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Blind Photographers: A Quest into the Spatial Experiences of Blind Children

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Abstract

In the context of inclusive design, this paper reports on a photo-ethnographic study that is part of a wider inquiry into the haptic qualities of the built environment. To stimulate conversation with children born blind about their haptic spatial experiences, we invited them to take pictures of their daily living environment—a school for children with visual or hearing impairments or autism. The pictures taken by the blind children offer a unique perspective on how they experience the school environment. Non-visual triggers for taking pictures were both tangible (tactile, olfactory, auditory) and intangible (memories and knowledge) in nature. Besides offering insights into non-visual stimuli in the school, this study suggests that photo-ethnography may be a useful approach for communicating about sensory experience with children born blind and for overcoming a lack of vocabulary to articulate these experiences. Moreover, using the camera provoked sensory experiences and memories in general and revealed details on haptic perception in particular.

Keywords: architecture, blind children, inclusive design, photo-ethnography, photographs, senses

Introduction

Our experience of architecture is intrinsically multisensory in nature: we assess the quality of space, matter and scale using multiple senses (Rasmussen 1964; Hall 1966; Bloomer and Moore 1977; Pallasmaa 2005; Pallasmaa and MacKeith 2005). What a space looks like is important, but its feel, sound and smell also contribute to our experience.

During the 1970s, the importance of a human-centred approach to design received much attention. Ron Mace (1985; Story 2001) was the first to coin the term Universal Design (UD) to refer to "an approach to design that incorporates products as well as building features which, to the greatest extent possible, can be used by everyone." Depending on the geographical region and the research field, this concept is also referred to by the terms Inclusive Design (UK) or Design for All (EU). In line with the principles of Universal Design, Inclusive Design or Design for All, our research aims to support architects in developing their knowledge of non-visual senses with a view to enriching the built environment with more multisensory qualities. In particular, we focus on the sense of touch—or haptics—in the built environment.

The term "haptic" is derived from the Greek *haptos* (adj.) or *haptein* (verb), meaning "to lay hold of" or "pertaining to the sense of touch" (Minogue and Jones 2006). Society's view of the sense of touch has evolved over the course of the centuries, and if people refer to the haptic system, they may either be referring to the sense of touch in a narrow sense, to a sensory system that connects all touch related processes, or to a perceptual system triggered by movement in general. In this study, we use the term haptic to cover all the different modes of touch regarding the experience of the built environment.

It was decided to focus on the haptic sense for architectural as well as sensory reasons. From a sensory point of view, the sense of touch is remarkable. Historically, it has been viewed both with contempt and with great respect, but it is a fact that the haptic sense is the first to develop in fetuses (Hooker 1942). In the context of architecture, it is the fundamental sense for the experience of movement, which according to Pink (2007) is indispensable for architecture. Some architectural theorists even regard the haptic sense as the extension of all senses (Pallasmaa 2005).

Within an architectural context, "haptic" has a broader meaning than "tactile" in that it involves not only cutaneous perception, but also the interaction of cutaneous perception, positional awareness, balance and movement in the built environment (O'Neill 2001; Herssens and Heylighen 2007). Haptic spatial perception involves connections between movement and touch (Millar 2005). In relation to the built environment, we argue, haptic perception involves active as well as dynamic and passive touch (Herssens and Heylighen 2007; 2010; Herssens 2011). Active touch is the result of stimuli produced by a body in movement. Gibson (1966) originally defined dynamic touch in relation to object perception, a definition also adopted by Turvey (1996). In this research, we extend this definition to the built environment, describing dynamic touch as the exploration of a body or environment through the

use of a tool, object or aspect that is external to the object being explored. Whereas active (Heller 2000) and dynamic touch (Turvey 1996) require movement from the body itself, passive touch (Heller 2000) arises from movement in the environment: the body's outer surface is touched by an external object or being.

In order to identify haptic qualities, limitations and the process of haptic perception in the built environment, we complemented a review of the literature with empirical research, consisting of three qualitative studies relying on the expertise of people born blind (Herssens 2011). These included 1) home visits to adults born blind (Herssens and Heylighen 2010, 2) observation of children born blind, and 3) focus group interviews with caregivers. This enabled us to triangulate the experiences of these three groups. The topic of this paper, a photo-ethnographic study, emerged from observations of children born blind.

Methodology: Involving Blind Children's Expertise in Studying a School Environment

Expertise of Children Born Blind

In this study, we drew on the experiences of people born blind as a form of expertise: because they are forced to rely on non-visual information, they have learned to be more attentive to non-visual stimuli in the environment (Tuan 1977; Warren 1978; Hollins 1989; Fjeldsenden 2000; Devlieger et al. 2006). Moreover, the haptic sense is a very important source of information for people born blind (Hollins 1989; Lusseyran 1999; Millar 1994).

Fjeldsenden (2000) states that children who are born blind are very sensitive to non-visual environmental stimuli, which makes them ideal participants in research dealing with the less striking features of the environment. Similarly, O'Neill (2001) points to childhood experiences of the landscape, which represent an important phase of intense tactile and kinesthetic learning.

The involvement of blind children was therefore an informed choice and they were regarded as social actors and active co-researchers. Christensen and Prout (2002) identify four different ways of approaching children in scientific studies. The traditional and best known approaches are those in which the child is considered as an object or a subject. Studies taking an object approach do not regard children as social persons in their own right and the investigations are based on the assumptions and statements of adults. Studies that acknowledge the child as a subject adopt a more child-centered approach. However, this second approach still uses age-based criteria linked to children's social competencies and cognitive abilities and researchers are advised to carefully consider the child's development and maturity. The third approach goes a step further and considers children not only as subjects but also as social actors that can act, take part in, change and be changed by the social and cultural world in which they live. The fourth approach, finally, considers the children as social actors and active participants in the research.

It is this latter approach that we adopted in the present study, as the children were considered co-researchers. Children are a particularly interesting group to involve in this type of research as their perceptions may differ from adults'. For example, children can create their own social worlds and social relations, of which adults only have a partial or fragmentary understanding (Valentine 2008). Children have their own likes and dislikes, needs and curiosities, which are not the same as adults' (Druin 2002). Halprin (1975, 26-27) praises the spontaneity of the child, saying:

> *I am level-making a big jump, because what I am saying is that somehow or other we've lost the ability to experience as children experience and I use the child because the child has such an instinct to ritualize and create spaces; the child hasn't yet been deadened.*

Druin (1999) supports the idea that the child's perception might be truly honest, adding that this honesty lies in their actions and thus in concrete experiences: children often prefer to do and act instead of engaging in discussion.

As our approach focuses on the abilities of children born blind and on their positive contribution to the research process, it contributes to the empowerment of the children (Davis 1998), who are regarded as experts in haptic perception.

Research Design

Because the expertise of children born blind was crucial to our research, we contacted all schools for visually impaired children in Belgium. Representatives of these schools attend a monthly meeting in which upcoming research projects and calls for participation are discussed. We were invited to present our research topic and design during one of these meetings. As it was important for our research to observe children with few, or no, additional impairments, the members of the group agreed that the Royal Spermalie Institute in Brugge would be the best location, as most of the children there do not have additional impairments. Moreover, this is the oldest educational institution for children with visual or hearing impairments or autism in Belgium. Currently, it houses 81 children with visual impairments. The observations were conducted at the primary boarding school for children aged 3 to 13 years with a visual impairment while the photo-ethnographic study was limited to children aged 8 to 11.

Before the actual observations started, the first author joined the children on outings to an amusement park and took part in a tandem bicycle trip to the seaside. This provided an opportunity for all parties (children, educators, and the researcher) to become acquainted with each other.

In November 2007, observations commenced with participatory activities on Wednesday afternoons, which continued until March 2008, except during holidays or at the request of the chief caregiver. Weekly reports summarized the main issues and the key observations made at each of these observation sessions.

The researcher worked closely with the care supervisor in order to design an appropriate observational setting. The care supervisor picked out four classes and

selected five children born blind. The school's policy is to gain informed consent from all parents at the start of each new school year regarding all research studies planned for the following year. In addition to obtaining parental and teacher consent, however, a "social actor approach" implied that the children were personally asked whether they agreed to participate. The educators therefore informed the children about the study but not about its actual design. Hence, the children did not know that it would rely on the expertise of people born blind.

However, as all research participants volunteered to participate in the photo-ethnographic study before they had been asked, it was unnecessary to gain consent. For the publication of pictures from the photo-ethnographic study, the researcher also obtained personal permission from the parents involved.

Research Participants

SPE 01 was a 9-year-old boy, born with Leber's Optic Atrophy, an inherited defect of the optic nerve affecting the retina. He was congenitally blind but still had some light perception in his left eye. The second participant, SPE 02 was an 11-year-old girl born with Norrie Disease, a genetic disorder that primarily affects the eye and leads to blindness at birth or soon after. She had also undergone enucleation of the eye meaning that the eyeball has been removed, leaving the eye muscles and remaining orbital contents intact. Although Norrie Disease often results in deafness as well, this girl had no other impairments. The third participant, SPE 03, was an 8-year-old girl with less than 5 percent vision in her left eye due to perinatal Retinopathy of Prematurity, an eye disease affecting babies born prematurely. It is assumed that disorganized growth of retinal blood vessels causes scarring and retinal detachment. This participant had a motor impairment as well. Both our fourth participant, SPE 04, an 8-year-old without residual vision or light perception, and our fifth participant, SPE 05, an 11-year-old girl, were also affected by Retinopathy of Prematurity. At the time of the investigation, SPE 05 still had light perception in her right eye and less than 5 percent vision in her left eye (Table 1).

Table 1. Overview of research participants

Code	Birth Date	Gender	Visual Impairment	Onset of Visual Impair-ment	Residual Vision % Left Eye (LE) % Right Eye (RE)	Light Percep-tion
SPE 01	April 1998	Male	Leber's Optic Atrophy	congenital	RE: < 1/20%, LE: 0%	LE: light perception
SPE 02	April 1996	Female	Norrie's Disease - Enucleation	congenital	no congenital	no
SPE 03	December 1999	Female	Retinopathy of Prematurity	perinatal	RE nil % LE: <1/20	LE: light perception
SPE 04	December 2000	Female	Retinopathy of Prematurity	perinatal	no perinatal	no
SPE 05	July 1996	Female	Retinopathy of Prematurity	perinatal	RE: 0% LE: 1/20	RE: light perception

All participants stayed at school for the whole week except for SPE 04, who often left the boarding school early on Wednesday afternoons. For this reason, it was decided to omit her from the photo-ethnographic study, which was eventually conducted with the following four children: SPE 01, SPE 02, SPE 03, and SPE 05.

Developing a Research Approach

During the first two months of observation, no research-related activities were planned and the researcher maintained a low profile. Once mutual trust had been established, more focused activities were initiated in order to encourage the children to talk about their surroundings in a self-confident and independent way. However, it became clear that a great deal of creativity would be needed to develop a research design in which the children could be involved as participants.

In January 2008, one of the teachers hit on the idea to organize an after-school game, i.e. a quest across the school in which the children would be invited to talk about their surroundings. Over the next two weeks, this idea was elaborated together with the researcher, and a possible research approach was developed. This involved a dual challenge: the game needed to 1) yield reliable data on haptic perception and 2) meet the needs of a pedagogical exercise. The researcher prepared a semi-structured questionnaire, a topic for the game and a time schedule, which consisted of two afternoons: one afternoon to prepare the game and one on which the actual game took place. Prior to the game, we planned to talk with the participants about their experiences of their surroundings. We started this study with the 11-year-old participant, SPE 03.

After a brief explanation, SPE 03 was invited to participate and to think about a tour through the school building, including the hints and the questions that she wanted to ask. Our common theme was; “places at school.” The game involved all children of the class and was guided by SPE 03. In the preparatory phase, SPE 03 was accompanied by the researcher, who decided to walk through the building while devising different tasks for the game. Unfortunately, the girl was too timid to take initiative herself, which resulted in the researcher being too involved and making suggestions, which made the output unusable. The game ran its course and the children had great fun, but the researcher had to continue her search for a different and more reliable data collection technique.

One day, SPE 01 asked to use the researcher’s camera because he was intrigued by objects with buttons. The boy mentioned that he had asked St. Nicholas for a camera, but unfortunately had not received one. Moreover, his parents had told him that he would never be able to use it properly. Inspired by his story and questions, the researcher started to reflect upon the possibility of conducting a photo-ethnographic study.

More on Photo-Ethnography

The use of photography within research is not new. Not only architecture but also other cultural phenomena have prompted photographers to use the camera for documentation purposes. In addition, 19th century colonialism stimulated researchers to visualize new cultures. Originally used as a documentary tool, this

colonial photography soon led to what has become visual anthropology. Although colonial photography provided the Western world with interesting information, it still played its traditional role, with the researcher taking photographs of the subject under study. It would take until the mid-20th century before the first steps were taken to connect the visual with applied anthropology. John Collier is best known as one of the first social scientists to make this connection (Collier 1967). His book *Visual Anthropology: Photography as a Research Method* provided a manual for a systematic approach to visual research.

Use of Photography to Study the Self

In the 1970s, researchers such as Robert C. Ziller (1977; 1990) and Dale E. Smith (1977) started using photography as a research method for observing the self without influencing the subjects. By the end of the 20th century, the camera connected the objective with the subjective world as people started using it for research objectives involving the self. Before Universal Design, Inclusive Design or Design for All was even considered as a research topic, Ziller and Smith observed wheelchair users and hearing-impaired people using the camera as a tool to talk about their spatial experiences and to overcome the constraints of language in spatial experiences. These researchers demonstrated that photography is a unique medium for communicating experiences. The camera can elicit behaviors and attitudes that form the basis of the research analysis; in other words, it allows for a phenomenological approach in which pictures are taken "by" and not "of" the perceiver. For example, the world seen from a wheelchair user's viewpoint is different from that seen from a walking or standing viewpoint—perceptual, physical and social differences that can be captured using a photo camera (see Ziller and Smith 1977). Moreover, the camera can reveal the consequences of these viewpoints for users of the built environment. The present study expands the photo-ethnographic horizon by inviting blind children to participate. Furthermore, within this photo-ethnographic study, the camera is used as a tool to reveal haptic perception, stimuli and characteristics.

In general, however, participants in research studies are not taught to articulate their sensory experiences and may even be afraid to express their opinions. To overcome these shortcomings, researchers use photography or visual imagery as a means of communication. Thus, anthropologists discovered that photo-ethnography offers a relevant research method in situations where there is language deprivation (Mathers 2008). Besides their advantages as tool for communication,

> *photographs, more than almost anything else, have a special emotional appeal: they are personal, they tell stories. Personal photographs are mementos, reminders, and social instruments, allowing memories to be shared across time, place and people* (Norman 2004, 50).

Using photography for conducting research with blind children on the haptic sense in the built environment might seem paradoxical at first. Yet, inspired by the interest of one of the participants in the camera, we decided that the camera could act as a tool with which to talk about sensory experiences in the environment. Indeed, research shows that many children prefer to "act out" rather than to start a

discussion as an adult might (Druin 2002, 1). Unlike audio equipment, the camera requires constant interaction as buttons need to be pushed in order to take a picture.

Photo-Ethnography and the Photo Tour

Native Image Making

Photo-ethnography is sometimes referred to as “native image making” due to the intimate, almost voyeuristic, nature of the method (Wagner 1979, 20). Furthermore, according to Samantha Warren (2005), visual research is characterized by four aspects relating to images: 1) data including visual signs and symbols; 2) records that document social, cultural and physical processes; 3) stimuli to elicit information from research participants; and 4) a method to help participants to express their thoughts, behaviors, reactions and experiences.

The characteristics of photo-ethnography accord with the general objective of our research, which prompted us to use photography as a vehicle for communication about sensory experiences with children born blind. A digital camera thus became a means to focus the children's attention on their daily thoughts, behaviors, reactions and experiences concerning their school environment. An individual photo tour was carried out with each child. Before the tour, children received brief verbal instructions on the use of the compact digital photo camera. They were given full control over when, how, and where they would take pictures.

Photo Interviewing

To encourage the participating children to take pictures with a focus on their school environment, the researcher prepared a semi-structured questionnaire with instructions and questions such as: “Take a picture of the place in or around the institute which you feel is the most pleasant. Why did you choose this place? What are the most pleasant materials in the institute? Why? Where do you use the sense of touch? Why? How?” These questions were read to the children during the photo tour. At the start, the semi-structured questions encouraged them to take photographs. Afterwards, the children’s answers helped to clarify the reasons for the pictures taken and the topics photographed.

This method is known as photo interviewing (Hurworth 2003), an interview technique that questions participants while, or after, they are taking pictures. Photo interviewing made it possible to communicate with children born blind about their haptic experience of the school environment. During the interview, we focused on the layers of thought, behavior, reactions and experiences of the children while they engaged in taking a picture.

The photographic tours took an average of two to three hours and were recorded on a dictation machine. During the tour, the researcher made notes on the subjects of the pictures taken, remarkable perceptual actions of the participants, or their reasons for taking pictures.

Analyzing Data

After each photo tour, all pictures were uploaded onto a computer and printed. The researcher then assigned a name to each picture based on the notes made during the photo interviews. This list was completed after listening to the digital recordings. A second listening revealed more details about the children's reasons for taking the pictures or about how they were taken.

The photographs were then classified, first by topic mentioned by the children (e.g., wallpaper, computer, classmate, elevator, ceiling, corridor, own class, button elevator, bed, physiotherapy room, garden…), and then by identifying similar topics across the various photo interviews by using general keywords such as "classroom," "people," "corridor," "stairs," "elevator," "room," "door," "object" etc. This analysis also revealed that some pictures were single images while others were part of a series. The series of pictures were then grouped. The third classification linked the keywords to the semi-structured questions, while the fourth classification paid attention to the tangible (haptic, olfactory, auditory) or intangible (memories or knowledge) triggers for taking the pictures in relation to the senses stimulated.

Besides analyzing the actual images, we also zoomed in on "how" these pictures were taken. In stressing the importance of these "how-questions" in photo-ethnographic studies and the way in which others can read the image, Pink (2006) refers to the anthropologist Banks (2001). Banks suggests that social research that uses visual data should ask the following questions: (1) What is this an image of, what is its content? (2) Who took it or made it, when and why? And (3) how do other people come to have it, how do they read it, what do they do with it?

Context is important as well, and the meaning of an image can be revealed by examining not only the image itself but also the language of participants who took it. In the present study, analysis revealed that the findings are not limited to the actual images, but also include the haptic perceptions of children born blind. This became clear by observing them while they were making photographs. Our observations therefore allowed us to study sensory triggers, the process of perception and the way in which the camera was handled.

Findings

The children's use of the camera, their stories and the actual pictures all provided unique insights into the role of non-visual perception in the built environment and the use of the haptic sense in particular.

Accordingly, we classified our findings into three main groups: 1) the results relating to photo-ethnography as a methodology for sensory research. The stimuli or elements in the school environment could be divided into two groups demonstrating either 2) tangible or 3) intangible properties.

Photo-Ethnography as Methodology: The Camera as a Tool for Investigating the Process of Haptic Perception

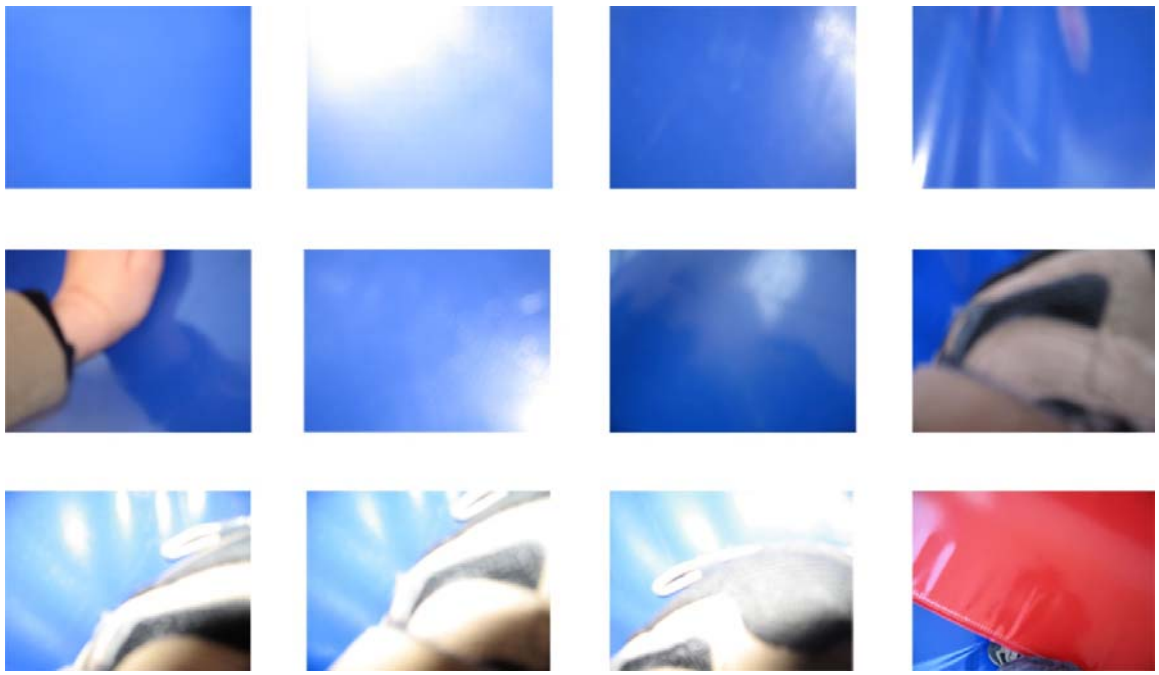
Many pictures showed haptic stimuli, but haptic perception was also unexpectedly revealed while observing the children. The way in which the children handled the

camera reminded us that for them, the world is literally at their fingertips. They use their fingers as detail seekers, while understanding the bigger picture through their body as a whole.

From the start of the photo tours, it became clear that children approached the camera in a tactile and auditory way. The resulting photographs related to the radius of the children's physical body space. When taking a picture, they tended to push the lens against the object being photographed. Moreover, they preferred to physically engage with the lens and to hold it while taking a picture, thus including their fingers and feet into the scene. This suggests that the children considered the camera to be an extension of their body (hands or feet), directing it along the trajectory of their limbs or body position.

In addition, the act of pushing the button became an experience in itself. It provided both a haptic and an auditory experience. Feeling and hearing the shutter go up and down was confirmation that the picture had been taken. One participant even followed the fingers of his left hand with his right hand while taking a series of pictures of the perceived tactile spot. This explains why so many pictures were taken of the same subject and why many images show fingers and thumbs (Figure 1).

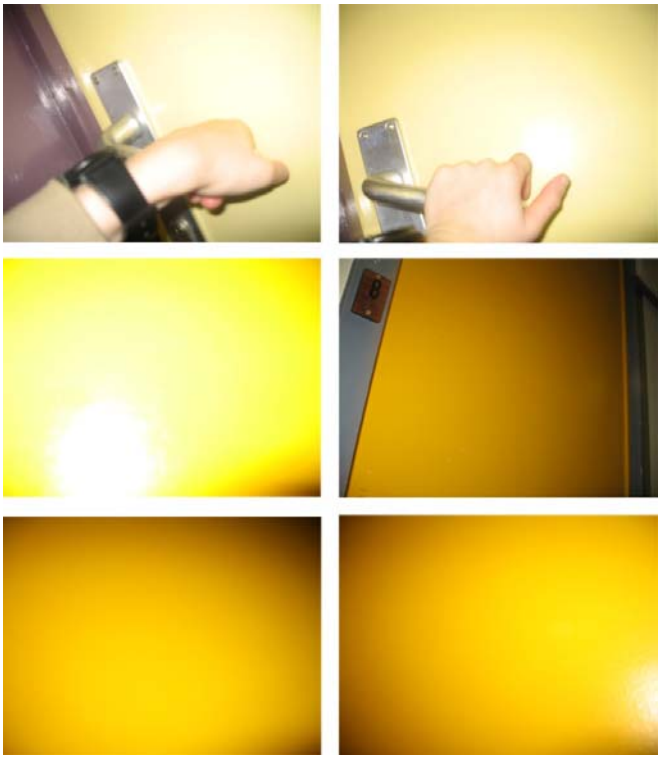
Figure 1. 12 pictures of the same subject capture the sequential perception



The pictures captured the sequential character of haptic perception. At times, the children even photographed the process of experiencing space or elements that suggest movement. For example, all children took pictures of the door to their room before photographing an object or space inside (Figure 2). SPE 01 even took

pictures of the actual movement of opening the door, one hand operating the camera and the other pushing the door handle. Several children repeated this cinematic way of photographing at different locations, and it seemed to reflect their time-related way of perceiving their surroundings. Moreover, this seemed to suggest that "motion" itself may act as a stimulus.

Figure 2. Compilation of pictures taken by all participants showing the door to their rooms

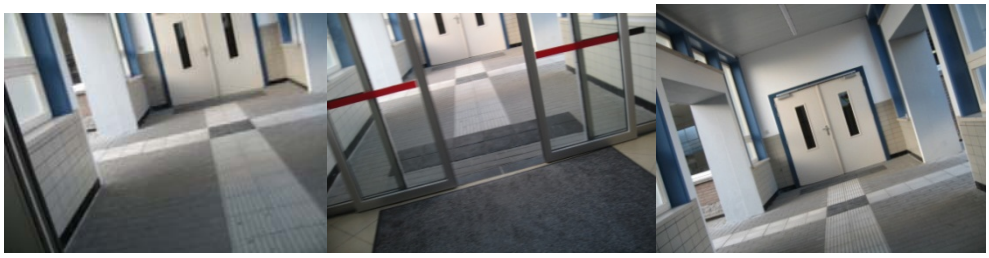


The proximal nature of the haptic sense was also revealed because the children held the camera close to their bodies, resulting in many close-ups of objects. In the case of tangible triggers, all children touched the photographed object before they actually decided to push the shutter. Other effects of the proximal nature of haptics included the children's outspoken interest in materials as well as a focus on details. A small, practically invisible, bump, for instance, might represent an important haptic stimulus and thus become a trigger for a picture.

Having children document their own experiences at school thus offered several other benefits. Besides registering haptic stimuli, elements and perception, the camera also contributed to the participants' self-confidence. They demonstrated happiness, relaxation, and excitement, took on the role of experts (through ownership, pride, freedom, and knowledge), were given an independent voice (allowing independence and self-expression) as well as the opportunity to be self-reflective (through awareness of surroundings and self-alteration through the experience).

In general, the photo-ethnographic study confirmed that children born blind have an interest in non-visual stimuli. Auditory, haptic and—to a lesser extent—olfactory stimuli all appeared in the pictures. For example, the elevator was a favorite auditory topic. Asked why they wanted to photograph the elevator, one of the children literally said that it was special to her because it allowed her to hear where she was [SPE 02]. This girl considered photographing the elevator before we passed it, suggesting that her picture was triggered by a memory of sound. By contrast, two other children decided to shoot the elevator when they heard its recorded "voice" or felt its buttons. Something similar happened to SPE 05 on her way to the playground of the secondary school: when she recognized the sound of the sliding outside doors, she wanted to record this experience (Figure 3).

Figure 3. Three pictures in the direction of the sound of sliding doors



Olfactory triggers were also found in this photo-ethnographic study, but less frequently. When passing by the herb garden, SPE 02 enthusiastically started taking photographs, holding the camera between a few sprigs of chive, parsley, coriander, and rosemary and recording the sand, moss, and weed between them (Figure 4). Although few herbs were growing in February, an olfactory memory prompted this girl to take a picture. Other pictures were triggered by directly perceived olfactory triggers, such as the smell of a kitchen. For instance, SPE 01 took a picture in the direction of the kitchen, as he smelled it in passing (Figure 5).

Figure 4. Picture of the herb garden

Figure 5. Picture in the direction of the kitchen

However, the most frequent triggers were haptic in nature, and because our research focused on haptics, we categorized and classified the most important pictures triggered by either tangible or intangible stimuli. Tangible stimuli comprised all the perceptual stimuli that activate the body's haptic receptors and that the children perceived in real time. Intangible stimuli included the memories that prompted the children to take a picture as well as impersonal knowledge about spatial elements or objects.

Tangible Stimuli

On the basis of the literature review (Klatzky and Lederman 2003; Gentaz and Hatwell 2003) and the photo-ethnographic analysis, we were able to classify the tangible stimuli into material properties and geometrical properties. Material properties are the well-known properties of building materials, whereas geometric or spatial properties refer to the structure of the built environment or the layout.

Material Properties

The children paid remarkable attention to materials, and accordingly materials were frequently photographed. Moreover, the pictures themselves revealed material characteristics due to the handling of the camera. For instance, while taking pictures, the children were particularly attentive to temperature, elasticity and texture.

Temperature

Although temperature is of course not actually visible in the images, all the children explicitly referred to its importance when explaining why they liked or disliked certain materials, objects or spaces. For example, the radiator was photographed because it was an unsafe element: when the children followed the guiding line in the corridor, they automatically bumped into the radiator (Figure 6). Additionally, a hot radiator can also serve as a landmark, perceived either positively or negatively depending on the circumstances.

Cold spaces were often described as unpleasant. One explicit example was a picture of the so-called “cold corridor.” SPE 03 took a picture of this passage because she frequently walked through it, but in fact she disliked the space because of its permanently cold temperature. A constant, cold draft blows through the “cold corridor,” which connects the big hall—used for play activities—with the hall leading to the back entrance. Furthermore, many materials used in this space feel cold and unpleasant. In contrast, warm rooms or materials are perceived as pleasant (Herssens 2011). Wooden elements, for instance, were frequently referred to and photographed.

Figure 6. Picture of the radiator

Elasticity

The children had more than one favorite place in the school, but the one they were most enthusiastic about was a room underneath the roof: “the judo room,” a name referring to the judo mat in this room (Figure 7). In the “judo room,” children can run around, jump, do somersaults or whatever they like without fear of being hurt. In a way, this room is associated with freedom. It is one of the few places in the school where body movements are not restricted, limited or guided. The room seems to offer the children haptic freedom, inviting them to explore all possible movements. Partly this is due to the elasticity of the judo mats, which all users of the judo room commented on. Elasticity is the extent to which a material exerts a counterforce or is transformed in response to an external force (Herssens 2011). Elastic materials are comfortable, as participants do not hurt themselves when falling.

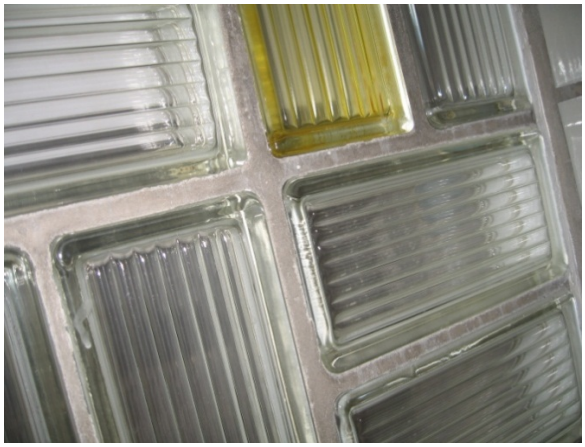
Figure 7. Three pictures of the judo room

Texture

A material characteristic frequently recorded by the children was texture, which provides information about the microstructure of a surface in all its forms: natural characteristics, production techniques and the applied surface technique (Herssens 2011). It is interesting to note that the children photographed textures intrinsic to certain materials as well as textures resulting from the manipulation of materials. For example, one participant (SPE 05) photographed the veins of a leather seat, an intrinsic characteristic of leather (Figure 8). The bumps in the glass bricks, on the other hand, were the result of a mold in which the glass had been poured (Figure 9). The children greatly liked to touch both textures. The same held for the "smooth" tiles in the corridor (SPE 03). Interestingly, the children did not make pictures of unpleasant textures, whereas the blind adults explicitly referred to unpleasant materials, such as the rough plaster of certain walls, during the interviews (Herssens and Heylighen 2008).

Figure 8. Picture of the texture of a leather seat

Figure 9. Picture of the texture of poured glass



Geometrical / Spatial Properties

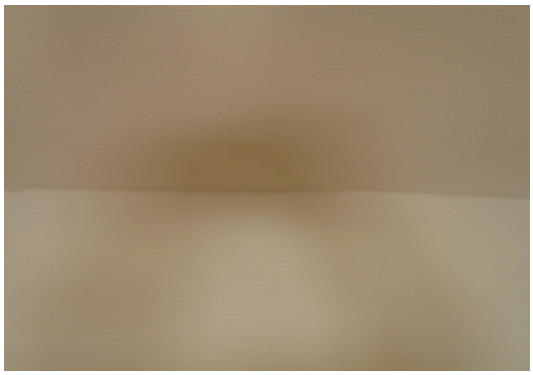
Geometrical or spatial properties involve the layout or the structural characteristics of the environment. Orientation refers to the relation between spatial elements and the body of the perceiver, while complexity refers to the relation and interaction between different spatial elements. Size/dimension is a property that includes the size of the photographed object as well as its dimensions in relation to the body of the participant.

Orientation

While walking through the building, the children took pictures of all the surfaces that surrounded them, i.e. ceilings, floors, walls, windows. This indicated their awareness of the position of planes in relation to their own body. Actively touching these surfaces also prompted the children to take pictures. If the planes or surfaces pointed in a certain direction, this direction could also be a subject of their photo. Angles of surfaces were interpreted in relation to their own body. For instance, they placed the camera parallel to the inclination of a surface, such as the sloping surface in the playground (Figure 10) or they pointed the lens perpendicular to the surface or the boundary between the two surfaces. This marked the difference in direction or the noticeable angle. For example, SPE 05 took a picture of the horizontal line where the wall meets the low sloping ceiling covered with fiberglass (Figure 11).

Figure 10. Picture of the sloping surface in the playground

Figure 11. Picture of the boundary between the sloping ceiling and the wall



Complexity

Unlike the relation between plane and body, which results in “orientation,” the connection between planes is described by the term “complexity.” Strikingly, all children took pictures of the boundaries of spaces and places, even if these could not be touched.

If planes can be touched, special attention can be paid to the connection between different planes. The meeting of or connection between two planes attracted the attention of all participants, resulting in pictures of boundaries between surfaces. This connection could be a boundary between two planes or an opening in a plane. The children were frequently attentive to contrasts between two surfaces or planes, like the boundary between wood and fiberglass. It was clear that the number of surfaces marking the route was always perceived by following the perimeter of space, as taught by the educators. Children also registered doorframes and doorsteps as crossing points that required decisions about movement.

If the number of planes along a route is rather high, it has increased complexity and additional landmarks, like edges or corners. Several children (SPE 02, SPE 03, and SPE 05) appreciated rhythm. SPE 03 explained that she took a picture of the

corridor and the different glass wall-windows because she liked to feel the openings and corners while walking by. She even counted the number of glass wall-windows. This repetition triggered a response, and thus the rhythm and number of planes may support "recognizability" despite the complexity.

Size/Dimension

Analysis of the photographs taken by the children revealed that images of surfaces at hand or foot height were most common. This suggests that these are the most actively and dynamically touched places. However, passive touch is less visible and therefore not traceable on the pictures.

Participants (SPE 01, SPE 02, and SPE 05) took pictures of, on the one hand, small spaces, and on the other hand, very large spaces in which they were not afraid of bumping into other people.

Intangible Stimuli

Not all pictures were prompted by actual sensory triggers (whether material or geometrical) perceived during the photo tour. Sometimes, the children's decision to take a picture was triggered by their perceptual memories of the object or impersonal knowledge they had acquired from others. This was the case, for instance, for wide-area overview photographs such as pictures of the outdoor playground.

Memories

One girl (SPE 03) led us to the playground and took a picture of the shelter (Figure 12). This place reminded her of rainy days when the roof protected her from getting wet and cold. Prompted by auditory and haptic memories, she held the camera upside down, with the lens in the direction of the roof.

Figure 12. Picture of the shelter

Another place in the school that children often photographed based on their memories was the "big hall". All participating children remembered this as a pleasant space, in which they could run around and play games. Functionally, there are similarities with the "judo room," but spatially there are huge differences. Whereas the "judo room" is a cozy space with limited daylight, the large, two-story hall is bathed in light. Above all, it is the size of the hall and the presence of a tactile mat that makes it so popular. All participants decided to take pictures of the

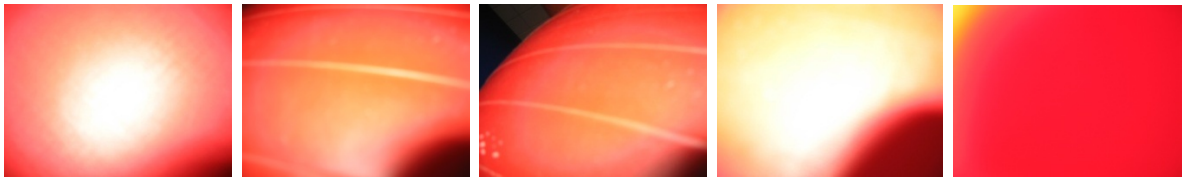
tactile mat (Figure 13), known as “the tingling mat.” This mat was created by the teachers to help children find their way haptically at a tricky point, i.e. the door between the secondary school and the primary school. In the “big hall,” this tactile mat hangs against the wall leading to the entrance door. It marks the end of a guiding line on the floor. Rough, bristly hair framed by soft wooden slats offers poetry for the hand. The memories of the “tingling mat” prompted the children to take pictures of this tactile spatial landmark.

Figure 13. Compilation of pictures of the tactile mat

Besides remembering material stimuli, children also remembered elements that triggered motion, such as the exercise ball. All participants consciously decided to take a picture of the exercise ball, which required them to carefully fetch it from where it was stored (Figure 14).

It became clear that memories played an important role in the meaning that the children assigned to their experiences of the built environment.

Figure 14. Compilation of pictures of the exercise ball



Meaning

Besides taking pictures based on actual haptic stimuli or memories of haptic stimuli and perception, children also took pictures based on general impersonal knowledge.

Very telling in this respect was a picture of the sky (Figure 15) taken by one of the girls. The sky is abstract but verifiable through visual perception. If you have never been able to see, your knowledge about the sky relies on non-visual stimuli (e.g. thunder creates an auditory ceiling) or on information gained from other people's stories. On a beautiful sunny but cold winter day, SPE 02 pointed the lens skywards and recorded a blue sky hidden behind the branches of a tree.

Figure 15. Picture of the sky

Another example in which a participant relied on his knowledge was the series of pictures taken by SPE 01, who ran into his classroom to photograph two goldfish in a clear glass bowl, which he knew was kept on the cupboard. This resulted in four pictures shot in quick succession. Starting with a haptic exploration, he first took a picture from above the fish bowl and then moved the camera inside the bowl (Figure 16). Perhaps he did not know that the fish bowl was made of glass, or he did not fully grasp the notion of transparency—something which is obvious to sighted people. However, the boy's knowledge of the daily ritual of talking to and taking care of these pets inspired him to take a picture. Although he had never touched the goldfish before, he remembered the stories told by his teacher.

Figure 16. Picture series of the goldfish taken by SPE 01

Discussion

Our study has demonstrated that "native image making" offers data beyond what is visible. The digital camera can act as a tool to gain intimate insight into blind children's haptic perception of their school environment. As a result, it offers a vehicle by which discussion of spatial considerations can be fostered and better understanding of lesser-known haptic experiences can be achieved.

In a subsequent study, the haptic qualities and limitations identified through this photo-ethnographic study were triangulated with the findings from interviews with blind adults and focus group interviews with caregivers, and compared and contrasted with other people's perspectives (i.e., people who are not blind) to assess the extent to which these findings pertain to all of us. Finally, the findings were translated into haptic design parameters, which architects could use during the building design process (Herssens 2011). The usability of these parameters has been evaluated by architects as well as the users of the built environment (Herssens 2011, Herssens and Heylighen 2011).

Unlike the majority of photographers, the photographers in our study experienced the built environment in a non-visual manner. As photography is intended to have a visual outcome, originating from visual triggers, blind children are generally not introduced to it because of their restricted capacities. Focusing on photos triggered by other, non-visual, sensory experiences and stimuli, our research therefore turned the notion of photography on its head. This photo-ethnographic study resulted in "non-visual sensory images" that may appear as failures to people who do not know about the intentions or the story behind each photo.

The photographic actions revealed participants' haptic perceptions. The way in which pictures were taken was very telling in this respect. As the children explored their school environment, they took pictures according to the sequence of haptic

perceptions and the direction of auditory and olfactory signals. This often resulted in a whole series of photos being shot, as the children clicked the shutter every time they moved their hand. As a result, the picture series registered the action involved in haptic perception. Besides an emphasis on the action, we found that the successive images taken by each photographer helped us understand their story. While guiding us through the school building, the children took pictures that related to tangible as well as intangible triggers. For the most part, intangible triggers were memories, while tangible triggers arose from actions during the guided tour. Intangible triggers also involved sensory triggers, because memories became meaningful through past sensory experiences. The children's memories clarified the meaning they attributed to spaces and objects therein as they took different pictures.

To conclude, this study demonstrates that photo-ethnography can serve as a vehicle for research into the spatial experiences of blind children in their school environment. The spontaneity of children is both an advantage and a challenge for researchers. By using a camera as a catalyst for discussing spatial aspects, the blind children were encouraged to express their interests and to explain how they assigned meaning to their school environment through both tangible and intangible stimuli.

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References

Banks, Marcus (2001). *Visual Methods in Social Research*. London: Sage.

Bloomer, Kent C. and Charles W. Moore (1977). *Body, Memory and Architecture.* New Haven: Yale University Press.

Christensen, Pia and Alan Prout (2002). "Working with Ethical Symmetry in Social Research with Children." *Childhood* 9(4): 477-497.

Collier, John (1967). *Visual Anthropology: Photography as a Research Method.* New York: Holt, Rinehart and Winston.

Davis, John. M. (1998). "Understanding the Meaning of Children." *Children and Society* 12: 325-335.

Devlieger, Patrick, and Frank Renders, and Hubert Froyen, and Kristel Wildiers, eds. (2006). *Blindness and the Multi-Sensorial City.* Antwerpen, Apeldoom: Garant.

Druin, Allison (1999). "Cooperative Inquiry: Developing New Technologies for Children with Children." *Proceedings of the ACM CHI 99 Conference on Human Factors in Computing Systems,* 223-230.

----- (2002). "The Role of Children in the Design of New Technology." *Behaviour and Information Technology* 21(1):1-25.

Fjeldsenden, Bjarne (2000). "Blindness and Cognitive Structures." Available from: http://www.svt.ntnu.no/psy/Bjarne.Fjeldsenden/Articles/Cognitionandblindness.html

Gibson, James Jerome (1966). *The Senses Considered as Perceptual Systems*. Boston: Houghton Mifflin.

Gentaz, Edouard, and Yvette Hatwell (2003). "Haptic Processing of Spatial and Material Object Properties." In Yvette Hatwell, Streri Arlette and Edouard Gentaz, eds. *Touching for Knowing: Cognitive Psychology of Haptic Manual Perception.* Vol. 53: Advances in Consciousness Research. Amsterdam/Philadelphia: John Benjamins Publishing Company, 123-159.

Hall, Edward. T. (1966). *The Hidden Dimension*. New York: Anchor Books.

Halprin, Anna (1975). "Rituals of Space." *Journal of Architectural Education* 29(1): 26-27.

Heller, Morton A. (2000). *Touch, Representation, and Blindness.* Debates in Psychology. Oxford: Oxford University Press.

Herssens, Jasmien (2011). *Designing Architecture for More.* Hasselt-Leuven: PHL University College, University Hasselt, University Leuven.

Herssens, Jasmien and Ann Heylighen (2007). *Haptic Architecture Becomes Architectural Hap*. Lÿsekil, Sweden: NES 2007.

----- (2008). *Blind In-sight in Architecture*. Glasgow: Flaneur Press, 102-112.

----- (2010). *Haptic Design Research*. Washington, D.C.: EAAE-ARCC.

----- (2011). "A Framework of Haptic Design Parameters for Architects: Sensory Paradox between Content and Representation." In Pierre Leclercq, Ann Heylighen and Geneviève Martin, eds. *14th International Conference on Computer Aided Architectural Design.* Liège: CAAD Futures, 685-701.

Hollins, Mark (1989). *Understanding Blindness.* Hillsdale, NJ: Erlbaum.

Hooker, Davenport (1942). "Fetal Reflexes and Instinctual Processes." *Psychosomatic Medicine* 4: 199-205.

Hurworth, Rosalind (2003). "Photo-Interviewing for Research." *Social Research Update* 40: 1-4.

Klatzky, Roberta, and Susan Lederman (2003). "The Haptic Identification of Everyday Life Objects." In Yvette Hatwell, Streri Arlette and Edouard Gentaz, eds. *Touching for Knowing: Cognitive Psychology of Haptic Manual Perception.* Vol. 53: Advances in Consciousness Research. Amsterdam/Philadelphia: John Benjamin Publishing Company, 105-122.

Lusseyran, Jacques (1999). *What One Sees without Eyes*. Norwich: Floris Books.

Mace, R. (1985). *Universal Design: Barrier-Free Environments for Everyone.* Los Angeles: Designers West.

Mathers, Alice R. (2008). “Hidden Voices.” *Local Environment* 13(6): 515-529.

Millar, Susanna (1994). *Understanding and Representing Space*. Oxford: Clarendon.

----- (2005). "Network Models for Haptic Perception." *Infant Behavior and Development* 28: 250-265.

Minogue, James, and M. Gail Jones (2006). “Haptics in Education.” *Review of Educational Research* 76(3): 317-348.

Norman, Donald A. (2004). *Emotional Design.* New York: Basic Books.

O'Neill, Marie Eithne (2001). “Corporal Experience.” *Journal of Architectural Education* 55(1): 3-12.

Pallasmaa, Juhani (2005). *The Eyes of the Skin.* Chichester: John Wiley & Sons.

Pallasmaa, Juhani and Peter MacKeith, eds. (2005). *Encounters*. Helsinki: Rakennustieto Oy Building Information Ltd.

Pink, Sarah (2006). *The Future of Visual Anthropology*. London: Routledge.

----- (2007). “Walking with Video.” *Visual Studies* 22(3): 240-252.

Rasmussen, Steen Eiler (1964). *Experiencing Architecture.* Cambridge, MA: MIT Press.

Story, Molly Follette (2001). “Principles of Universal Design.” In F.W. Preiser and Elaine Ostroff, eds. *Universal Design Handbook.* New York: McGraw-Hill.

Tuan, Yi-Fu (1977). *Space and Place.* Minneapolis: University of Minnesota Press.

Turvey, Michael T. (1996). “Dynamic Touch.” *American Psychologist* 51(11): 1134-1152.

Valentine, Gill (2008). “Being Seen and Heard? The Ethical Complexities of Working with Children and Young People at Home and at School.” *Philosophy and Geography* 2(2): 141-155.

Wagner, John (1979). *Images of Information.* London: Sage.

Warren, David H. (1978). “Perception by the Blind.” In Edward C. Carterette and Morton P. Friedman, eds. *Handbook of Perception, Vol. 10*. New York: Academic Press, 65-86.

Warren, Samantha (2005). “Methodological Insights Section.” *Accounting, Auditing and Accountability Journal* 18(6): 861-882.

Ziller, Robert C. (1990). *Photographing the Self.* London: Sage.

Ziller, Robert C. and Dale E. Smith (1977). “A Phenomenological Utilization of Photographs.” *Journal of Phenomenological Psychology* 7(2): 172-182.