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ARCHITECTURE FOR AUTISM: THERAPEUTIC AND EDUCATIONAL CENTRE FOR CHILDREN IN ZAMOŚĆ, POLAND

This article addresses the issue of therapeutic and educational centres for children with autism. Autism, which affects perception and behaviour, requires specialised care, of which the built environment is crucial. This article presents the concept of a centre that meets the individual needs of children with autism, promoting a safe and welcoming environment for their development. Particular emphasis is placed on spatial aspects that facilitate social interaction and tranquillity. The paper is based on research in the literature and analysis of the collected information, offering new insights into the design of educational spaces for children with autism.

Keywords: autism, architecture for autism, therapeutic architecture, Poland

1. Introduction

Autism, as a neurological disorder, affects an increasing number of children worldwide. Research on therapeutic-education centres for children with autism has important implications not only for the development of architecture and urban planning, but also for improving the quality of life for these children and their families, as well as for addressing the important social problem of the scarcity of facilities with this function. The design of therapeutic and educational centres for children with autism requires a holistic approach. It is not only a question of building but, above all, of creating a space that meets the specific sensory and educational needs of these children.

Autism, a term derived from the Greek word 'autos' meaning 'alone', was first used in psychiatry by Eugene Bleuler in 1911 [7]. It originally described a symptom of schizophrenia, characterised by a disconnection from reality, abandonment of logic in thought and mental withdrawal.

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Autism is a developmental disorder that affects children's perception, social interaction, communication and behaviour. Individuals with autism may have difficulties making social connections, recognising the emotions of others, using language in a socially acceptable way and processing sensory information. Typically, a diagnosis of autism is made in the preschool or early school years. Therefore, it is important to provide specialised medical and educational care to children with autism, allowing them to develop with dignity and be educated in a spatial environment adapted to their specific needs.

Recently, there has been a growing interest in designing spaces that take into account the needs of people with autism, as reflected in a number of research publications in this area [4]. This trend is due to a growing awareness of the special requirements of people with a variety of disabilities and the increase in autism diagnoses in developed countries [5]. In this perspective, creating an indoor environment that is comfortable and conducive to a good quality of life for people with autism becomes crucial.

Architecture, adapted to the requirements of people with autism, has an important role in enhancing their quality of life, comfort, and effectiveness of therapy. By creating spaces that support social integration, skill development and sensory balance, architecture can make a significant contribution to improving the living conditions of people with autism. Therapeutic and educational centres for children with autism are becoming an increasingly important investment in view of the increasing incidence of autism. Adequate therapy and education are crucial to ensure decent living conditions [8].

The article synthesises architectural, therapeutic and didactic issues. Designing a therapeutic centre for children with autism has a real impact on improving their quality of life and supports their development. Additionally, the project aims to raise awareness of autism, which is an emotionally important aspect of the work and can provide great professional satisfaction.

The aim of this study is to conceptualise a centre that fully meets the needs of children with autism spectrum disorders and their families. Another important aspect of the research is to take into account the specific needs of children with autism who require an individual approach. Architectural solutions are sought that enable children to develop their skills, discover their potential and acquire knowledge in a safe, friendly environment. Special attention is paid to spatial aspects that facilitate social interaction, relaxation and tranquillity.

The designed centre should meet the highest safety standards, guaranteeing optimal conditions for the development and mental health of children. The research process involves a multistage methodology, including an analysis of the literature on the spatial needs of children with autism, a critical analysis of the information gathered, and a proposal for an architectural concept for the centre. The article is based on Wiktoria Małek's master's thesis conducted under the supervision of Anna Martyka at the Faculty of Civil and Environmental Engineering and Architecture, Rzeszów University of Technology.

2. General characteristics of autism and therapy methods

Autism, also referred to as autism spectrum condition (ASC), is a complex neurological condition characterised by varying degrees of difficulty in social communication, interpersonal interactions, limited interests and behaviour. Its complexity and variety of symptoms and their intensity in different individuals result in autism being defined as a 'spectrum'. Children and adults with autism experience challenges with social communication and interpersonal interactions on a daily basis. These difficulties include maintaining eye contact, understanding speech and non-verbal cues, and understanding and using language in a social context. In addition, people with autism can encounter difficulties in recognising the emotions of others, which exacerbates their communication challenges. Intense but often limited interests are also characteristic of autism. These specific passions can be a source of inspiration, but their narrow scope means that autistic people often focus on very specific areas. Repetitive behaviours, such as fluttering or twisting objects, are a common symptom of autism, acting as a function of sensory self-regulation [1].

Sensory sensitivity is a key component of autism, and different individuals respond to sensory stimuli in unique ways. Some individuals are hypersensitive, while others are insensitive to stimuli such as light, sound, or touch, which affect their daily functioning. People on the autism spectrum often have difficulties in establishing and maintaining social relationships, which can lead to withdrawal or avoidance of social contact. In light of these challenges, it is critical to create an environment that is inclusive and supportive, tailored to the diverse needs and abilities of people with autism.

Autism, defined as an autism spectrum disorder, is a complex neurological condition whose causes are partially unknown. Currently, there is no complete cure for autism, but several therapeutic approaches are available to alleviate its symptoms and support the development of people with the disorder. These offer support in a variety of areas, including social communication, life skills and sensory skills. Therapeutic methods for people with autism include [3, 6]:

- Behavioural therapy: Applied Behaviour Analysis (ABA) – a science-based method to modify a child's behaviour to develop skills and eliminate problems; Treatment and Education of Autistic and Communication Handicapped Children (TEACCH) – an educational programme developed by Schopler, based on the values of teaching, expansion, appreciation, cooperation and holism.
- Speech and communication therapy: focused on developing verbal communication skills.
- Sensory therapy: focusses on the regulation of sensory experiences.
- Occupational therapy: helps develop life and social skills.
- Movement therapy: promotes motor development and coordination.
- Play and social interaction therapy: supports the development of social skills.
- Cognitive behavioural therapy: focusses on cognitive skills such as problem solving.

- Field and environmental therapy: teaches children how to cope with everyday life.
- Family therapy: supports families to understand and cope with the challenges of autism.

In addition, complementary therapies such as art therapy, music therapy or animal-based therapies are available and can be used to complement the primary forms of therapy.

3. Requirements for adapting facilities to meet the needs of children with autism spectrum condition (ASC).

Adapting facilities and spaces to meet the needs of children with autism is key to providing a suitable environment for their learning, development and comfort. The space should support the development of children with autism, allowing them to reach their full potential in a safe environment. The following describes the most important recommendations for the design of therapeutic and educational centres for children with autism, taking into account their specific needs [2]:

- Therapy rooms: should be of adequate size (minimum 3 metres wide) for free movement of therapists and children.
- Occupational therapy rooms: require activity space (minimum dimensions 4 m × 6 m) and the sensory room should be at least 20 m². Their equipment includes light control, sound control and sensory equipment.
- Adaptive spaces: designed for therapy in smaller groups, spaces must be at least 2.5 m × 3.5 m.
- Relaxation zones: equipped with comfortable and safe furniture, such as sensory mattresses measuring 1.5 m × 2 m.
- Toilets: adapted to the needs of children with autism, with sufficient space for the caregiver and appropriate facilities.
- Safety of use: sharp edges and potentially dangerous architectural features must be protected.
- Appropriate dimensions for doors and corridors: doors leading to rooms that children can use should be at least 90 cm wide, corridors at least 150 cm wide.
- Signage and identification of the space: clear signage, in large letters and marked with appropriate pictograms to facilitate orientation.
- Interior furnishings adapted to the needs of the children: height-adjustable furniture, sensory mattresses, communication boards, sensory equipment, toys, computers with therapeutic software, therapeutic equipment (e.g. swings, sensory mirrors), art materials, educational games and sports equipment. An essential element is a quiet corner where children can relax.

As can be seen from the above guidelines, it is important to pay attention to a number of aspects in order to create a welcoming and functional space. It is important to use an appropriate division of the space, taking into account

transition zones and promoting routines. The use of pictograms can facilitate orientation in the space. In addition, the provision of appropriate furniture, materials and equipment is key. Assistive technology, such as sensors that record body and environmental parameters or systems that detect dangerous situations, also plays an important role. The organisation of the space should be well thought out, with an emphasis on calm, orderly and uncrowded rooms, which facilitates mobility. Differentiating the space, by using different heights and colours, is also important, as is avoiding a large number of windows and doors. Consider the placement of sensory stimulating areas, such as the bathroom and kitchen. Ensure adequate safety, including additional navigation solutions during evacuation from the building, is essential. Biophilia, i.e. the use of natural materials and connecting with nature, together with the integration of sensory elements in the design, are important aspects of space design

In addition to architectural aspects, it is important to provide facilities for optimal temperature control and ventilation. Abrupt temperature changes should be avoided and the best thermal comfort should be ensured through the use of appropriate finishing materials that take into account tactile sensitivity. Underfloor heating and proper hot water control help avoid direct access to heat sources and hyposensitivity problems such as pain sensitivity. Temperature control should be adapted to individual sensitivity and subjective needs, e.g. a cooler environment for hyperactive people.

In visual design, it is crucial to control the lighting and exposure to the sun to avoid excessive visual stimulation. It is important to adjust outdoor views and lighting appropriately to suit individual sensitivities. Rapid changes in lighting should be avoided, and natural light should be used, supporting natural diurnal rhythms. It is necessary to pay attention to the brightness and intensity of the light, with adaptability to accommodate people with different sensitivities. Using diffusers, indirect lighting, adjustable curtains and avoiding bright surfaces and fluorescent lighting is recommended. Full-spectrum light sources and coloured filters are preferred, as well as providing daylight without distraction. It is important to increase lighting in work areas and avoid shadow patterns. Use colours and textures appropriate for people with different visual sensitivities, preferring soft, low-arousal colours and avoiding complex patterns. Assistive technology can be used to control sunlight, artificial light and other environmental parameters.

In terms of acoustics, attention to sound and noise, whether too quiet or too loud, is important, taking into account the subjectivity of perception. Background noise, echo and reverberation should be avoided as a source of distraction. The use of doors, appropriate space partitioning and acoustic insulation (e.g. sound-absorbing materials, curtains, multipaned windows, acoustic glass) is key to reducing noise from inside, outside, and neighbouring rooms. The use of sound-absorbing and sound-dampening materials, such as acoustic panels or carpets, is recommended. Unexpected noises should be avoided and efforts

should be made to make them tolerable. The recommended noise threshold is 50 dB and the reverberation time should be 0.4-0.7 seconds. The sound should be maintained in the frequency range 150-4000 Hz.

People who are hypersensitive to sound should be on the upper floors of workplaces and people with hearing impairment on the lower floors, with the floors acting as a sound buffer. Sound amplification systems, personal active noise reduction devices or active sound amplification devices can also be used, as well as room amplification systems [8].

4. Architectural concept of a therapeutic and educational centre for children with autism

The aim of this project was to create a centre that responds to the needs of children with autism and their families. A lack of understanding of autism often leads to inadequate therapeutic approaches. The selection of a suitable plot of land is a key element in the design process, and the context of the surroundings significantly affects the functionality of the facility. It is important that the location is well connected and user-friendly, in this case for children with special needs. Proximity to facilities such as schools, kindergartens and medical facilities is an additional advantage. A location in Zamość was decided upon. This city was chosen for its cultural and historical significance, including its UNESCO-listed Renaissance market square, which is renowned both in Poland and internationally. The plot on which the project is located is at the intersection of Piłsudskiego and Kamienna Streets, adjacent to the Museum of the 3rd Legion Infantry Division. The Higher School of Humanities and Economics is also located nearby.

The project site is located in an area of varied elevation, with the highest point 214 m above sea level and the lowest at 210 m above sea level. There are minor slopes in the vicinity of the existing building. In general, the area is relatively flat and slight differences in elevation, particularly in the area of Stone Street, do not pose an obstacle to the project. The development in the study area is quite dense, particularly in the eastern part of the area. In the eastern area, development is less dense and chaotic. In this area, there are buildings ranging in size from smaller single-family houses, located mainly to the west of the selected plot, to large buildings with cultural or multifamily residential functions. There is a main road, cycle paths and bus stops in the vicinity of the plot, providing efficient access to the proposed development.

The designed centre, consisting of four facilities, is intended to be welcoming to children and young people with various forms of autism, from the withdrawn to the more active. The circulation routes on the site have been designed as low, wooden paths that facilitate access to each facility. These paths are adapted to the needs of people with disabilities and are intended to facilitate the orientation of children with autism (Fig. 1).

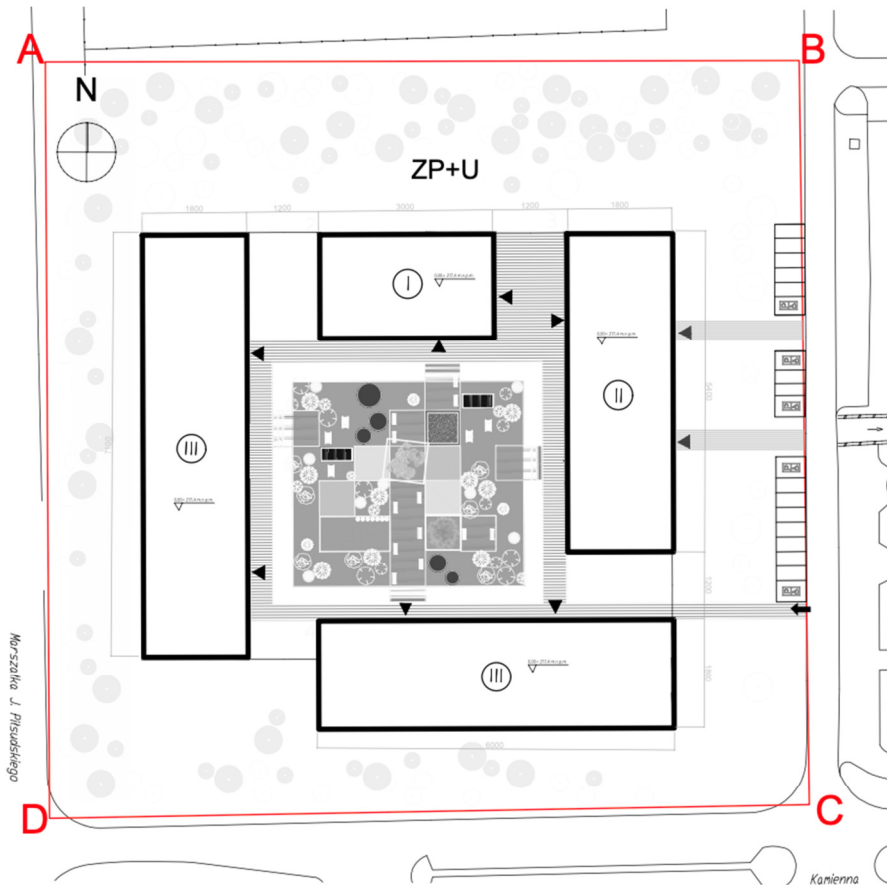


Fig. 1. Concept of plot development. Prepared by W. Małek

The main consideration was to create a place that provides peace, relaxation and developmental opportunities for young people on the autism spectrum. It was crucial to design buildings that not only accommodate the needs of people with mobility limitations, but also meet the requirements for safe functioning for people with autism. Dividing the centre into four smaller volumes was intended to accommodate the diverse behavioural needs of the children. Each building was designed to meet a different need, but always with the autistic child in mind. The centre is intended to provide freedom and foster development by offering spaces of a different nature. Another important element of the project is the creation of an attractive sensory garden to serve not only educational and therapeutic purposes, but also as a landmark and recognition point for visitors to the centre. Sensory gardens are particularly important for children with autism, as they help them with spatial orientation, while also offering opportunities for healthy development and contact with nature, which has a positive impact on their wellbeing.

The therapeutic and educational centre designed is characterised by its division into four separate but stylistically coherent buildings, each with a different function. They are built on 6 x 6 metre modules, allowing them to complement each other harmoniously. Each building, despite its different functions, focusses on therapy and education. They differ in their adaptation to meet a variety of therapeutic needs, from quiet spaces to areas that allow for freer expression of emotions. Building number 1, located on Pilsudski Street, is dedicated to group therapy for children and parents, with dormitory rooms on the top floor. Building number 2, with a glazed terrace and sensory garden, allows sensory therapies and its roof is equipped with panels to regulate sunlight. Building number 3 is a place for 'quiet' activities with individual therapy rooms, reception, secretariat and other administrative spaces. The last, building number 4, contains a canteen and workshop rooms, promoting the development of children and young people's interests. The cubic capacity of the individual facilities varies according to their function, as can be seen in the aerial drawing. Despite the differences in size, modularity has been maintained, creating a coherent and functional whole (Fig. 2).

When designing accessibility and eliminating barriers in urban spaces, we often think of people in wheelchairs or with visual and hearing impairments. However, people with autism spectrum disorders also face obstacles such as overstimulation, clutter, loud noise, and other factors that may not be visible to others. The toilets in the centre have been adapted to meet the needs of children with various disabilities, including autism. They are spacious to accommodate a child and an attendant, and the height of the washbasin, toilet seat and other sanitary facilities are adjusted to accommodate children in wheelchairs. Lighting is even and nonglare, with adjustable intensity to suit the child's preferences.

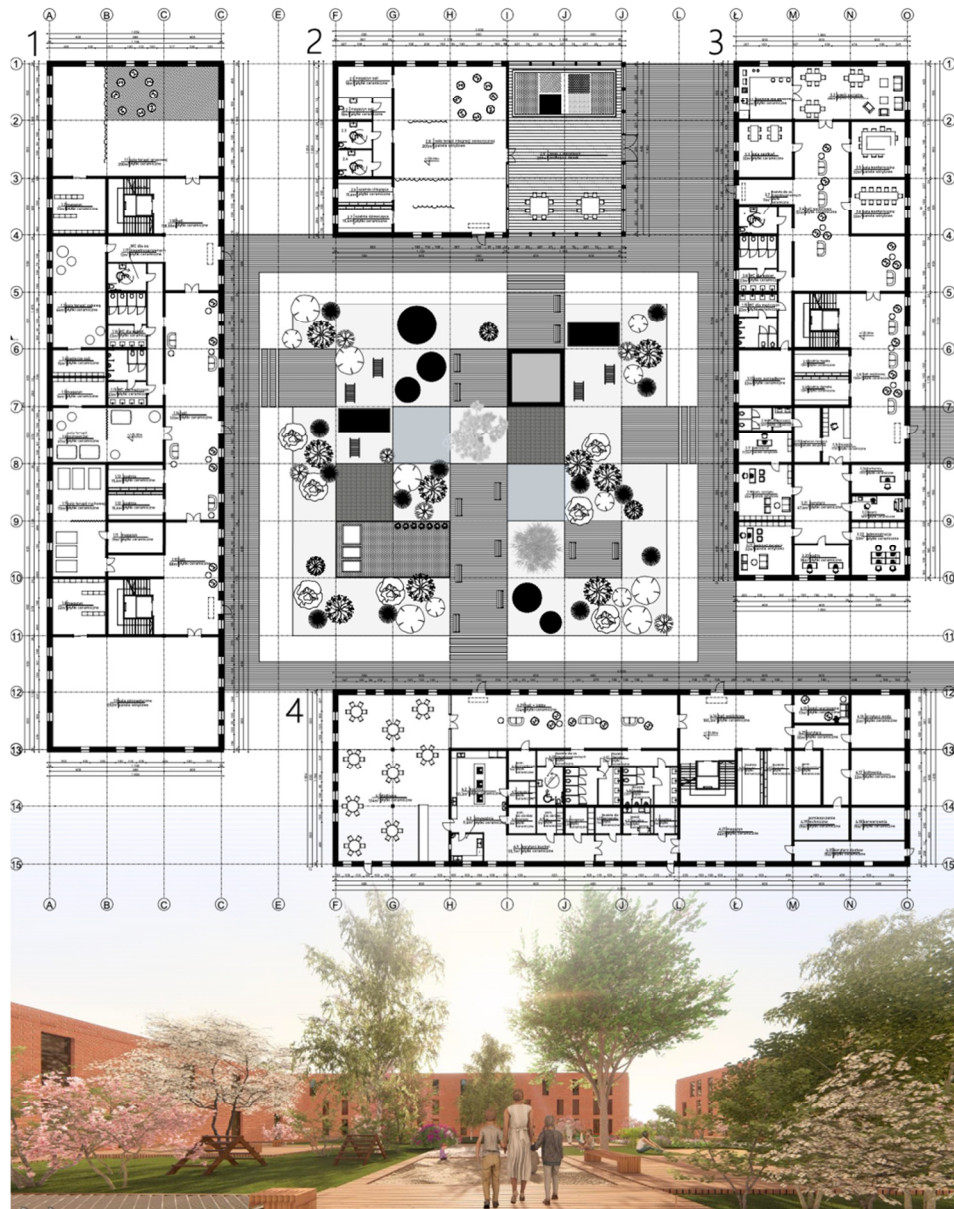


Fig. 2. Concept of a therapeutic and educational centre for children with autism. Ground floor plan and visualisation of the inner courtyard. Prepared by W. Małek

Acoustics are also important, with the use of sound-absorbing materials or noise-reducing structures. In multi-story buildings, planning a lift that meets accessibility standards is key. Lifts in the project are spacious, with adequate space for a wheelchair and caregiver, and with clear audible and visual signage to facilitate use by children with autism.

In the design, the main material used for the facades of the buildings is red brick, chosen because of the similar style of the neighbouring building. This natural material, produced from clay without artificial additives, fits into existing buildings and the harmony of the site, while responding to ecological needs. Another material used is wood, used to create the paths connecting the buildings on the plot. Adding warmth and naturalness, the wooden paths contribute to the aesthetics and comfort of the space. The wood is ecological and can be shaped into a variety of patterns, giving a unique character to the whole area.

5. Summary

Autistic people make up a significant and growing proportion of the world's population, and exposure to their indoor environment can lead to different sensory perception, as well as different adaptive abilities. However, appropriate design of indoor environments can benefit their wellbeing, health and independence.

The design of the therapeutic and educational centre for children with autism in Zamość focusses on creating a space that meets the needs of this special group of users and their families. The design takes into account the appropriate location, the proximity of important infrastructure facilities and the harmonious integration into the existing urban environment. The centre consists of four modularly designed facilities, each adapted to different forms of activity and therapy for children with different degrees of autism. They have been designed with tranquillity, relaxation and children's development in mind, using red brick and wood as the main building materials, which supports the ecological and aesthetic aspect of the project. Accessibility and barrier elimination aspects, particularly important for people with autism spectrum disorders, were also considered in the design. Toilets, lifts and other infrastructure elements have been adapted to meet the needs of people with various disabilities, including children with autism. The design uses natural materials and ensures that the centre can be navigated comfortably, providing a welcoming and functional environment for its users.

To summarise the research presented, the following general recommendations can be made to designers and the public to raise awareness of autism and to consider the needs of people with the disorder when designing spaces for them:

- Autism-as-a-spectrum – the diversity of autism symptoms requires an understanding and flexible approach to design to meet the diverse needs of people with the disorder.

- Sensory adaptation – designers should consider the sensory sensitivities of people with autism, controlling visual, auditory and tactile stimuli to avoid overstimulation or provide appropriate stimulation.
- Safety and accessibility – Spaces should be safe and accessible for people with autism, with appropriate safety features and orientation solutions.
- Promotion of social interaction – Spaces should be designed to promote communication and social interaction for people with autism, providing both group activity areas and relaxation areas, taking into account the need for privacy.
- Use of Assistive Technology – Assistive technology, such as communication and sensory applications, can significantly improve the quality of life for people with autism.
- Education and public awareness – Educational initiatives should accompany the design of spaces to raise awareness of autism and contribute to the creation of an inclusive environment.
- Participation of people with autism – involving people with autism in the design process will ensure that the resulting spaces better meet their needs.
- Flexibility of spaces – modular and flexible design solutions allow spaces to adapt to the changing needs of people with autism.
- Natural elements and materials – the use of greenery and natural materials, in line with the principles of biophilia, can have a positive impact on the wellbeing of people with autism, reducing stress and promoting relaxation.

Incorporating these recommendations into design and social practice can help to create a more welcoming environment for people with autism, while raising general awareness of the condition.

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