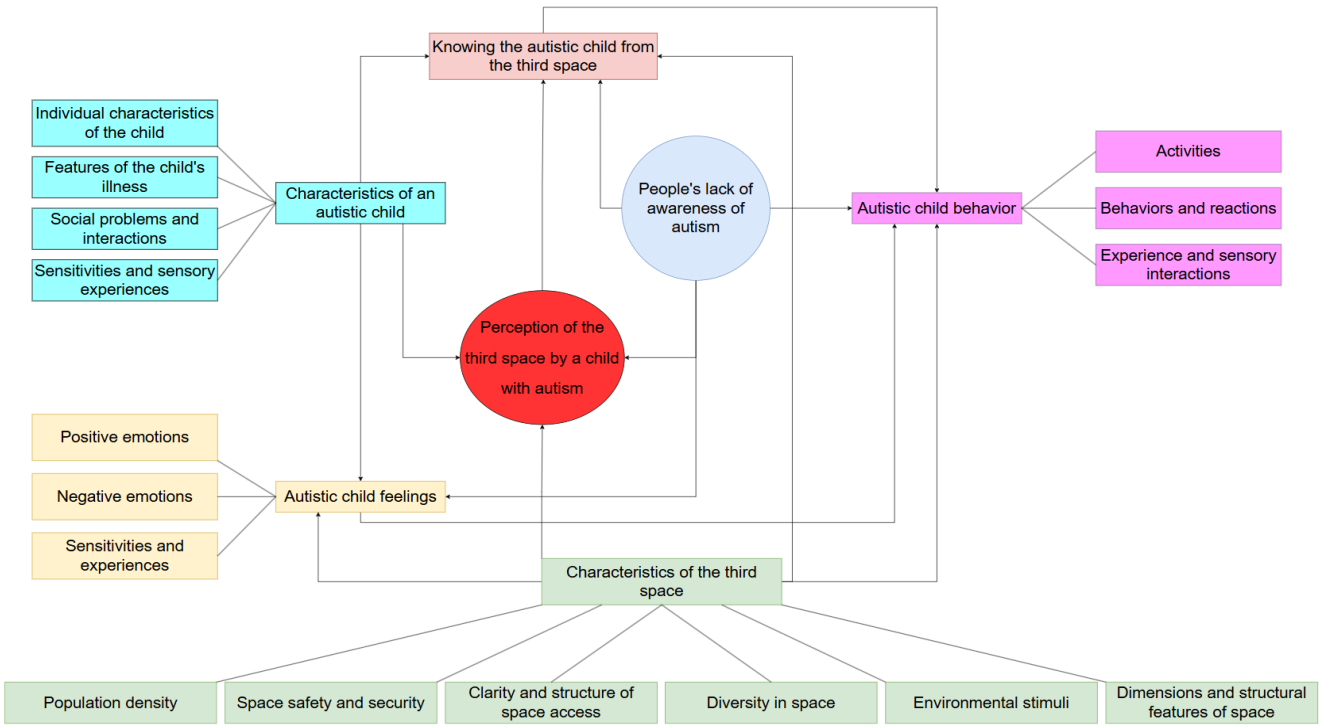

Figure 3. Model of the impact of third spaces on the perception and behavior of children with autism [15]

This inability to understand the gestalt or the totality of the environment makes some situations confusing and unfamiliar to them, which in turn leads to greater social isolation and anxiety. From a social perspective, children's interactions in public spaces with fewer people and parental support have been more positive and dynamic. Families have played an important role in reducing social tensions in these children, and providing private and safe spaces has helped to strengthen their sense of security.

Overall, this study shows that designing urban third spaces by considering the special perceptual and sensory needs of autistic children can have positive effects on their experience of the environment and their social interactions.

6. Research conclusion

This model focuses on the perception and behavior of autistic children in urban third spaces. The relationships in the model are described below:

The impact of the characteristics of the autistic child as a perceiver and the characteristics of third spaces as the space in which perception takes place play a key role in the perception process. Due to the specific characteristics of these children, such as sensory sensitivities and communication problems, urban environments must be designed in a way that is compatible with their needs and limitations. The feeling of an autistic child towards the environment has a great impact on his perception and behavior. If the urban space does not create a sense of security and comfort for these children, they are likely to be unable to communicate with the environment properly. The child's perception of the urban third space is also of particular importance. The correct perception of the environment allows the child to properly use the available facilities and spaces and interact effectively with the environment.

The child's recognition of the third space means the correct understanding and perception of the space and how to use it. This recognition can be improved through experience and education, but in situations where society does not have a proper understanding of autism, the correct recognition of the environment is challenged for these children.

The child's behavior in the third space is the final result of these perceptual processes. In this study, due to the specific characteristics of children with autism and also the lack of public awareness of autism in third spaces, the behavior of these children is affected. The lack of proper understanding by society of the needs of these children may lead to misunderstandings and inappropriate behaviors that can disrupt these children's experience of urban space.

This model shows that the perception, feeling, cognition, and behavior of children with autism in third spaces are strongly influenced by the individual characteristics of these children and the characteristics of the space in which they are placed.

In addition, the lack of public awareness and understanding of autism can negatively affect the interaction and behavior of these children in urban environments, which requires more attention in the design and management of these spaces.

To answer the research question, it is necessary to address how environmental content in urban third spaces can affect the perception and behavior of children with autism. These effects occur due to the specific characteristics of children with autism and the way they interact with their surrounding environment. Urban third spaces, influenced by the content of the environment, affect the perception and behavior of children with autism.

1. Sensory and environmental stimuli:

- Light, sound, and texture: Urban third spaces are full of different sensory stimuli, such as artificial lights, environmental sounds, and different surface textures. Children with autism often have different sensory sensitivities and may react to these stimuli in unusual ways. For example, bright lights or loud noises can cause sensory overstimulation and cause anxiety or discomfort in these children. Conversely, calmer environments with gentle sensory stimuli can help create a sense of security and comfort in these children.

2. Spatial structure and environmental design:

- Dimensions and proportions: Spatial design, such as the size and dimensions of spaces, can have a great impact on the perception of children with autism. Very large and open spaces may create a feeling of loss or fear in these children, while more confined and appropriately scaled spaces can help create a sense of security and control.
- Permeability and continuity: Well-designed urban spaces with clear and understandable paths help children navigate their environment better and avoid confusion. On the other hand, complex and unpredictable environments can increase anxiety and stress.

3. Physical elements and environmental materials:

- Use of appropriate materials and colors: Choosing appropriate materials and colors in urban environments can help positively influence the behavior and perception of children with autism.

Soft and soothing colors and the use of materials with simple and predictable textures can help reduce sensory stimulation and create a comfortable and welcoming environment.

4. Social interactions and activities:

- Social activities and play: Urban third spaces are often places for gathering and social interaction. For children with autism, these interactions can be challenging. Spaces that provide diverse opportunities for selective and controlled activities can help improve social skills and reduce social anxiety in these children.
- Diversity and multifunctionality of space: Spaces that allow for diverse activities can better meet the diverse needs of children with autism. These spaces can help reduce monotony and create motivation to participate in environmental activities.

5. Social presence and supervision:

- Safety and security: A sense of security is an important element in urban spaces for children with autism. Well-supervised and safety-appropriate environments can help reduce anxiety and increase the desire of these children to interact with the urban environment.

6. Individual and perceptual characteristics of children:
- Sensory sensitivities and individual experiences: Each child with autism has their own unique sensory experiences and sensitivities.

The general conclusion of the research is as follows:

1. Environmental Impacts on Perception and Behavior of Children with Autism

Third spaces in urban areas, which include informal public and semi-public spaces such as parks, cafes, and social centers, significantly impact the perception and behavior of children with autism.

The results showed that these spaces can affect the feelings and behaviors of these children in various ways. Major impacts include:

- Sensory Environments: Children with autism are highly sensitive to sensory stimuli. Well-designed third spaces can help reduce stress and anxiety in these children. Such designs may include reducing noise, using appropriate lighting, and creating quiet spaces free from crowding.
- Social Spaces: These spaces provide opportunities for social interactions and the enhancement of communication skills. Designing environments that allow positive and pressure-free interactions for children with autism can help improve their social skills.

2. Perceptual and Experiential Differences in Children with Autism

Children with autism experience third spaces differently than other individuals due to specific differences in sensory and social processing.

These differences include heightened sensory sensitivity, the need for structure and predictability, and communication challenges that affect how these children interact with urban environments. The research findings showed that:

- Feeling of Security and Comfort: Designing spaces that address the sensory and social needs of these children can help create a sense of security and comfort.
- Different Experiences: The experiences of children with autism in third spaces are different from those of other people. These differences arise from their unique perceptual and social characteristics, which should be considered in space design.

3. Importance of Proper Urban Space Design

The research emphasizes that designing third spaces with the specific needs of children with autism in mind is crucial.

Properly designed environments can improve the quality of life for these children, and this includes:

- Appropriate Sensory Spaces: Designing spaces with balanced sensory stimuli, using natural light, and incorporating soft colors.
- Social and Positive Interaction Spaces: Creating spaces that facilitate positive interactions and social opportunities.

4. Practical Recommendations for Improving Urban Spaces

Based on the findings, practical recommendations for enhancing the design of third urban spaces are as follows:

- Designing Calm and Safe Spaces: Reducing sensory stimuli, using appropriate lighting, and designing open, uncrowded spaces.
- Providing Opportunities for Social Interaction: Designing environments that support social skills development and positive interactions.

These differences may mean that urban spaces need to be designed to meet these specific needs. Environments that respect these differences and provide a variety of opportunities to meet diverse needs can help improve the perception and behavior of these children. Urban third spaces can profoundly influence the perception and behavior of children with autism through sensory stimuli, spatial structure, physical elements, social interactions, and environmental features. Appropriate design of these spaces, taking into account the sensory, perceptual, and social needs of these children, can help improve their experience of urban environments and create a safe, predictable, and supportive environment. The present study concludes that urban third spaces, if properly designed, can play a key role in improving the perception and behavior of children with autism. The findings show that designing urban spaces by focusing on reducing excess sensory stimuli, better organizing spaces, and creating safe and calm environments helps these children have more positive experiences of the environment and establish more successful social interactions. This research emphasizes the importance of understanding the perceptual and sensory differences of autistic children and states that paying attention to these needs can help reduce their anxiety and stress. Also, designing spaces that facilitate social interaction and make these children feel safe and comfortable can lead to improved behaviors and strengthen their abilities to communicate with others. Finally, this research recommends that urban designers, architects, and planners consider the specific needs of autistic children in the process of designing and planning urban spaces in order to provide more inclusive and accessible cities for all people, especially people with autism.

7. Final recommendations

Based on the findings of this study, the following recommendations are made for designing third places in urban areas:

- Creating calm and low-stimulus spaces: Reducing loud noises and intense lighting, and using appropriate textures to minimize unpleasant sensory stimuli.
- Using soft lighting: Creating uniform and gentle lighting to prevent uncomfortable light stimuli.
- Designing structured and predictable spaces: Creating spaces with clear and predictable structures to reduce anxiety and foster a sense of security.
- Providing diverse environments: Creating spaces with various activities and areas to encourage positive sensory stimulation and provide new experiences.
- Increasing awareness about autism: Providing accurate information and raising awareness about the characteristics and needs of individuals with autism can help create suitable and inclusive urban environments for them.
- Acceptance and support: Supporting the design and development of urban spaces tailored to the needs of individuals with autism can improve their experience and prevent social isolation.
- Promoting understanding and solidarity: Encouraging cooperation and understanding among those involved in the design and implementation of urban spaces can significantly enhance the experience of individuals with autism.

This research shows that designing third space in urban areas with the needs and characteristics of children with autism in mind can improve their quality of life and their experience of urban spaces.

These findings can serve as a guide for urban designers, educators, parents, and researchers in the field of autism and environmental design. With these considerations, it is hopeful that through collaboration among all members of society, third places in urban areas can become better and more welcoming for everyone.

8. Limitations and suggestions for future research

This research focuses on the city of Kerman, and its findings may be influenced by the cultural, social, and environmental characteristics of the city. However, the general principles of the proposed model, which include environmental, perceptual, social, and physical components, are adaptable to other regions. The theoretical framework of the research is based on international studies and inclusive design principles for children with autism, making the findings applicable beyond the geographical boundaries of Kerman. The proposed model, considering key characteristics of third spaces in urban areas, such as physical, functional, social, and sensory-perceptual elements, can be adapted to various cultural and climatic conditions. For instance, concepts like reducing sensory stimuli, structural clarity of spaces, and using environmental cues for wayfinding for children with autism are applicable in other cities as well. The recommendations of the research, such as designing low-stress and interaction-oriented spaces, can be implemented with slight adjustments to meet local needs in other regions. To increase the generalizability of the model, conducting comparative studies in different cities can help refine the proposed model and make it a useful tool for urban designers to create spaces that meet the needs of children with autism and other sensitive groups.

Authors Contribution
All authors contributed to the study conception and design. Sajede Mehrabi handled data collection, field observations, interviews, analysis, interpretation, and manuscript preparation;Afsoon Mahdavi guided urban planning, spatial analysis, and manuscript revision; Mahin Eslami Shahrbabaki validated autism-related interpretations and reviewed behavioral findings; Mahshid Tajrobehkar supported psychological consultation, instrument refinement, and analytical review. All authors approved the final manuscript.

Availability of data and materials
The datasets generated and analyzed during the current study are not publicly available due to ethical and privacy considerations related to children with autism but are available from the corresponding author upon reasonable request.

Conflict of interests
The authors declare no conflicts of interest.

References

[1] Siahoui HR, Fathali HM. Educational spaces for autistic children from the perspective of environmental psychology. In: Second National Conference on Architecture, Renovation, Urban Planning and Sustainable Environment; 2014; Hamedan. Available from: https://civilica.com/doc/304844

[2] Bader O, Fuchs T. Gestalt perception and the experience of the social space in autism: a case study. Psychopathology. 2022;55(3–4):211–8. doi:10.1159/000524562

[3] Eilam E, Garrard GE. Perception of space among children studying their local grasslands: examining attitudes and behavioural intentions. Sustainability. 2017;9(9):1660. doi:10.3390/su9091660

[4] Farash Khiabani M, Shahabian P. Let's learn from cafes: cafes as other spaces. Q J Urban Stud. 2019;8(30):109–21. doi:10.34785/J011.2019.407

[5] Goli R. Designing the urban space of Shahid Beheshti Street with an emphasis on behavioral patterns [master's thesis]. Tehran: Islamic Azad University, Science and Research Branch; 2015.

[6] Hakim INA, Mohamad UH, Ahmad A. A framework for designing an augmented reality application focusing on object function for children with autism. J Inf Syst Technol Manag. 2021;6(22):158–70. doi:10.35631/jistm.622013

[7] Harvey D. Social justice and the city. Athens (GA): University of Georgia Press; 1973.

[8] Hatami M. Application of environmental psychology in architecture and urban design with emphasis on principles and criteria for designing residential complexes. J Urban Manag. 2016;15(42):153–78. Available from: https://www.magiran.com/p1520422

[9] Hyman SL, Levy SE, Myers SM; Council on Children With Disabilities, Section on Developmental and Behavioral Pediatrics. Identification, evaluation, and management of children with autism spectrum disorder. Pediatrics. 2020;145(1):e20193447. doi:10.1542/peds.2019-3447

[10] Ebrahili F. Design methods and suggestions for autistic-friendly spaces. Knowledge Int J. 2021;48(4):715–21. Available from: https://ikm.mk/ojs/index.php/kij/article/view/4897

[11] Khezri SS, Salehian MH, Peyghan RH. The effect of eight weeks of Braitonic training on skill behaviors of autistic children. Rev Investig Univ Quindío. 2023;35(1):404–14. doi:10.33975/riuq.vol35n1.1194

[12] Kodak T, Bergmann S. Autism spectrum disorder: characteristics, associated behaviors, and early intervention. Pediatr Clin North Am. 2020;67(3):525–35. doi:10.1016/j.pcl.2020.02.007

[13] Lefebvre H. The production of space. Nicholson-Smith D, translator. Oxford: Blackwell Publishers; 1991. (Original work published 1974).

[14] McGowan E. What is a Third Place (And Why You Should Have One). The Good Trade. 2024 Sep 26. Available from: https://www.thegoodtrade.com/features/third-place-community-spaces

[15] Mehrabi S, Mahdavi A, Eslami Shahrbabaki M, Tajrobekar M. Behavior in urban spaces: a systematic review with qualitative research methods. J Geogr Sci. 2023;19(45):129–47.

[16] Oldenburg R. The great good place revisited: coffee shops, community centers, general stores, bars, hangouts, and how they get you through the day. New York: Da Capo Press; 2000.

[17] Qamar NH, Liaqat NH. Parents' observation on their child's behavior diagnosed with autism spectrum disorder: a qualitative exploration. PJPPRP. 2020;11(1). doi:10.62663/pjpprp.v11i1.57

[18] Reeves H. Human perception and the built environment: a proposed autism life learning centre for Durban [dissertation]. Durban: University of KwaZulu-Natal; 2012. Available from: https://hdl.handle.net/10413/9896

[19] Shan J, Mei H. A theoretical and practical review on multi-sensory interactive space design for autistic children. In: Yang L, editor. ICEBT. New York: ACM; 2020. p. 61–5. ISBN: 978-1-4503-8778-1

[20] Soja EW. Thirdspace: journeys to Los Angeles and other real-and-imagined places. Oxford: Blackwell Publishers; 1996.

[21] Tarçın Turgay Z, Tunçok Sarıberberoğlu M. The role of the senses in children's perception of space. ICONARP Int J Archit Plan. 2022;10(1):70–96. doi:10.15320/ICONARP.2022.194

[22] Vanolo A. Autistic cities: critical urbanism and the politics of neurodiversity City. 2023;27(1–2):190–208. doi:10.1080/13604813.2023.2178273

[23] Von Hofsten C, Rosander K. Perception–action in children with ASD. Front Integr Neurosci. 2012;6:115. doi:10.3389/fnint.2012.00115

[24] Wu S, Wang P, Yao L. Study on the influence of urban built environment factors on the social behavior of ASD children. J Environ Public Health. 2022;2022:8963416. doi:10.1155/2022/8963416

[25] Zakaros. Defining the third space. Third Space Network. 2023 Dec 6. Available from: https://thirdspacenetwork.com/about/defining-the-third-space/

[26] Arabani MH, Bavar C. Strengthening the focus of autistic children with an environmental psychology approach. Creative City Design. 2018;1(2):15–19. Available from: https://oiccpress.com/crcd/article/view/7596

[27] Arbab N, Saedi Monfared S. An investigation of the effect of environmental security component on the mental health of citizens in urban spaces: a case study of Janbaz Square in Mashhad. Creative City Design. 2019;2(2):33–45. Available from: https://oiccpress.com/crcd/article/view/7616