Quality of the Built Environment from the Point of View of People with Autism Spectrum Disorder

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Abstract. The features of the built environment that pose obstacles to people with Autism Spectrum Disorder or Asperger Syndrome have been evaluated in recent times to a certain degree, however, the awareness of these problems are still not common among architects. An effective way that could change the social awareness seems to be the dissemination of direct personal experience of contact with people that have a different perception and response to the built environment. Such contact can evoke the emotional reaction of sympathy and desire to understand their specific problems, which should entail a permanent change in the awareness of those involved. In view of the above a participatory action research experiment has been launched to enable students of architecture to investigate selected problems of the design of the environment with teenagers with ASD/AS, and, at the same time, assist them in their direct experience of space.

Keywords: Participatory action research · Asperger syndrome
Autism spectrum disorder · Built environment features · Quality of space
Users' needs

1 Context – People with ASD in Architectural Space

The Autism Spectrum Disorder (ASD) is a developmental disorder which is being diagnosed with an increasing frequency in recent years. In tandem with a growing number of cases recognized early on, one can observe an increase in social actions taken in order to raise and change the awareness of the problems that people with this developmental disorders must face in everyday life.

As shown by scientific research[1] and the experience of families and therapists involved, some features of the built environment can influence the life and work of people with ASD differently than in the case of neurotypical people. It is very important to incorporate the knowledge of these features into the architectural design practice, especially in the process of designing educational facilities, where students with ASD can encounter numerous problems resulting from various deficiencies. These difficulties pertain not only to the influence of the architectural environment on the

[1] For current state of research which constitutes basis for this text please refer to our other text "Shaping the space for persons with Autisms Spectrum Disorder" in this publication.

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students' ability to concentrate during classes but also, due to the specific developmental differences in people with ASD, to the broadly defined notion of well-being. These difficulties, e.g. due to excess sensory stimulation, may cause or worsen the anxiety, feelings of disorientation or feeling of being overwhelmed, which can also influence the quality of communication skills as well as interpersonal relationships. Knowledge of the influence of the built environment on people with ASD is improving all the time. However, its penetration into various professional groups which, just like architects, are not in touch with ASD problems on daily basis, is still not enough to bring about realistic and institutional changes that would improve the space for everyday life and social activity of people suffering from ASD.

In Poland there is no organized support system for people with ASD that would be based on legal regulations. Few educational facilities are truly ready to accept and take in children and teenagers with ASD. Support in all spheres of life (in the process of diagnosing, in therapy, in finding ways to solve everyday life problems) is only provided by non-governmental organizations. At public educational facilities, children and teenagers with ASD cannot hope that environmental conditions will be adjusted to their needs. In the scope of architectural activity, one can observe few pioneer cases of actions taken for the sake of "autism friendly" design which would include needs expressed by ASD people, for example as part of the approach called "Universal Design"[2].

At the same time, the current state of research into the features of the built environment related to the needs of people with ASD made it possible for many developed countries to introduce various organized actions, which incorporate the knowledge of the needs of people with dysfunctions such as the ASD into architectonic design. Nevertheless, despite all informational actions and efforts made by social organizations in Poland, stereotypical perception of what autism spectrum disorder stands for still persists. Moreover, there is still a lot of animosity and lack of understanding when it comes to the nature of that phenomenon.

2 Research Background

Research presented in this article was very limited but its significance can be based on the pioneering character (as per our local setting) and participatory experimental nature. The situation opened new field of research for our team and broadened our search for design solutions which in later years effected in the form of new courses and master thesis projects, publications and presentations. Above all, the results of research action introduced the needs and understanding of the significance and specificity of situations of the people with ASD into our awareness and experience. The main aim of the research was to sensitize young architects-researchers to the possibility of a different space perception by means of a direct experience which consisted in assisting teenagers with ASP in their exploration and evaluation of the architectural space[3].

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[2] Recently, the students from Gdańsk, Poland, made an interesting research on playground places for children with ASD, Herkt et al. [1].

[3] Similar experienced students have gained during participatory research workshop with elders, which were organised by our team, see Bielak-Zasadzka and Tymkiewicz [2].

The construction of the research project stemmed from the scientific interests of both the authors of the text. On the one hand, this is the pre-design research based on ideas of Universal Design (Maria Bielak-Zasadzka, PhD) and, on the other hand, this is doing and disseminating research in compliance with the idea of Participatory Action Research (Agnieszka Bugno-Janik, PhD). The common denominator for these two approaches is the social sensitivity which guides the research with people discriminated because of their disability or social inequality. It consists in investigating and trying to change their social situation. Therefore, a discriminatory spatial environment constitutes the subject matter of the actions and investigations carried out by the both authors of this article.

Participatory Action Research (PAR) main assumption is to make research which can influence positively the researched situation by empowering discriminated people in a way that help them actively influence the change of their own situation. The process of scientific investigation of the social problem is interwoven with the process of acquiring new competences by the people from the investigated community. The participants have the position of co-researchers and have their own active role in planning and conducting the research. In our case two cooperating groups – architects and people with ASD – created the participatory action research situation focused on evaluation of educational space quality in one of the University building.

3 Assumptions, Goals, Methods

In the presented research situation the intention was not to discover new significant features of a built environment affecting users with ASD. The main intention of the experiment was to create a possibility of establishing a relationship between students of architecture and a group of teenagers with autism spectrum disorder, who for the first time came into contact with an entirely new educational space within a newly modernized building which had been dubbed as a distinctive example of modern architecture. The teenagers with ASD who had been invited to take part in the project were treated – in compliance with the PAR approach - as experts in their field.

The research was carried out at the beginning of 2014 by the group of 4th year students of Architecture. Planned as participatory action, directed at the problems of people with ASD, were initiated by an alumnus of the Architectural Faculty - young architect Marta Stachurska and her mentor, dr Joanna Ławicka, the president of the PRODESTE Foundation, which acts for the improvement of the situation of people with ASD.

The goals of the research were specified in three areas:

1. scientific:
    - to compare the evaluations of basic features of the built environment of educational facility, carried out by invited teenagers with ASD with the knowledge from experiments and research carried out around the world,
    - to test usability of created research tools for architectural space evaluation, working within the PAR framework with people with ASD

2. social:
   - to strengthen competency for future influence of the changes in the built environment by people with ASD,
   - to sensitize young architects-researchers to the problems of people with ASD through direct contact with teenagers and their problems, in a specific situation in a real building.
3. educational:
   - training of the participatory methods of research on the built environment.

Organization of the research was, on the one hand, supposed to provide students/researchers with the possibility to collect information about how people with ASD assess the indicated features of a building, on the other hand, it was supposed to allow respondents/teenagers with ASD – to familiarize themselves with the architectural terminology, architects' way of thinking about the space and the methods of space evaluations. Such interaction and cooperation were aimed at changing both parties of the research process - the teenagers with ASD could acquire new skills allowing them to better communicate their observations, needs and difficulties related to the space of a building, while the students of architecture could experience, by assisting teenagers wit ASD, what it is like to have untypical needs in neurotypical space[4].

The research was conducted during carefully prepared workshop which lasted six hours. Before the workshop preparation the students were introduced into the problems of autism spectrum by Joanna Ławicka, PhD, by several-hour long lecture followed by discussion. The lecture was focused on the most important features of ASD type of mental development which may cause problems in normal life within a typical built environment and typical social situations and also treated the issues related with the specificity of the communication and social relations of people with ASD, necessary for an adequate preparation of the research tools for the workshops to come.

The role of co-researchers was given to a group of 10 teenagers aged 13–19, dr Joanna Ławicka's protégés, together with volunteers and therapists from the PRODESTE foundation who work with that group of people on a daily basis.

The group of researchers counted 20 4th-year students from the architectural faculty and authors of the text.

Typical research activities, within the PAR method, require long period of time, necessary to build a deepened relationship between the co-researchers, which enable better understanding and broadening of experience. Due to the fact that the workshops lasted only a day – (around 6 h) and due to specificity of the group of co-researchers (ASD), a solution was chosen that made it possible to establish a relationship between the participants in small teams, using tools, specially designed to facilitate communication during the execution of research tasks.

[4] Similar approach was demonstrated by Ian Scott in his experiment with design the ideal classroom with children with ASD [3].

Each team consisted of 2–3 students of architecture, 1–2 teenagers, who played the role of experts in terms of how people with ASD function within the building, and helpers from the PORDESTE Foundation.

The first part of the workshops was an introductory lecture for the teenagers co-researchers, prepared by the students. The lecture demonstrated selected features of the built environment in an easy to understand way, with definitions and explanations as to the set of characteristic features of a building subjected to research.

The set of features, which could significantly influence the wellbeing of an ASD person and, at the same time, proves difficult to change, was agreed on the basis of an analysis of the state-of-art and the situation of the building chosen for research[5]. The features chosen for research, are these which need to be taken into consideration at the building's design stage, which make it difficult to change after the building is finished. At the same time, identification of these features does not require special qualifications and is possible following a short theoretical introduction.

Research stage of the workshops was planned in form of a field game. Subsequent teams had to locate a given room, assess it (people with ASD played the role of both co-researchers and experts, responsible for the assessment, while the students of Architecture played the role of assisting researchers as they had knowledge of the building) on the basis of strict instructions (for ASD people precision as well as good task specification are of great importance) in a given time and according to a plan which differed depending on the team. The gaming aspect of the activity was introduced as entertainment and relation building mean.

The building in which the research was done constitutes an interesting example for that type of research due to the following reasons:

- it was recently modernized in an untypical way for a building of an educational facility in Poland - a potentially interesting experience for young people who had not had any contact with such designed buildings. The building was rewarded for its interesting design. Because of his specific design it constitutes a good educational tool to present numerous functional, technical and esthetic problems of the modern architecture;
- diversity of architectonic features of didactic rooms - rooms of different sizes and proportions, lighting quality, transparent walls, with finishing materials creating different interior climates (moods);
- unclear circulation with wayfinding problems (historical structure of a building which served previously as a cinema and students' club, later redeveloped into an educational facility make real maze for new users), rendering the site challenging for the teenagers invited to research organized as a field game (Fig. 1);

For the purposes of evaluation eight didactic spaces were chosen, significantly different in the scope of:

lighting, access to external view, transparency of inner and outer walls, the finishing materials (colors, texture and patterns), equipment, and the general climat/mood:

[5] The selection of features to investigate was based on dr Joanna Ławicka personal experience and knowledge and state of the research review, especially of Simon Humphreys experience [4].

Evaluated spaces:

1. large lecture hall (014) - for about 200 people, with proportions similar to a cube, without natural light, with glazing at the upper floor level along the circumference of the room, uniform artificial warm lighting, not too bright, finished in warm tones, lateral walls finished with perforated brick (for better acoustics);
2. small lecture room (015) - semi-open (border between the room and corridor difficult to define, dark with no access to natural light, with cold artificial lighting, longitudinal, high;
3. large classroom (107) – a narrow, high room with a large glazing on the outer wall, all internal walls made of glass or with internal windows, a lot of natural light (which may sometimes be blinding);
4. computer lab (110) - a small room equipped with 25 computer workstations, 3 m high, with three glazed internal walls, brick-finished walls, lack of natural light, dark, with quite dim (but warm) artificial light, tables densely arranged for individual work with screens, dark furniture and finishing;

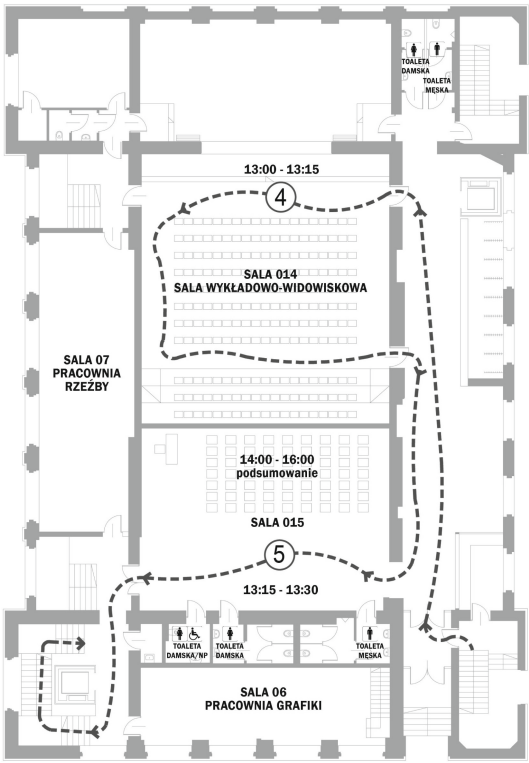

Fig. 1. First floor of evaluated University building with field game route.

5. two small classrooms (112 and 113) with identical features - small, with 4 fully glazed walls, including the internal wall, with lots of daylight, gray (neutral) finishing and furniture;
6. art classroom (202) - a longitudinal, medium-sized room, with natural lighting of high windows with limited external view;
7. small lecture room (207) - medium-sized room, with 3 glazed rooms, indirect natural light, gray equipped, lack of access to external view of the building;

Features which were subject to evaluation:

- quality of the natural and artificial lighting (intensity, regularity, glare);
- size (size, height) and proportions of the rooms (length to width, floor area to height);
- method of divisions of the room (transparency, zoning, shape of the walls)
- interior finishes
  - divisions – number, regularity, continuity
  - colors – saturation, brightness, combination
  - texture – roughness, gloss, pattern
- details – open question "which detail is mostly annoying or causing deconcentration?"
- room equipment – number, distribution
- equipment finishes – material, color, texture,
- climate – outer sounds, inner sounds, smell, temperature.

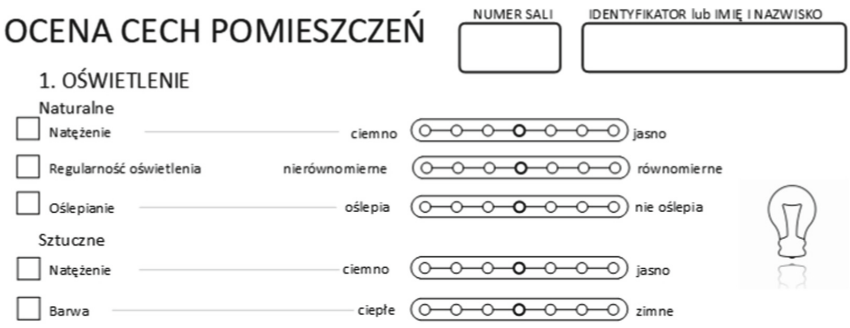

Fig. 2. Part of evaluation form with semantic differential.

The evaluations consisted of two elements:

- the basic impression, evaluated as positively, neutral or negatively (+,0,−) which influences the way in which a given feature is expressed (left column on evaluation form), and
- evaluation of the symptoms of a specific feature, expressed by means of the Semantic Differential (Fig. 2),

Research was supposed to find answers to the following questions:

1. will the texture of the exposed brick walls, either full or perforated, found at significant places of some of the rooms, be recognized as an element exceedingly stimulating (sharp, visible pattern of bricks r) which may hinder concentration or distract participants?
2. what intensity and type of lighting are preferred by the persons with ASD - bright or rather dim, natural or artificial?
3. will the large or disproportionate rooms (e.g. very long or very tall) be evaluated negatively?
4. will the internal and external glazed walls be viewed as significant sources of discomfort or distraction?
5. are bigger rooms preferred over smaller ones, or vice versa?
6. what type of color arrangements will be evaluated as better: the neutral grays of the brightly, naturally lit rooms, or warm, natural materials colors of artificially lit rooms?
7. which combinations of the features listed above will be perceived as positive?

4 Results

The research delivered several sets of information:

1. results of the assessments, written in the assessment forms,
2. remarks concerning the rooms from the conversations held during workshops,
3. general assessment, approved during the final discussion held among the participating teenagers with ASD and students of architecture,

The analysis of the results showed a high degree of convergence resemblance conformity in the assessments, in several matters:

Size and Proportion. The large lecture hall (014) was evaluated unanimously as the best. Critical remarks were directed at elements which had been damaged; at the large lighting fixtures, narrow aisles and uniform lighting. Cubic proportions of the room were perceived as good and the climate of interior was also evaluated highly. Its size did not make a negative impression on the majority of the evaluators (we supposed that its height might seem overwhelming). Perhaps, this could be connected with larger proxemic needs of people suffering from ASD, as noted by Humphreys [4].

Patterns as Source of Distraction. In positively assessed large lecture hall, the most characteristic features include walls with a visible pattern of perforated. When planning research we focused on the fact that that very pattern could cause irritation as well as distraction. We were curious to see in which rooms it would be negatively perceived. In that room the finishing was jointly assessed as rather uniform (although few answer differed).

Only two people out of eight [6] perceived the brick pattern of that room as a negative phenomenon. Perhaps, all the positive opinions were influenced by the effect of scale, the texture of the perforated brick lining might not seem dominant in relation to the size of the room. It is also possible that the lateral walls which are located at a significant distance in relation to the center of the room are not capable of distracting one's attention away from the large screen located in the center.

In the much smaller room of the computer laboratory (110), only one person out of nine described the brick bond pattern negatively, two people expressed neutral opinions while as many as six delivered positive reviews. In case of room 202, a room where the respondents spent most time during the lecture, the assessment of the brick pattern on the wall where the projection screen is located were neutral (4) and positive (5). There was only one remark saying that the "bricks cause a distraction, as you are forced to look at them during the presentations". To recap, for most of our young experts the brick bond pattern on the wall was not as annoying as we had expected.

And yet, the co-researchers were able to find more patterns at places which we did not take into consideration - the glazed wall partitions. We observed correlation between the responses at places where one could find some sort of lack of organization (e.g. there was disorder in the arrangement of the furniture or the furniture itself was damaged) or mismatched patters. In places perceived as not ordered there were fewer positive opinions about patterns. Possible explanation could be related to over-whelming aspect of disorder, which affected the perception of patterns visible for evaluators.

Invisible Border. What was really interesting, was the discovery made during the assessment of a small lecture room (015), whose characteristic feature was that it lacked one wall, which had been criticized during everyday use by neurotypical students and by teachers. Our co-researchers with ASD did not pay any attention to undefined border (lack of a dividing wall on the side of the corridor, with just a row of columns), perhaps due to the fact that the corridor had not been, at that time, used by any people from outside of the workshop group.

That very room, which from the perspective of neurotypical people (architects) seems "boring", dark, gloomy, long and slightly too high ('bad' proportions), was assessed as quiet, well-ordered and non-distracting (facilitating concentration). It has neutral medium-gray walls, dim cold artificial lighting and average, evenly distributed chairs. It has no windows and only meager access to day light through the mat glazing of the door. Dark ceiling does not attract too much attention. In the summary, at the end of the workshops, one of evaluators said "that is irony: we do prefer such boring rooms". Also the proportions of that room were assessed as rather positive, which probably could have been caused by the unclear ("invisible") border of that room.

[6] Not all rooms were evaluated by all teams. It resulted from the specificity of the game in which the assumption was that inside a small room there might only be 1 team to avoid disturbances during evaluation. The attractiveness of the game for teenagers, and the fact there was no rush to do the evaluations were more important than the number of results.

Further conclusions

- Those features which was assessed as clearly visible by the neurotypical architects, were definitely more often assessed as positive. Ambiguous situations, expressed irresolutely, received mixed opinions (positive or negative).
- Disorder, trash, signs of petty vandalism were viewed negatively and as irritating in additional remarks
- Translucent internal and external walls were viewed by some researchers as irritating only if what happens behind these walls attracts too much attention and caused distractions.
- Features which were listed as irritating in the comments section of the questionnaire or during conversations (due to the fact that they are exceedingly absorbing and distracting):
  - glass panes if it is possible to see people who pass behind them;
  - light if it gets too dark or to bright
  - colors if they are to intense;
  - distant sound in small glazed rooms;
  - dearth of light in some rooms;
  - too bright daylight;
  - narrow aisles between chairs, rows and furniture;
  - large, prominent, untypical elements - enormous lighting fixtures in abundance, large mechanical ventilation pipes, damaged elements (chipped and scratched tables), trash, lack of order in the elements of the equipment.

5 Assessment of the Results of the Research

Research was conducted on the basis of PAR, however, the undertaking itself was too short to provide a deep insight into the situation of the ASD people (which constitutes the essence of PAR). Nevertheless, the assumed social targets were met. After almost 4 years, a student-researcher (currently professionally active architects) still claim that that experiment was extremely impressive and say that it was a significant experience for the way in which their professional stance came into shape.

For the members of the co-researchers group, that experiment was one of many organized in the scope of the activity performed by PRODESTE foundation called “Autism Friendly Space”. Directly after the workshop, they also stated that the experiments were interesting and educative.

Space evaluation results, which were obtained as part of that research, do not constitute an unequivocal indication for designing. They do, however, indicate a direction of further research. It will not be easy as the organization of the workshops required a lot of effort, especially on the part of the PRODESTE foundation. We would like to continue research as they revealed numerous weak spots in the understanding of the reality which people with ASD space must face at educational institutions. Thanks to them we seem to have realized that going deeper into that subject may yield significant results, also for the practice of the architectural design.

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