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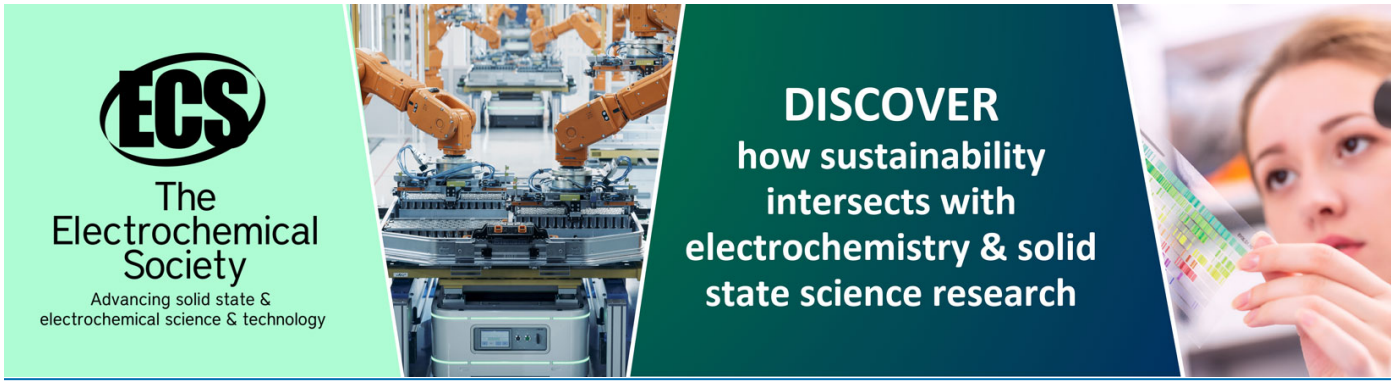

Situating the light: Methodology for sensory and spatial fieldwork

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Abstract. Sensory perceptions are a novel point of departure for lighting research, where human factors have long been approached through isolated variables and controlled environments. However, informed by philosophy and social sciences and supported by ethnographical methods, researchers and practitioners are gaining new ground in understanding human-environment relations by approaching user perspectives in empirical inquiries. Situating the lighting in spatial settings and sensory experiences is crucial when exploring the dynamics of the changing visual perception of aging and vision loss, and how these phenomena can affect everyday life. Although spatial and sensory perceptions have typically been approached from different positions represented by architects or anthropologists, the following question remains: How can we develop a methodological framework for exploring entwined sensory and spatial experiences? This paper presents the method development process for our upcoming sensory and spatial fieldwork in the project "The role of light when vision changes." The process is described in autoethnographic narratives, analysis of the technological frames, approaches, and understandings of light represented in the project, and the knowledge gained from testing the developed tools and schemes hands-on in a home environment. The initial findings indicate that both spatial and sensory experiences are interactional, as experiences situated in a specific body interacting with the specific environment it is situated in. Furthermore, in addition to the changes in visual perception, the spatial and luminous characteristics of the indoor and outdoor environments are also dynamic and changing, making the aspects of transitions and thresholds relevant for our upcoming fieldwork. Our hypothesis is that the shared technological frame developed in the project includes the relevant qualitative and quantitative measures that will allow us to make the knowledge of visually impaired participants explicit in ways that will inform and improve future lighting design.

Keywords: Field work, everyday life, domestic lighting, incipient vision loss, methodological framework

1. Introduction

Light is paramount for humans in terms of both our visual perception and the non-visual support of our health and well-being. However, light is even more crucial for people experiencing visual impairment. On the one hand, light is decisive for their residual vision to function. On the other hand, the threshold between the light working as an enabler or disabler is marginal and dependent on small variations in

light quality, position, and direction [1]. The human eye and vision change with age, yet the process of losing sight remains an unexplored phenomenon for most of us, much like in the field of lighting. A 2019 special issue on lighting research methodologies addressed approaches to understanding and working with human responses to lighting. The contributions represented scientific rationales from the laws of physics that have characterized the field of lighting for many years: psychometric principles [2]; photometric and radiometric measures [3]; metrics of theories and techniques for assessing, measuring, and quantifying elements. However, the authors of this special issue also acknowledged the interdisciplinarity of the lighting domain and that light affects humans in multiple ways, both physically and psychologically: "Lighting quality exists in the balance of meeting needs, integrating with architectural elements, and addressing energy and environmental considerations" [2]. The human-experienced light cannot be isolated into single factors and treated individually since it is always "interacting and simultaneous" [4]. "Science, technology, engineering, and mathematics – leave out humanity…[by] not consider[ing] any of the many fields of knowledge that do understand people..." [5]. Consequently, Norman stressed the need to expand or complement the unintelligible and abstract metrics of STEM methods, with meaningful insights relating to humans and their quality of life. Contrary to the averages and accuracy of physical sciences that aim to generalize measures from any specific context, humans are context-sensitive and insights on contextual aspects and meaning can be gained by qualitative approaches [5]. Kelly argued that lighting researchers can learn the practice of qualitative research from the humanities and their methods in exploring complex issues of human behavior in post-occupancy evaluations and case studies [6]. Thus, social sciences, philosophy, phenomenology, and anthropology can provide useful theoretical frameworks for exploring human-environment interactions in architectural research [7]. In line with cross-disciplinary learnings and attempts to cover a more diverse understanding of functional abilities, architectural researchers also borrow concepts or frameworks from other disciplines [8]; however, the methodological considerations of implementing these in a mixed-method practice are seldom described. This paper is an attempt to put these considerations on the table by addressing the following research question: How can we develop a methodological framework for exploring sensory and spatial experiences? This will be tested in the case of understanding the everyday lives of the visually impaired in their luminous home environments. Moreover, we discuss how the findings from this initial inquiry can inform our further work across the quantitative and qualitative approaches to lighting in our empirical inquiries.

2. Background

The research project "The role of light when the vision changes," running from 2023 to 2026, aims to investigate the role of lighting in and around the home in sustaining activity and engaging the everyday lives of visually impaired individuals. For the group of researchers, this involves learning more about enabling and disabling aspects of light in everyday situations while simultaneously challenging our understanding of spatial and sensory perception. Our hypothesis is that translating the findings of this study to the practices of lighting design, architecture, and planning will ultimately support the well-being of citizens experiencing vision loss in the future.

The current project involves three work packages: 1) field studies testing and developing the methodology as well as gathering data on the role of lighting for the visually impaired; 2) design laboratory developing design parameters and scenarios from the empirical material collected in the field work; 3) designing interventions for optimizing light in a housing association. The aim is to translate the findings of the first work package to the practices of lighting design, architecture, and planning in a way that can hopefully support the well-being of citizens experiencing vision loss in the future. The field studies will provide knowledge on the transition between age-appropriate normal sight, incipient vision loss, and impairment and on the role of light as part of everyday life for this target group.

During the winter of 2023/24 and summer of 2024, we will visit 40 participants (55+ years), including a group of 10 normal-sighted participants and 30 participants representing different types of visual impairments (impairment of peripheral vision, central vision, or a combination of both). However, the following question remains: How can we explore this two-fold phenomenon—i.e., the change

processes of vision loss and the reconfiguration of everyday life, including the relationships with and use of their luminous home environments—with our participants?

The overall project has been assessed eligible for exemption from ethics review, and informed consent will be obtained from future participants, yet for the initial inquiry presented in this paper, the participants involve the five authors and is therefore not subject to the GDPR regulations. This initial inquiry within the first work package identifies and describes the pool of methodological approaches to light within the project group, and what changes the contexts of housing research and lighting design have initiated.

3. Theoretical framework

In physical science, knowledge has been closely related to the ability to measure. However, contrary to the precise measurements of scientific methods aiming for generalizability, qualitative and more open measures of ethnography aim to understand context-specific aspects. Qualitative insights can be more difficult to measure due to a range of different and dynamic variables, where much of the complexity of human behavior can be lost in an abstract measure. Quantitative and qualitative approaches are fundamentally different, and the act of combining or mixing methods (e.g., numbers and narratives) can be a delicate matter in terms of both how to empirically collect them and how to coordinate their input, with one providing facts and the other providing meaning [5].

Kelly's [6] two first points for good quality qualitative research within the field of lighting concern interviewing techniques and the "critical reflection of interview data and technique documented." He further describes how the iterative process of qualitative research, where a research question might evolve and expand as the research progresses, makes the different parts of this process closely interrelated. As such, the adequacy of methods depends on the research question. Knowing the analytical framework and scope is useful when designing the overall research, while specifying the participants and developing an interview guide are also important. The possibilities of this exploratory approach are massive, but to navigate them, the reflexivity of the researcher is essential in terms of the research, participants, findings, and the researchers themselves.

The concept of technological frames can help us explore the design and development processes of technologies. A technological frame describes a shared framework for how a given technology or artifact is understood in a social group and was first introduced by Bijker in 1987 in an analysis of technological innovation [9]. The technological frames of a given technology structure the use of it; however, they are also at stake across designers, engineers, and other groups in design processes. A technological frame holds a common understanding of goals, key problems, theories, rules of thumb, and testing procedures, thereby structuring the thinking, problem-solving, strategy formation, and design activities of the group sharing the specific frame. Bijker later used this concept to analyze the historical development of fluorescent lighting during the first half of the 20th century [10]: by showing how opposing divisions of the US Government, lamp manufacturers, electricity-producing utilities, and housewives—representing different social groups with various technological frames—played part in negotiating and stabilizing the technology today known as the fluorescent lamp. The technological frames that were established nearly a century ago—with some arguing for the health-improving aspects of the technology—have been refined and developed ever since. In this paper, we use this concept to study the small steps of method development of implementing qualitative measures in a predominantly scientific field.

4. Methods

The methodological development has been the focus of the first work package, which has involved developing a methodological framework that can allow us to explore the sensory and spatial experiences of the visually impaired in their luminous home environments. In addition to studies from the literature, this development process has been facilitated in three steps: 1) assessment of an existing method from low-vision rehabilitation; 2) reflective discussions of individual, autoethnographic narratives of our existing methodological approaches and technological frames; 3) testing our toolbox in a home setting.

One of the project's main objectives has been to refine a method developed in low-vision rehabilitation with further inputs and contributions from the field of lighting design and architecture. The method for lighting assessment and intervention “Better Light, Better Living” (BLBL) was developed and tested by the Center for Special Education, Slagelse from 2017 to 2019 [11], included a narrative interview, vision- or task-related surveys (visual function questionnaire and performance measure), light measurements, and documentation through photos and plan drawings. The initial assessment of BLBL involved the investigation of documents and previous observations [1; 12] evaluating the relevance of the elements from the original method in relation to the fields of housing research and lighting design, and what elements to include in our methodology and toolbox.

In three workshops held during the spring and summer of 2023, the methodology and tools were discussed in relation to our own background practice knowledge, theories, and approaches, including the different approaches to lighting. In preparation for one of the workshops, we drafted individual narratives of our understandings of and approaches to lighting.

To decide what measures and instruments to involve in the fieldwork, as well as how best to operationalize these in the interviews and observations, we conducted a test in the home of one of the group members. With the narrative interview as a point of departure, the adjusted framework was demonstrated in a semi-structured manner by asking and continuously discussing the elements and the process of the interview, such as the introduction, positioning, sequences, and the relationship between the researcher and the participant in this inquiry.

The meetings and the tests were recorded and transcribed. Furthermore, reflections, decisions, and unsolved issues from the meetings were documented in a project log, which, together with PowerPoint files, photos, different versions of schemes, fieldnotes, and drawings have served as the basis for analyzing the methodology development described in this paper.

5. Inquiry on autoethnographic narratives

The project group includes a lighting designer and current Ph.D. scholar, an accessibility consultant with a background as a naval constructor with the lifelong experience of turning blind from retinopathy of premature and later cataracts, and three researchers sharing an architectural background that have different approaches to lighting in their work (i.e., mixed-method measures of daylight and atmosphere; lighting as part of building processes and regulation; lighting and its role in everyday life and among visually impaired). As an initial inquiry into our existing pool of approaches and methodologies, the group members were given the task of describing the individual practice knowledge at stake when working with or experiencing lighting.

Insider knowledge on living with visual impairment was provided by Anette, who stressed that people use their residual vision differently and that even “a visually impaired person sees in two different ways, one with each eye”. Her right eye has never been functional, making her unable to see depths. Consequently, adequate lighting and color contrasts have always been essential for her ability to detect level differences. From school age, she used the residual vision in her left eye (6/60 in first grade) and could read normal text and ride a bicycle (on known routes) until 31 years old, when she got cataracts. Reading was assisted by light with high lux levels from a specific direction and reading at a distance of 5 cm or by using a magnifier, reading glasses, or a monocular. Riding a bike was possible on a cycle lane separated from traffic during daylight hours when the lane was visible and contrasted against the pavement. Between the ages of 26 and 31, she could only see the streetlights at night, which she actively used as important direction indicators, supplementing the use of a white cane. After the cataract, her visual acuity of 2/60 decreased due to major complications from surgery. Today, her vision only perceives focused lighting contrasting darker surroundings. Thus, lamps or windows can enable her orientation as a supplement to the use of a white cane.

Visual impairment is further known from a second-person perspective by Turid, who has followed BLBL and the group of low-vision consultants and their clients in developing and testing the lighting assessments and interventions in their practice. They explored the role of lighting in low-vision rehabilitation as it unfolded in the interactions between consultants and participants in the homes and

the lighting lab. In participatory observations, ethnographic methods were combined with a spatial/architectural focus by mapping the narratives and scenarios in drawings and photos since the conversations typically addressed spatial, physical, and relational conditions. The observations also included the metrics used for evaluating the physical environment, the interview guide, and the overall assessment design. The low-vision consultants' theoretical frameworks were based on recovery and rehabilitation, and their tools for home visits included surveys, a semi-structured narrative interview, tools for visual performance testing, a spectrometer, a camera, paper, and a pencil. Some of the fieldwork was conducted in the homes of the participants months after the lighting interventions and employed walk-along interviews that involved following the participants as they described the different situations of their homes. Turid's theoretical lens, which was applied in the studies of the low-vision consultants at work, was based on socio-material frameworks such as science and technology studies, practice theory, and architectural anthropology. Spatial assessments were documented in descriptions, drawings, and photos, while sensory perceptions were represented in second- and third-person inquiries.

Another approach to observation is held by Anne Kathrine, which departs in a more architectural assessment of light by including the view of the room, its orientation, rhythm, position, and window distribution, and how the light interacts by and with contrasts, colors, surfaces, and reflections. In these observations, she uses her own perception: How are the contrasts between illuminated objects and the ambient light levels? How do materials and objects look? Are details visible or not? Are there different light characteristics? Soft, sharp, or precise? How do window openings convey the transition between inside and outside? Her theoretical framework has largely involved a phenomenological understanding documented by photography. Interviews have been conducted to understand other people's uses and perceptions of space, architecture, and lighting but with a focus on architectural assessment.

Compared to Anne Kathrines more overall and multiple architectural assessments with user input, Nanet has a more focused approach to lighting, observing light and space. For her, lighting is always dependent on the simultaneous presence of light sources, materials, and the human eye, which is why it relates to physical radiation in the electromagnetic spectrum between 380 and 780 nm. Light is understood as both spatial and material [13], and is explored through light level, light distribution, shadows, reflections, glare, light color, and surface color [14]. However, by drawing on a mixed-methods approach expanding beyond light geometry, Nanet has also drawn on phenomenology and meteorology in her studies. Consequently, this has involved assessing both measurable and non-measurable aspects, such as measuring lux levels, mapping the daylight factor, analyzing the intensity and distribution of light in the room combined with the perceived visual environment. The interaction between the light and the surroundings is assessed by measuring the reflectance of the surfaces and the light transmittance of the windowpanes. Furthermore, her phenomenological observations largely represent a first-person perspective focused on spending time at the location, moving around, and observing the dynamics of the daylight. Photography has been a key mapping tool used to document and maintain the registrations (both single frames and timelapse). By compressing time, the latter has been shown to effectively highlight changes in the light.

Photography has served as a path into the field of lighting for Senja, who was drawn to the different phenomena of light in spaces and their connections to humans' emotional states. Starting as a lighting designer in film and television by creating atmospheres and storytelling, she later started focusing on optimal lighting for different users (e.g., supporting the healthy sleep-wake cycles of the elderly in elderly care facilities). In terms of methodology, user experiences of lighting were assessed by ethnographic interviews and combined with more traditional light measurements such as illuminance on task areas, luminance-based uniformity assessments, and evaluating the quality of the spectral power distribution of light in spaces.

As shown in Table 1, the project group represents different methodological approaches and theoretical framing of lighting, including different positions in first-, second-, and third-person inquiries. The last row represents the low-vision consultants' approach.

Table 1. Paradigms and tools of the individual group members.

	Research paradigms	**Tools – spatial perception**	**Tools – sensory perception**
1	Autoethno-graphy	Narratives – Needs and (dis)abilities regarding light levels, direction, magnification, distance, and contrast.	First-person personal observations related to situations and the trajectory of impairment.
2	Science and technology studies practice theory, and architectural anthropology	Observations/descriptions of everyday practices and socio-material interactions. Mapping, drawing, and photos.	Second-person (walk-along) interviews and third-person observations.
3	Phenomenology	Observations and architectural assessments – Orientation, rhythm, context, windows, relationship to space function, contrast, reflections, and photos.	First-person personal observations – How do space and things look? Second-person interviews.
4	Meteorology and phenomenology	Observations and mixed-method lighting assessments. Luminance mapping, daylight factor, lux levels, and photos.	First-person observations of dynamic daylight.
5	Ethnography and lighting engineering	Observation of atmospheres, photography, Illuminance mapping, and luminance-based uniformity assessments.	First-person assessment and design process and second-person interviews.

6. Assembling the empirical toolbox for sensory and spatial fieldwork

6.1. Spatial mapping

In the first phases of the methodology development, the architectural focus was refined in a spatially funded model representing our assessment of domestic lighting (see Figure 1).

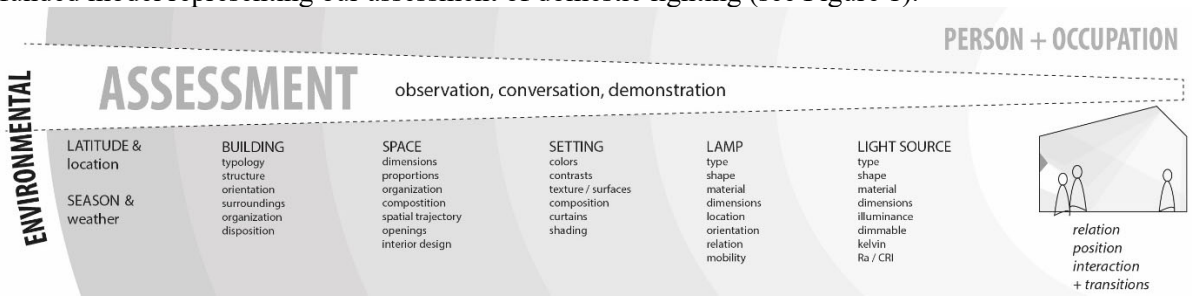

Figure 1. Model for assessing the spatial setting of the building environment and its lighting technologies.

In this understanding, light is not only situated across physical scales from the luminaire to the setting, space, room, building, and close context but also in regard to the personal relationship with and use of the light. The assessment would involve observations, conversations, and demonstrations led by the

participant, as an expert in both this specific environment and of their own condition and everyday life. The personal will be unfolded in the interview but always in relation to the spatial setting. Three categories combining the personal and the environmental—relation position, and interaction—were added as focal points for the assessment.

6.2. Interview guide/mapping the user's everyday practices and sensory experiences

This section raises an important question: How do we get hold of the participant's expert knowledge of perception and everyday life? Our inquiry will focus on understanding the status quo. However, involving the participants as experts in their own everyday lives and with their visual impairment is a key parameter to be taken from BLBL. Although people are often unaware of their behavior, interview questions can enable personal reflections on perceptions and experiences. Knowing that our analytical framework would focus on the role of the home environment and the lighting conditions within the interactions of everyday life, an objective of our design of the interview guide was that it should guide a spatial trajectory from entering the participant's home when seated in a traditional interview-setting or walking across the different spaces in a walk-and-talk interview. The group members' previous experience from conducting walk-and-talk interviews indicated that it was important to be able to "go with the flow" of the conversation and follow up on the way that spatial and material artifacts are put into play by the interviewee. By zooming in and out on details, situations, and activities, as well as the thresholds and transitions between these, we discussed using a diagram to facilitate the narrative interview in order to facilitate a more fluid and less structured scheme, which was inspired by the interview guide of the low-vision consultants.

7. Test: Preparing the toolbox for implementation

The following section concerns our reflections on the different elements of the first test of the methodological framework, on what tools to include in our toolbox, and how it would be appropriate to use them during the visit.

In this test, the toolbox included a practical bag equipped with a clipboard, pens/pencils, a ruler/ distance meter, and squared paper/a sketchbook for taking field notes and making simple sketches. Moreover, we had developed three schemes. Schema A includes a checklist for the visit, listing each step from the greeting and welcome to leaving the place. The checklist also includes a simple guideline for how to use mapping techniques such as signatures, measurements, and photo documentation. The spatial mapping would be documented in schema B and prepared with a plan drawing (specifying scale and direction), and diagrams for mapping weather conditions, time of day, and season. Schema C included the interview guide addressing the participants' narratives, including their descriptions of their sensory experiences. The first draft of the schemes, was discussed during our visit, and a range of issues were processed—the most relevant of which are described in the following sections.

7.1. Scaffolding the narrative interview

The overall objective of the study is to learn more about the role of light in the everyday settings and lives of people experiencing vision loss. Consequently, the main question of the interview guide would be what issues the participant has experienced, first of all regarding their current vision and lighting condition in the specific setting and at the specific time of the interview. Since we expect problems to be related to different situations, such as task-related activities, social settings, and orientation/wayfinding, we need the questions to be rather open. On the contrary, if there is a need to push the conversation forward, sub-questions could expand to past or future conditions and other contexts, and relate to changes made to the physical condition, physical setting, or workarounds in developing new ways or approaches to their activities. When discussing the interview guide in schema C, the group decided to include a more traditional list of questions and a process diagram that—together with the semi-structured interview diagram—could facilitate a more flexible guide to the narrative interview. To allow the flexibility of moving around in the dwelling more freely, a clip-on mini recorder was used for recording the interviews.

Furthermore, field visits have shown that the conversations were largely supported by our presence in the specific environment. In this sense, the interview also draws on schema A, while the spatial mapping and use of the plan drawing could also be incorporated as the participant describes specific issues.

7.2. Lighting measures

The methods for conducting the lighting measures should accommodate both the novice and the more experienced practitioner since our experience in assessing light and conducting lighting measurements differs within the group. Simple lux measurements will be conducted in the activities and settings identified in the narrative interview. In a seated activity, the instrument is placed horizontally on a surface (e.g., a table) facing upwards, or at 85 cm height in a spatial setting (the measure is noted in the plan of schema B). If an activity involves social interaction across a table, the light measurement will need to be done vertically, corresponding to the position of the face and torso of the other in order to map the conditions for interpreting body language. If the activity involves a range of positions or viewpoints, it could be relevant to take a series of measurements. The position, relation, and interaction between the participant and the light will be noted in either photos or field notes.

Even for the more advanced lighting measurements, the participant-led decisions on what and where to measure could differ from the regular lighting assessment. Consequently, *how to measure* was discussed in our development. Since the light of interest was contextualized within the participant, the light was not an objective condition. The measure could say something about the physical environment, but not about how the participant perceived this. Therefore, the light measurements will be of secondary importance when compared to the interview. They will be indications of light levels but always accompanied by observations. However, to understand the perception of the participant, we also need to engage our own visual perception of the specific environment in the conversation. Subsequently, in the case analysis, the lighting measurements will support triangulation by providing valuable input to the settings and situations described by the participant while facilitating further assessments across the different cases.

Perhaps one of the most professionally informed understandings of spatial perception among architects and designers is the importance and relevance of transitions and thresholds, which we had recognized during our project development process. In contrast to the scientific approach, the architectural approach is concerned with a holistic whole rather than individual parts, as well as trajectories rather than snapshots, to understand the everyday lives of the participants. We have planned two visits—a winter and a summer visit—to cover the seasonal transition. If these could be arranged so that we covered the day and night as well as natural and artificial lighting without the need to black out the daylight, this would frame different lighting scenarios just from the timing. In the interviews, we would ask about specific activities within the home as well as transitions between activities or the act of moving across the space—or zooming in and out between a focused activity and orientating. Furthermore, exterior settings close to the home would be another transition of relevance. Therefore, taking a series of light measurements representing the movement across different spaces could also be relevant.

Upon discussing the role of the lighting measurements, it was clear that while the lux value was in itself less relevant, it serves an important role as a fragment of the larger situation and setting. Therefore, the position and direction of the measurement would be as important as the measurement itself, while the mapping would involve a plan drawing and the use of photos. During our round of reflections on the measurements, we recognized that taking the measurements could be used as a tool for exploring the settings and issues (e.g., assessing the relational aspects at play in transitions and thresholds). Furthermore, since the luminance photos could potentially be used to support the succeeding assessment of the light distribution in a problematic setting or understand the transitions and thresholds between different positions or activities, in addition to the more detailed luminance mapping, we decided to include a simple version of the luminance photo in the documentation of one or two specific situations.

7.3. Multiple roles of photography

From the beginning, documenting the home environments and specific activities of concern had been an essential part of the method. Since the fieldwork would involve 40 different home environments, photo documentation would allow us to revisit the empirical material by analyzing the contextual complexity of the samples. Photos can support the memory of recalling conversations and the atmosphere of a place. Upon discussing the role of the photos, we recognized that the act of taking the photo—similar to the act of taking light measurements—serves a role in the assessment. As an aspect of the otherwise tacit knowledge of conducting architectural research, observing an environment through the lens of the camera serves an important role. Moreover, from the brief discussion on the role of photography in each of the group members' practices, we seem to have different opinions, objectives, and pay-offs from engaging in this kind of visual inquiry, which will be explored in future fieldwork. A particularly interesting area of exploration is how we can document and represent luminous environments. Prior to our test, we had discussed using a longitudinal section motif to register the transitions across a spatial trajectory, yet the initial experience from testing this out in an actual setting has already provided the first alternatives to this approach.

Beyond documenting the environmental setting, the photography will also be tested and explored to understand the visual perception of the participant across our differences in visual abilities through photo-elicitation. It is thought that the photographic lens does not directly represent the human eye with or without impairment. In a situation chosen by the participant, the interviewer will encourage them to choose a relevant position, direction, and framing of the motif using a tablet. This photo could then be a point of departure for the following conversation: “Can you describe how you perceive this motif?” This is followed by a reflection on how the interviewer interprets the same: “OK, so from what I understand, this part (pointing at something in the picture) with the brighter area gets blurred the most for you…? What about this field?” In this sense, both the photo and the lighting measurements would serve different roles in the field study, thus enabling insights into understanding the other and documenting the specific setting.

8. Discussion

The purpose of the method development process has been to find ways to support the study of lighting when situated in the everyday settings of people experiencing incipient vision loss. Spatial and sensory perception are aspects that are seldom measured and difficult to align or generalize—at least in a traditional scientific manner [5]. Lighting research has suggested photometric principles and measures [2; 3]; however, to understand how people perceive and consequently act and feel in their environment, we must explore the more complex and dynamic relationships between individual, social, and technical aspects, such as contextual aspects and meaning [5]. We argue that positioning the individual as an expert in their situated knowledge and scaffolding a constructive narrative interview—guided by sensitivity as well as our spatial focus—can enable this kind of insight. In the frame of the conversation, we will draw on both the qualitative and quantitative in the assessment of light. By studying light situated in a specific social and physical context, we believe that we will obtain an informed understanding of the phenomenon. In our case of exploring and challenging the role of the lux and luminance mapping within the conversation and the hands-on assessment, mixing and triangulating will contextualize the measures within the experience of activities and spaces situated in the everyday lives of the participants.

The mapping of the different theoretical frameworks and methodological approaches, as well as the first-, second-, and third-person perspectives represented within the group, have been helpful in acknowledging and coordinating our different practice knowledge. Architectural anthropology, ethnography, autoethnography, phenomenology, and practice theory all represent humanistic theories that aims to understand the human perspective. Science and technology studies may be more focused on the technological aspects of human life, while meteorology concerns physics and mathematics. It must be recognized that even if we share many aspects, such as understanding the technology of lighting in a situated manner and focusing on the socio-material relation of lighting and housing, we are also

different. As different focuses related to positions in an architectural or lighting design process or in construction of knowledge. Our specificity and generalization vary, as well as the use of context-specific knowledge, rules of thumb, and standards. We represent different technological frames embedded in different fields and practices working and engaging with light. We believe that this will eventually constitute a new shared technological frame as we employ our new spatial and sensory methodology throughout our project. Beyond the overall spatial focus, the focus on transitions and thresholds in both research design and our empirical observations has been refined in our methodological considerations, thus adding a broader and more holistic scope of thresholds and transitions between different scenarios and activities. Furthermore, the approach incorporates different measures of the sensorial in the narratives of the participant, the conversations with the participant and observer, and finally the interaction with the home environment. These sensory aspects are scaffolded by light measures and descriptions in both spoken and visual language. We have already discussed the role of representations and empirical data in different phases of the process—as with the photos and light measures serving a role in the conversation—by informing the personal or shared reflections of the researcher and the participant, as well as representation for subsequent analytical processing. Moreover, it must be recognized that although measurements and photos do not represent what either of us perceive, they preserve a section of time and space that can enable us to describe and explore what we perceive. Combining the quantitative and qualitative requires us to navigate in the specific case and we believe our different first, second-, and third-person approaches will help us triangulate reality.

Qualitative research can be characterized by explorative iterations, where the scope and research question develop in the course of the project, which requires the researchers to reflect on the choices made, as well as their consequences [6]. Some elements of the toolbox will be developed along the way, such as the photo-elicitation and the role of the observational drawings. However, even the interview guide has changed since we conducted the test. We have continued refining the schemes in a series of meetings held after the test. In particular, the interview guide has been adjusted to a more traditional top-down sequential list of questions. It remains to be seen whether we will adhere to this or re-introduce the semi-structured diagrams. In this manner, critical reflections on what tools and approaches support us best in gathering data and exploring the phenomenon are highly related to hands-on testing. On a more abstract level, the reflections of adequacy include considerations of the context-specific fit between the research design (e.g., methods, methodology, and participants), research questions, as well as the transferability of findings [6]. In these initial stages, piloting has been essential, and enabled following reflections: How can we articulate light? Can we explore incipient vision loss using visual methods*?*

Furthermore, the anomalies and nuances in our background knowledge would not necessarily have been detected if we had not conducted the test together. This is partly because the aspects recognized and discussed are part of the otherwise tacit knowledge of our practices that were made visible by exploring and testing, and partly because the reflections are a result of these actions. The analysis of our technological frames has helped us recognize the differences in our approaches, which can be used in navigating the project while facilitating critical reflections and triangulation as we move on from field observations to the design lab and design processes. Our task will then once again be to find the right measurements to translate the knowledge to design principles or assess whether interventions can improve the quality of our housing guidelines and design parameters. We hypothesize that transitions, thresholds, and trajectories are elements common to both sensory and spatial perception as well as different spaces and diverse bodies and abilities. The spatial and sensory approach and toolbox developed for understanding the phenomenon of visual perception as a dynamic and changing sensorial condition can be seen as a unique case. Yet, we believe this approach can help us recognize important qualitative aspects relevant to all individuals.

9. Conclusion

This paper provides insights into otherwise tacit practice knowledge of methodological considerations regarding the development of spatial and sensory methodologies for exploring the phenomena of aging and changing visual perception, as well as the role of domestic lighting in the everyday lives of the

visually impaired. Drawing on the theoretical framework of technological frames, the development process has been analyzed in three iterations. First, in our individual narratives concerning our status quo of how the group members of the project would normally approach lighting in our research. Second, in adjusting the approach for the context specificity of incipient vision loss and the home environment. Third, in testing the new methodological toolkit in a hands-on manner through a shared pilot study situated in a home setting with the insider knowledge of a visually impaired group member.

A method adopted from low-vision rehabilitation has been refined to fit the context and scope of housing and lighting research. The overall focuses on personal motivation and the therapeutic have been replaced by a focus on the situatedness of the individual knowledge that can inform future design in a more generalized matter via the collection across patterns and narratives. Ultimately, this can teach us about the phenomenon of incipient vision loss and aging, however the rich data and methods for collecting them can qualify fieldwork in general, such as providing insights on the relation of environmental factors as light and quality of life within housing and lighting research.

We believe that the findings from the initial phases of this study and the shared space for exploration and reflection will contribute to the further development and implementation of the spatial and sensory approach throughout the project, including the practice of operationalizing the quantitative with the qualitative, and vice versa.

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