Detail Matters: Exploring Sensory Preferences in Housing Design for Autistic People

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Abstract. Autistic people deal with their environment in a unique way due to differences in sensory perception. Designing housing for autistic people who are unknown is challenging. This research aims to help bridge the gap between architects' design intentions and autistic users' experiences. By combining interviews and participant observation, a case study of a residential facility shows how autistic users can experience things differently than architects assume. Differences relate especially to noise and temperature perception, the size of shared rooms, and visual stimulation in private units. Sensory preferences incorporated in the design based on particular examples of sensory symptoms within the autism spectrum do not necessarily match the preferences of the actual users. This case study contributes to an accumulative knowledge base of thoroughly studied housing designs for autistic people.

1 Introduction

Sensory perceptual differences represent a major aspect of autism[1] (American Psychiatric Association 2013). Examples include hyper- or hypo-sensitivity to sensory stimuli, inability to filter sensory information, fragmentation of information, or delayed processing (Bogdashina 2016). Because of these differences in sensory perception, autistic people[2] deal with their environment in a unique way, which affects how they experience and interact with the surrounding world (Kinnaer et al. 2016). Often they live in environments that do not take into account their responses to sensory input (Brand and Gaudion 2012).

Sensory accessibility is a major theme in the literature on designing for autism (Kinnaer et al. 2016). Sensory preferences are incorporated in architectural design as

[1] Autism refers to a range of conditions related to social behaviour, communication and language, and a narrow range of interests and activities that are unique to the individual and carried out repetitively (World Health Organization 2018).

[2] The term 'autistic people' tends to be preferred by autistic adults, whereas professionals rather prefer 'person with autism' (Kenny et al. 2016).

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a sensory design approach for autism (Mostafa 2008). This approach tends to balance sensory experiences (Kim and Sherry 2015), e.g., by creating a sensory neutral residence where visual, acoustic, olfactory and tactile qualities can be easily modulated to suit a resident's particular preferences (Brand 2010), or by creating different rooms so that residents can choose the suitable sensory environment for themselves (Mostafa 2008; Brand 2010).

The sensory design approach shows limitations. Concepts used can be interpreted in multiple ways (Kinnaer et al. 2016). For example, whereas one autistic person prefers open spaces because the overview they offer makes things predictable, another autistic person prefers compartments, as they reduce sensory input and offer structure (Kinnaer et al. 2014). Researchers developed design guidelines (Kim and Sherry 2015; Gaines et al. 2016), based on experimental (Mostafa 2008; Brand 2010; Khare 2010) and feedback studies (Whitehurst 2007; Scott 2009), yet these focus mostly on hypersensitivity (Kim and Sherry 2015) – possibly because some researchers oversimplified sensory perceptual differences within the autism spectrum (Bogdashina 2016). Additionally, evidence-based studies about designing for autistic users are still limited.

When designing accommodation for autistic adults living independently, architects may adopt the sensory design approach to adjust their design to autistic users' needs. To help bridge the gap between architects' intentions and users' experiences, our case study seeks to answer the following questions: (1) how are sensory preferences within the autism spectrum incorporated in architects' design intentions? And (2) how do autistic residents experience the resulting environment? In addressing these questions, we hope to enrich the understanding of sensory preferences in the context of housing design for autistic people - among architects, developers and care professionals who may reconsider their position and seek opportunities to improve autistic people's quality of life.

2 Methods and Materials

In order to gain an in-depth understanding of architects' design intentions and autistic residents' experiences, we adopted a qualitative research approach that combines interviews and participant observation. The first author – henceforth 'the researcher' – has a background in architecture and residential planning. She developed skills in communicating and interacting with autistic people, within the context of the Relationship Development Intervention programme (Gutstein and Sheely 2002) and her own family. The second and third authors have backgrounds in architecture, design research and anthropology.

The selected case is Peacefield,[3] a residential facility designed to provide independent living conditions supervised by coaches[4] for 20 autistic residents with mild mental retardation or an average IQ. It is located in a quiet area in the middle of a residential block, in a low-density residential district at the outskirts of a city. Situated in the middle

[3] To omit details that might allow participants' identification, the setting's and participants' names were pseudonymised. However, the illustrations may enable people familiar with the setting to recognise it.

[4] A coach is a professional care provider, Flemish word is 'woonbegeleider', meaning guide or counsellor.

of the site, the building consists of staggered volumes, intended to emphasise dwelling rather than institutional care. Individual residential units are articulated by alternating roof heights, like the pitched roofs of many Belgian town-houses, and town-house windows (Fig. 1a, b).

Based on the ratio of 1 coach to 5 residents, each dwelling module is called a 'house'. The five private units are spread along a curved corridor, at the end of which there is a shared living room with a working desk for the coach. There are two houses on the ground floor and another two on the first floor. Two modules on the same floor are connected through a corridor and share a bathroom, time-out and laundry rooms (Fig. 1c). Each resident rents a private unit as a fully equipped, small apartment. It has an entrance, cabinet and shower room. Depending on the resident's preference, there is a kitchen, and a removable wall allows the unit to be a bedroom with a separate living room (Fig. 1d) or a large studio (Fig. 1e).

The person in charge of Peacefield's infrastructure – henceforth the developer – was interviewed informally (for two hours). From the team of five architects who designed the project, semi-structured interviews were conducted jointly with two architects – Peter and Leon – and separately with the interior architect – Maria (for 90 min each). Participating residents were chosen based on the researcher's informal contacts during participant observation, and in consultation with coaches. Coaches were chosen based on their availability. Eight residents – Charles, Anthony, Barbara, Emily, Antoine, Mitch, Dan and Fischer – and four coaches – Ellen, Kelly, Neville and Lea – were informally interviewed about their experiences. Participants had been living or working in Peacefield for about two to four years. Residents (2 women, 6 men) were between 19 and 63 years old, coaches (3 women, 1 man) between 30 and 50. They were free to choose the language in which to communicate with the researcher. Most of them preferred English, except

Fig. 1. a. Northern facade; b. Eastern facade; c. The ground floor shows the spatial organisation of two dwelling modules/houses; d. A private unit with a bedroom and a separate living room; e. A private unit as a large studio. © The architecture firm

for one resident who preferred French, and another for whom an assistant translated between Flemish and English.

Data collected include notes, pictures, drawings from residents, drawings provided by architects, the design brief from the developer, and audio recordings.

The developer was asked to recount her knowledge about autistic people and Peacefield's ambition, and to describe the building and how it was for residents to live there; the architects were asked to recount their acquaintance with autistic people and their design intentions during the design process.

In Peacefield, 55 h of participant observation focused on daily activities of residents and coaches at different times within one month (June 2018). The researcher's participation included talking to residents and coaches, cooking, joining residents during dinners, working in the Peacefield and communal garden, going out (for walks, to the spa by car, or out dancing). The researcher took notes on a laptop at the table in the shared living room, similar to how coaches did administrative tasks. The observations allowed the researcher to become acquainted with residents and coaches, the built environment, and daily activities. This helped to better understand and interpret interview data within their context.

Combining participant observation with interviews allowed to explore residents' experiences. In the interviews, residents were asked, first, to guide the researcher through their private units and, second, to describe their private unit to the best of their ability, how it was for them to live in their private unit and in Peacefield, and what they did or would like to do. Of the 8 residents, 4 made drawings about their private unit, the building and residential area. This made it easier to communicate their thoughts, allowing more time to reflect and think while offering an opportunity to avoid eye-contact. In follow-up interviews they talked about their drawings, which helped in understanding their experiences.

Finally, coaches were asked to describe the building, their role in the house, how it was for residents to live there, and what they consider essential for residents.

Data analysis focused on interviews with all participants, complemented by observation notes, drawings, pictures, and the design brief. It roughly followed QUAGOL (Dierckx de Casterlé et al. 2012) and used qualitative data analysis software (Nvivo 11). To gain thoughtful insight into the data (Dierckx de Casterlé et al. 2012), the analysis was conducted in consultation and through discussion with the second and third author. The third author also read transcripts and made narrative reports.

The study was approved by KU Leuven's ethical committee. Participants were informed about the study orally and in written form, and given the opportunity to ask questions. The interviews with residents were adapted to their individual capacities in terms of timing, length, and content. All interviewed residents said to feel comfortable doing the interview alone and gave written informed consent.

3 Findings

3.1 Sensory Preferences in Architects' Design Intentions

The architects highlighted themes like 'individualisation', 'homeliness' and 'sensory preferences'. Incorporating the latter appeared to be a primary design strategy and profoundly influenced decisions throughout the design process.

The architects seemed to be aware of the differences in sensory perception within the autism spectrum. During the design process, Maria and Leon spent a day and talked with the staff at another residential setting for autistic people managed by the same developer. Several severe sensory symptoms were considered during the design. Examples include someone who could count into hundreds if he saw 100 tiles, could hear a tapping pen from another room, could not sleep because of noise from the ventilation, or unscrewed his bed after one night. Sensory preferences from these accounts were used to question everything during the design process.

> *"Not everyone is sensitive with hearing or not everyone is fixed on a screw, depending on who will be living there, you can adjust and give more freedom or less freedom … I have (a) few faces in my head, so, when William is in there what we will do? It made it just easier to control your design somewhat and it made especially with colours and materials, it made a lot of decisions.*"
>
> (Interview Maria)

Architects' design intentions incorporated several sensory preferences. The primary design strategy was to create a low-stimulation environment by minimising visual stimuli in several ways: introducing a curved corridor to avoid hard edges (as these might create unpredictable confrontation between residents) (Figs. 1c and 2); minimising window details by installing a window fitting to be flush with the wall; using large-size (90 × 90 cm) bathroom tiles for walls and seamless, continuous floors and ceilings (incorporating lights) to reduce the number of joints; using neutral colours, and underfloor heating in order to avoid radiators.

Particular attention was paid also to acoustic solutions: situating the building centrally on the site created a buffering area which reduces noise from the surroundings; double walls between units and sand-lime brick absorb sounds, a green roof absorbs noise from rain, and an extra layer buffers sound from the roof; sloped walls and roof should reduce the sound reflection on the first floor; ventilation shafts run separately to the basement to avoid sound travelling between units; and underfloor heating avoids sounds from running water inside radiators.

Finally, the architects intended to offer individual units more space than shared rooms – unlike in the older group living facility managed by the developer, where individual units have limited space and shared rooms are much bigger.

3.2 Autistic Users' Experiences

In autistic residents' experiences, themes that stood out include 'autonomy' and 'sensory preference'.

A major concern for users is noise inside the building: the robust material in the corridor causes echo to occur (Fig. 2); a small detail of the lock used on all doors creates a loud sound each time a door is (un)locked; residents tend to check the lock multiple times; and the solution for sound absorption between floors is insufficient. A battle between residents was reported because of noise caused by a first floor unit.

> *"Some inhabitants have very highly sensitive hearing, so, if, they are also afraid of the door. If one of the doors closes, some […] inhabitants here can hear it. They are very nervous, very angry. It is, almost, noise cannot escape."*
>
> (Interview Fischer)

According to the coaches, a second major concern for the residents is the temperature. Since residents cannot control it by themselves, it relates to the theme of autonomy.

> *"The feeling of warm, cold, and they cannot adjust it by themselves. It is a problem… it's hard to explain to the technician to arrange the temperature, because they say 'No, it's 21 degree, it's fine like that'. But NO, we have COLD, and we have to use trousers. Because the feeling is not, eh, like that."*
>
> (Interview Ellen)

3.3 Confronting Design Intentions with User Experiences

A commonality between the architects' design intentions and users' experiences concerns the size of the private units. Most participating residents appreciated their spacious private unit where they could "escape" from outside sensory stimulation, relax, do their stuff. Charles named it his "escape room".

Differences concern the noise inside the building and the room temperature. Other differences were observed in relation to the size of the shared room and the visual stimulation in private units. While the architects intended to reduce the shared living rooms in size, some residents occupy more space than others according to their sensory preferences. For example, Mitch preferred to lean on the kitchen counter and observe

Fig. 2. 'Noisy' corridor with robust material

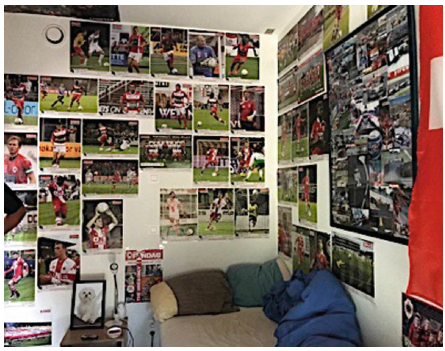

Fig. 3. Walls full of posters in Antoine's private unit

people from a distance rather than using the sofa. Barbara was keeping a distance from others, using her straight arm to measure her private space. She did not sit with others at the shared dining table, her table was set apart. Some residents occupied more space by moving their body to regulate their emotions and sensory inputs. For example, Barbara walked back and forth, rocked her body when she was nervously searching cheese for her diner sandwiches. Fischer walked back and forth when he was excited having his new game device on hands. The coaches admitted that the shared rooms were too small. Inside 5 private units, there were varieties of visual stimuli with many little things which relates to their personal interest, e.g., displayed collections of cigars, newspapers, CD-ROMs, posters, Pokémon images, decorating lights, Pop game figures or other stuff (Fig. 3). Unlike the architects' intention to minimise visual stimulation, those displays, presented to the researcher during the guided visit of the private units, were visibly essential in the residents' units.

4 Discussion and Conclusion

Incorporating sensory preferences profoundly shaped architects' intentions from the conceptual to the interior design stage. The users' experiences actually differed from what the architects had assumed, especially related to noise and temperature; the size of the shared room; and visual stimulation in the private units. More space is needed in the shared room to allow some autistic people to regulate emotions and/or sensory inputs. This is in line with Scott's (2009) finding that classrooms for autistic children require more space than those for neurotypical children. Minimising visual stimulation would be more important in the shared rooms than in private units. Some autistic people need visual stimuli, which might relate to sensory fascination (Bogdashina 2016).

Sensory preferences from particular (extreme) examples within the autism spectrum do not necessarily match the sensory preferences of the actual users. As Bogdashina (2016) claims, autistic people often describe their stims as defensive mechanisms. Attention should focus on civilising the sensory environment rather than judging autistic people's behaviour (Davidson and Henderson 2016).

In terms of limitations of the study, the language used for interviews was neither the participants' nor the researcher's mother tongue. Yet, additional techniques were used to collect data: participant observation allowed the researcher to reflect on architectural aspects of the built environment and users' performance; drawings by residents facilitated communication and offered more insight into their experiences.

The study offers insight into the design intentions that the architects put in practice and a nuanced account of how autistic residents experience the resulting housing environment. Autistic users turned out to experience things differently than the architects assumed. Detail matters: despite the architects' all-out efforts, something as small as a lock became a big issue. The insights from the study may support architects in incorporating sensory preferences in a tailored way and contributes to an accumulative knowledge base of thoroughly studied housing designs for autistic people.

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