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Chapter 8:

Lights out? Lowering urban lighting levels and increasing atmosphere at a Danish tram station

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Abstract

This study explores how lighting levels influence people's experience of space and social interactions in waiting areas for public transportation after dark. Existing insights of the effects of lighting levels are often limited to its compliance with technical and regulatory requirements, and seldom address how it *feels*. In the present study, we compare and contrast people's perceptions of space, immediate surroundings and other people in existing lighting at a tram station and with dimmed lighting, lowered as a part of this experiment. This is done through comparative go-along interviews using multimodal visual and sensory ethnographic methods in an architectural experiment with light at an inner-city Danish tram station. To gain a better understanding of how the dimming of light influences the atmosphere and perception of surroundings in the public transit situation, we link anthropological and architectural theory and methods, and dwell on the paradox of darkness being linked to both beauty and fear in the multisensory experience of nocturnal urban changes. This study reveals findings that indicate that lower lighting levels can sharpen our senses and create a more relaxed experience and atmosphere. Additionally, the lower lighting level enriches perceptions of - and connection with – the surroundings, and can increase (perceived) safety. We argue for greater attention to lowering and balancing of urban lighting levels in consideration of adjacent light zones and relating lighting levels to behavior and rhythms in the space. The study demonstrates an interdisciplinary way to draw nearer to people's experiences of lighting in every day (nocturnal) public activities.

Keywords

Architectural experiment with light, urban lighting design, darkness, public transportation, multimodal ethnographic methods, atmosphere, rhythm.

Introduction: Lights out?

In recent years, researchers have noted that people have forgotten to appreciate the aesthetic, social and sustainable qualities of darkness (Dunn and Edensor, 2020). Darkness can sharpen our senses, affect the atmosphere and enrich spatial and social interactions in public space during dark hours. In this study, we look at the role of darkness and light in the urban lighting context through a experiment at a tram waiting area in Aarhus, Denmark's second largest city. We examine how the dimmed lighting introduced in the experiment is perceived compared to the existing bright lighting setting. Focusing on the everyday activity of waiting for – and riding on - the tram amidst the urban rhythm of people, traffic and light, we explore the contradiction between the aesthetic values and safety functions of darkness and light.

Tim Edensor and Nick Dunn elaborate how they perceive this contradiction in their book 'Rethinking Darkness'. They align with; 'the contemporary academic, creative, ecologically inspired and aesthetic reappraisal of darkness that are challenging the long-standing negative associations that have prevailed until recently' (Dunn and Edensor, 2020: 1). We here seek to examine the positive and negative associations and connotations that darkness elicits in an architectural experiment (Rasmussen, 1957; Pallasmaa, 2012, 2014; Hansen, 2014) using anthropological methods to understand the embodied sensory experience of light and darkness in an everyday activity (Pink, 2018; Sumartojo, 2017, 2019; Edensor, 2019; Ebbensgaard, 2020, Thibaud, 2011).

The experiment was conducted at a tram station with urban commuters as part of this everday (waiting and) transport situation there, with light and darkness an experimential element of this (Fig. 1). Tram stations are currently being built in the three largest cities in Denmark to improve urban public transportation and connections to the suburbs, to upgrade the infrastructure, and to reduce car traffic (Jensen, 2017). In December 2017, the first tram line opened in Aarhus. Today, two tram lines and 48 stations connect the city with the countryside. The stations, both side- and island platforms, are implemented in the existing urban built milieu, with a strong visual connection to the surroundings and with traffic on each side. The stations represent a new element in the built urban environment and introduce new routes and rhythms in the dynamic urban context. People come here to wait, and then to move on to their destinations. The stations were designed by Holscher Design in close relation with Aarhus Light Rail and represent a minimalistic and functional design aiming to adapt to the existing urban architecture and transportation system. In order to provide appropriate platform illumination, fixtures are mounted in railings and in the sheltered waiting area lighting fixtures are integrated in the roof structure. Originally, dimmable fixtures were intended here but, to

achieve cost savings, controls for the lighting were never installed. The result is a brightly illuminated sheltered area which in the dark hours contrasts sharply with the downward directed low fixtures in the railings and the less brightly lit surroundings. We were interested in how people experience the rhythm of the local space and the surrounding context at Nørreport when they arrive at the tram station to wait for the tram. What effects does the lighting level have on their experiences?

Figure 1: Photos of Nørreport tram station illustrating the change of experience of the local space and the surrounding context during transition hours

In the following we introduce an experiment with dimmed light at a tram station, and provide a description of methods used to observe and attune to the place and gather empirical data *with* participants (Pink, 2015, 2021; Waltorp, 2020). We then go on to present the analysis of participants' experiences of dimmed light at Nørreport station and focus on the four themes; 1) atmosphere in the waiting area, 2) connectedness to context, 3) connectedness to people and 4) experience of people's activities in the mobile situation. We argue that lower lighting levels produce a relaxed atmosphere and create a visual connection between the waiting area and the surrounding urban context. We conclude that comfort and feelings of safety can be increased in the dimmed lighting at the station, but underscore that the lighting levels must be balanced according to the light levels in the immediate surroundings, people's activity in the area as well as the social interactions taking place to benefit optimally from the sensory and affective feelings to which light can contribute.

Analytical Framework: Light and darkness

The Nordic architectural tradition is rooted in a phenomenological approach concerned with how people experience space. Steen Eiler Rasmussen (1966) argues that architecture should be understood and experienced with all the senses in his book *Experiencing Architecture*, discussing how space, materials and rhythm must be felt, and emphasizing that light has an important role in telling the story of the experience of the built environment (Rasmussen, 1966: 33). The architect Juhani Pallasmaa (2014: 230) describes this phenomenological understanding of the quality of an architectural reality as 'a complex multi-sensory fusion of countless factors' and highlights the role of the peripheral

vision and how peripheral vision integrates us in space and lead us to spatial and bodily experiences (Pallasmaa, 2012: 15, see also Gibson, 2014).

Lighting is a factor that not only co-constitutes the optical qualities of a seeing in a space, but also very much the experience of the surroundings in the dark hours. Therefore, we should be aware of the balance between lighting in any given local space for visibility and lighting in the immediate surroundings to enable and reflect both the central focus and the peripheral vision. When focusing on the aesthetic values of lighting, Pallasmaa clearly demonstrates his opinion on too much diffuse light by stating that 'Homogenous bright light paralyses the imagination in the same way that homogenization of space weakens the experience of being, and wipes away the sense of place' (Pallasmaa, 2012:46). Pallasmaa continues with an elaboration on the qualities of darkness: 'Deep shadows and darkness are essential, because they dim the sharpness of vision, make depth and distance ambiguous, and invite unconscious peripheral vision and tactile fantasy' (Pallasmaa, 2012: 46).

To gain a better understanding of the relationship between light, darkness and atmosphere in the urban context, we also draw on the phenomenological theories of Gernot Böhme, who describes the ability of light to unify how the urban context 'illuminations are perceived as atmospheres' because 'all of what is seen takes on a tint that turns the diversity of what is seen into a unified whole' (Böhme, 2017: 202). Böhme uses the theatre as an example of how to articulate an aesthetics of atmospheres (Böhme, 2013). In theatre, lighting has a powerful role in creating atmospheres to enrich the story being told, including the story's emotions and rhythm. Lighting brings life to the stage, the actor and the drama. In the same manner, lighting can be designed to support the urban space, the pedestrians and their actions (Hvass and Hansen, 2021b). The ways in which light and darkness can influence atmosphere in the nocturnal urban context have gained increasing awareness in recent years, as mentioned above (Dunn and Edensor, 2020; Edensor, 2015a, 2019; Pink and Sumartojo, 2017, 2018, 2019; Thibaud, 2011). Both in permanet light installations and at urban lighting festivals featuring temporary light installations in an urban context, the atmospheric qualities of lighting are being unfolded (Edensor, 2012a, 2015b).

Edensor and Dunn explore the multiple meanings and uses of darkness across time and space, specifically how darkness has been laden with negative attributes throughout history and how, on the contrary, the positive aesthetic and sensory experiences of darkness *can* prevail (Dunn and Edensor, 2020). In contrast to this approach and related insights, increased illuminance is often combined with a higher degree of perceived safety and less crime within research in the quantitative

engineering disciplines of outdoor lighting. When doing tests with higher lighting levels in neighborhoods with high crimes rates, robberies, physical assaults etc. are reduced (Boyce, 2019) and traffic safety can also be improved (Gibbons, 2014). These are measurable indicators that clearly demonstrate the benefits of an increased lighting level. Occasionally, though, the higher lighting levels have an unintended effect because the human aspect of how the lighting feels is disregarded. The aim of this project is to achieve a more fine-grained understanding of people's experience of a specific urban space when we dim the light. We do this paying attention to whether and how lower lighting levels influence the experience of 1) atmosphere in the waiting area, 2) connectedness to context, 3) connectedness to people and 4) experience of people's activities in the mobile situation.

We frame the complexity of a public transit situation in relation to mobility in terms of the rhythm of everyday human practice in the waiting area. At the station, everyday patterns of movement and activity are 'characterized by immanent and emergent possibilities as well as repetitive rhythms' (Edensor, 2012b:14). This layer of movement, rhythms and constant changes due to car and tram traffic also has an influence on the lighting in the space, and is an important element in understanding the space. Furthermore, the presence and flow of people is an important factor that should be considered when aiming to understand how dimming of the lighting level is perceived. Such co-presence can be defined as simultaneous presence of individuals in the same physical location, but not necessarily engaged in face-to-face interaction with each other (Goffman, 1967). As a part of the public realm, Lyn H. Lofland describes 'urban settlements in which individuals in co-presence tend to be personally unknown or only categorically known to one another' (Lofland, 1998: 9). The dimming of the lighting should also support conscious and unconscious meetings between people - a social layer of light that should be designed to meet their needs (Slater, 2015).

Combining architectural and anthropological methods in an experiment

Limited research has been done that bring architectural and anthropological methods into dialogue in experiments with light. Anthropologists strive to understand people's situated experiences, perspectives on- and attitudes to a given phenomenon. Architects focus on describing the physical spatial context based on own observations, sketches and analysis of the space to suggest design improvements, with limited evidence of how people actually experience the space.

The architectural investigation of scale, spatial hierarchy and atmosphere (Rasmussen, 1966, Pallasmaa, 2012, Zumpthor, 2006) is rooted in the architectural design tradition of experimentation in a real context (Schön, 1991), as 'The practice of architecture demands the

resolution of a complex web of problems in arriving at contextually determined decisions' and the architectural experiment is a tool to arrive at these design decisions (Hansen, 2014: 614). The architectural experiment is based on analysis, informing the definition of the design criteria before the actual experiment is designed and tested (Hansen, 2014). What might be called a pilot study in Anthropological terminology. In this project two such analyses of elemets were conducted by the first author: one in the field and one in the lab. The first analysis (Hvass and Hansen, 2020) consisted of so-called "systematic architectural registrations" of the complex urban context. These were conducted by the first author, who is an architect by training, to analyze the role of lighting at the tram station and the surrounding urban context. Registrations were specifically conducted through a "serial vision" study (Cullen, 1997), conducting a serial of architectural photo registrations walking towards the station and capturing the experience of spatial relation between the station and the surroundings. Furthermore, registrations of being at the station were conducted through photos, architectural sketches and through interviews with travelers waiting for the tram (Spradley, 1979). The second analysis was an examination of people's experience of lighting levels between a localized space and the immediate surroundings which was conducted in a Lab setting (Hvass et al., 2021a) gathering information for the design of the final architectural experiment at Nørreport station.

Concept sketches presented later in this text have been used as an architectural tool, partly during the data collecting period and partly during the analysis of the results to illustrate spatial hierarchies. Sketches were produced in a reflection-in-action process (Schön, 1991) and in an architectural problem-solving process to obtain 'backtalk of self-generated sketches' as the architect and researcher Gabriella Goldschmidt describes the outcome of sketching (Goldschmidt, 2003). The practice of drawing has been used in the research process to frame themes between the authors, while in the final text, the sketches aim to evoke and illustrate to the reader findings on the role of lighting in urban contexts. Likewise, photos and luminancemaps aim to visually demonstrate the difference between the existing and the dimmed lighting setting, at the station and in relation to the regained contact to the surroundings when dimming the light[1].

The anthropological approach used in this study combine traditional ethnographic methods (Spradley, 1979) and multimodal visual and sensory ethnographic methods (Dattatreyan and Marréro-Guillamon 2019; Pink, 2015, 2021; Gaver, 1999; Waltorp, 2020, 2021). Go-along interviews were conducted over one week in the existing lighting setting and one week in the dimmed lighting setting. This aimed at an understanding of how the dimmed light influenced the atmosphere in the

[1] Concept sketches, photos and luminancemaps were produced by the first author

space and participants' experience of connectedness to the context and of waiting together with other travelers. Methods of visual and sensory ethnography have been well described in recent work on urban light and darkness experienced while walking (Sumartojo and Pink, 2017, 2019), giving a rich insight into the complex urban 'lit world' by gathering participants' experiences of everyday routes and light (Sumartojo and Pink, 2017), automated light (Pink and Sumartojo, 2018), and the authors' own experiences in light walks (Sumartojo and Pink, 2019). By investigating the mobile activities inextricably connected to the waiting at the tram station through go-along interviews, the change in lighting level in the architectural experiment was connected to the repetitive rhythms in the mobile situation (Edensor 2012b; Lefebvre, 2013). This fostered an opportunity to gather experiences of urban lighting 'toward understanding lighting as part of a configuration of things and processes that make up a perceptual environment—in this case, a lit one' (Sumartojo and Pink, 2017:18). Drawing on both the architectural and anthropological approaches in this search for the human sensory experience of a space 1) atmosphere, 2) connectedness to context 3) connectedness people and 4) people's activities in a dim lighting in the complex urban context, we see it as an advantage to work *with* people in an explorative vein rather than having a predefined template with more closed guides question-answer interview or questionnaires.

The architectural experiment: existing light vs. dimmed light

The site: Nørreport tram station and surroundings

Nørreport tram station is on the edge of Aarhus city center, and serves trams heading in the direction of the suburbs or towards Aarhus' main train station. It is located next to the intersection of the busy street Nørrebrogade and the less busy Nørregade. A two-lane road passes each side of the station and it affords an unobstructed view of the surrounding urban space. From the station, a three-story residential complex is visible on one side of the street (Fig. 2); on the other, a four-story building with a fitness center and a convenience shop on the corner, a three-story office building and a three-story residential property are located.

Figure 2. Photos of Nørreport station in existing and dimmed lighting settings with a residential complex in the background

The station thus acts as an island in the middle of the road with a pedestrian crossing connecting from pavements on each side of Nørrebrogade. It consists of an arrival area with a check-in stand for tickets and a sheltered area with benches in the middle of the station; it is in this latter area that the lighting is dimmed in the experiment. On each side of the sheltered area, railings function as standing furniture that people can lean against while waiting. The sheltered area is illuminated from fixtures installed in the ceiling, which were dimmed in the experiment. The rest of the station is lit by fixtures in standing furniture and railings mounted at hip height. Two lit commercial posters are installed under the shelter, located on each side of a glass wall and dividing the platform in two. The roads on each side of the station are illuminated by street lighting on masts. The experience of the urban lighting at this specific location is characterized by a complex mix of: the headlights from cars driving past, the rhythm of the traffic lights that glow in alternating red, yellow and green, the white tram that arrives and reflects the light from the shelter, and the tram's lights that illuminate the tracks when it arrives. This mix of traffic light is combined with the light from the buildings around the station, with lights that are turned on and off depending on the rhythm of the occupants, and a fitness center and a convenience shop that are constantly lit with a high light level. This detailed description of the lit world reveals the complexity of both static and dynamic light in this site and highlights the importance of balancing light between a lit space and the architectural, social and mobile traffic context.

The existing and dimmed lighting setting

The shelter ceiling light in the waiting area was dimmed using a neutral density filter attached on the fixture front. The filter reduced the lighting level without compromising the quality of the light and the ability of the light to reproduce colors. The lux levels in the surroundings, measured horizontal on the pavement close to the surrounding building facades, varied between 1 – 6 lux except in front of the convenience shop, where 80 lux was measured on the pavement in front of the shop. At the station, the lux levels under the shelter were approximately 165 lux in the existing lighting setting and in the dimmed lighting setting, approximately 20 lux. This led to an approximately 80% lowering of the horizontal measured lux level on the ground (Fig. 3 and 4).

Figure 3. Photo of the existing lighting setting in shelter ceiling

Figure 4. Photo of dimmed lighting setting in shelter ceiling

Luminance maps were produced to document the differences in luminance levels on vertical surfaces (Fig. 5) in the existing and dimmed lighting setting. The luminance maps illustrate how the dimmed lighting setting enables visibility of the surroundings compared to the existing lighting setting (Fig. 5). With the dimmed lighting setting, the glass panels under the shelter roof appear transparent and therefore the buildings on the other side of the street become visible, as was initially intended in the design of the station. Timelapses produced during the twilight documented the change in 'the scene' from daylight to electric lighting, capturing how the tram station and the surroundings changed over time - and how the electric lighting 'transforms' the appearance of the space in the dark hours (Fig. 1).

Figure 5. Luminance maps, illustrating luminance levels in existing and dimmed lighting settings and how differences in luminance levels impacts on the visibility of the surroundings.

Research Participants

Research participants were recruited via Facebook posts in groups related to Aarhus Tram, through the Consumer Council 'Tænk' and 'Passagerpulsen' and via friends and acquaintances; this yielded ten participants for two interviews each. The group of participants represented different kinds of people, with a mix of commuters and occasional tram users, both women and men, with some in their 20ies and others in the mid-50s to late 60s. Prior to the interviews, all participants were informed that they were to experience two different lighting settings and they were asked to take 2 – 5 pictures of a tram station in Aarhus before our first meeting. The recorded interviews were transcribed and coded, sorting the material and manually detecting and recognizing themes relating to atmosphere in the space, surroundings and people.

Go-along interviews and participant's photos as probe

The experiment took place in November 2020, a time of year when it is cold and cloudy in Denmark[2]. Participants were interviewed after dark between 5pm and 8pm. The go-along interview consisted of two meetings: the initial interview was conducted in the existing lighting setting and a subsequent interview in the dimmed lighting setting. The interviewer met each test participant at Nørreport station twice and took the tram to the next stop, Universitetsparken, and then back to Nørreport (Fig. 6). Walking with other people, with a camera, is a rich sensory ethnographic method, which places the interviewer and the participant on a common ground in the multisensorial activity of moving together and finding a path together (Pink, 2007, 2021; Waltorp, 2020), and this approach draws on both architectural and anthropological methodological traditions. Photos are frequently used in an architectural analysis to get an understanding of space and context (Cullen, 1997). In this case, the architectural interviewer used ethnographic methods to discuss the participants' spatial and social experiences by using their own photos as a tool. The go-along interviews with the tram ride back and forth made it possible to draw nearer to an understanding of the role of light at the station by analyzing the series of activities of which a tram ride consists: arriving at the station, waiting, boarding the tram, the actual tram ride, leaving the tram and finally leaving the station. Again, with a holistic architectural approach, the interviews enable examination of the situation from a specific contextual

[2] The interviews took place after the first lockdown due to the COVID19 pandemic in Denmark; the second lockdown was imposed just a few weeks after the experiment was completed. The fact that people had to wear masks and keep their distance had an impact on the results, and participants talked about differences between behavior at the station before the pandemic and present behavior, with increased distance-keeping from other travelers.

starting point (the sheltered waiting area) while moving about with, and discussing the participants' sensory experience of the urban context in the two contrasting lighting levels.

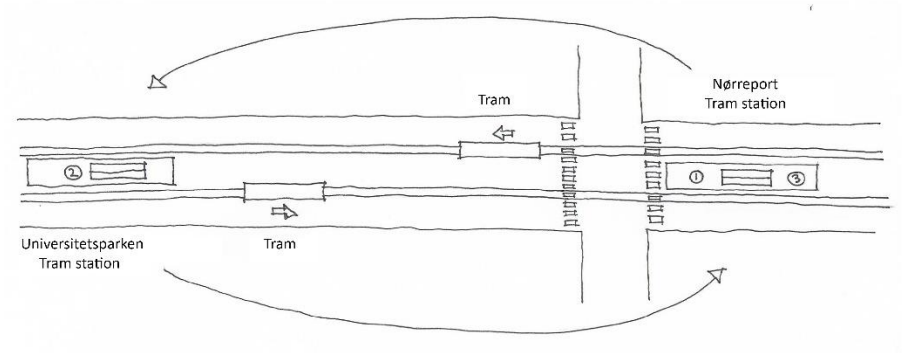

Figure 6. Concept sketch illustrating the process of the go-along interview.

Each recorded interview lasted approximately 30 minutes, depending on the arrival and departure time of the tram. The interview was divided in three parts. At arrival, the test participant was interviewed about the experience of the space, people, surroundings and the lighting. At the tram station Universitetsparken, we discussed the contrasts to Nørreport, and narratives and memories related to previous transit situations were elicited though people's photographs (Fig. 7). When returning to Nørreport, we discussed the 'return' to the station and how this affected the experience of the space. For the second meeting, the lighting was dimmed at Nørreport station. The tram journey was particularly effective, as the differences in the lighting levels between the original lighting setting at the secondary station and the dimmed situation at Nørreport became very clear to the test participants upon returning to Nørreport (Fig. 7).

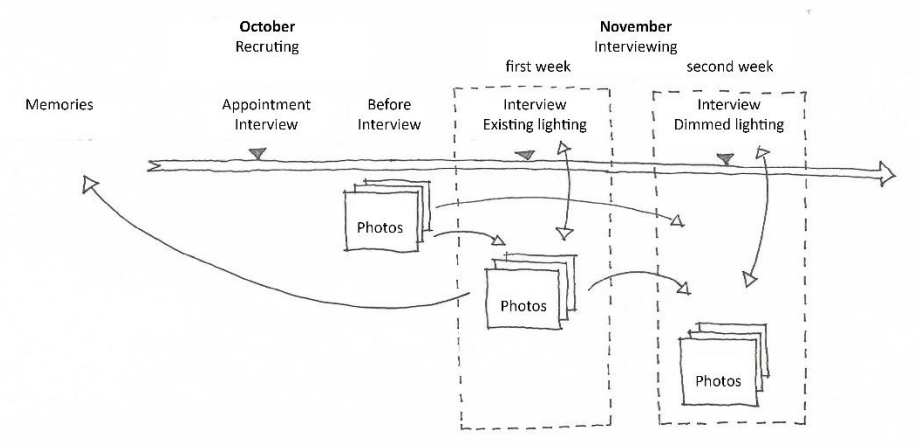

Figure 7. Concept sketch illustrating use of photos during interviews

Participant-produced images were used throughout the interviews in a number of ways. A first set of photos was produced before the first interview (Pink, 2021: 96). Participants were asked to take photos of a tram station in the dark hours, and to capture what their eye caught in the situation (Pink, 2021: 87). A second set of photos was taken during the first interview in the existing lighting setting at Nørreport, at Universitetsparken and again at Nørreport. A third set of photos was taken during the second interview in the dimmed lighting setting at Nørreport, the existing light setting at Universitetsparken and again at Nørreport (Fig. 6). At each tram stop, a number of questions were posed, and the participant was asked to take photos in relation to the issues discussed. The photos were taken as a collective probe to provoke responses and unexpected ideas (Gaver, 1999: 22). The photos led to sudden realization and triggered memories for the participants (Pink, 2021), opening up to previous experiences with lighting and the sharing of whichever associations this inspired.

Sensing shared space in dimmed light

Light and feelings about light can be difficult to express, indeed because the 'presence of light is often taken for granted in everyday experiences, a vocabulary is lacking' (Sumartojo and Pink, 2017: 1). Participant-produced photos in the process of the go-along interview allowed people to articulate the experienced atmosphere and how they sensed the place and the light. The results from the analysis of the interviews are gathered in four themes, explaining how participants express feelings about atmosphere, about connectedness to context and people and about how the evaluation of the lighting level was linked to people's activities in the mobile situation.

The first theme concerns how the dimmed lighting influenced atmosphere. The majority of the participants expressed a tense atmosphere in the existing lighting setting, where the feeling of being 'exposed' and 'uncomfortable' were dominant, and associations like 'operating room', 'gas station' and 'prisoner on an island' were used to express how the lighting felt. 'This is calmer and safer, and I feel more protected when I'm not exposed in the light', a participant stated in the dimmed lighting setting. Another participant explained the experience by thoughtfully saying; '…. it's nicer now, a more comfortable *room* to be in…. you're not so illuminated….. it is something very different… it is more intimate.' Some participants linked the dimmed lighting with safety, while others linked the dimmed lighting with a reduced feeling of safety. Two participants in particular felt 'unsafe', 'scared' but also 'fatigued' and 'drowsy' in the dimmed lighting. Others doubted whether their negative feelings about the existing high lighting level were legitimate; 'Even though the

lighting level is high and uncomfortable, it's probably the right thing to do to make you feel safe', a participant said, expressing mixed feelings about the uncomfortable high light level and how she/he supposed that the lighting level was adjusted to meet regulatory requirements for light.

The second theme touched upon how dimming of the light engenders connectedness to the context. The surroundings became visible in the dimmed lighting setting. Some were more positive about this fact than others, but the spatial and social connection to the surrounding space was clear to all. One participant presented new insights after taking photos in the existing lighting setting; 'Well, this wasn't really what I thought I would take a picture of, it is actually quite funny with the contrast. On one side you see the bright tram and on the other side the very dark street. It is quite a big contrast...' This particular person was very focused on safety issues and wished a high lighting level, but while taking a photo, the contrast that the unbalanced lighting levels produced became evident. At the second meeting, in the dimmed lighting, one participant described the visual border that lighting can produce when the contrast between two areas is too high in this way: 'Somehow it seems that the station is better connected to the rest of the city because it is not a light bubble anymore' (Fig 8).

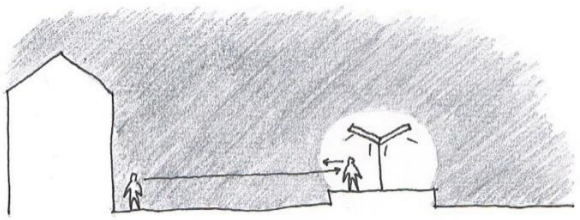

Figure 8. Concept sketch illustrating the light bubble, with a lack of spatial and social visual interaction due to high contrast in light level

Others used words like 'homogeneous' and 'in harmony' to describe the regained contact to the surrounding city, e.g. 'Before you stood in quite a lot of light, and then the surroundings became secondary, now it seems more homogeneous.' Some participants did have safety as their highest priority, though, and the feeling of being unsafe in the dimmed lighting was dominant. One participant preferred being exposed in the higher lighting level and felt that the light generated a safe and enclosed space at the platform. The expressions 'safe enclosed space' or visual disconnecting 'luminous bubble' are in this case contradictory, with a high light level connected to the feeling of safety (Boyce, 2019, Gibbons, 2014) on one hand, and a high light level connected to the feeling of being exposed and visually disconnected from the context on the other (Pallasmaa, 2012; Hvass et al., 2021a). This example could be regarded as an example of lack of vocabulary (Sumartojo and

Pink, 2017: 1) and different understandings of the role of light in everyday experiences. Nevertheless, the regained visual contact with the surrounding context in the dimmed lighting led to increased feelings of belonging and safety for the majority of the interviewed group (Fig. 9).

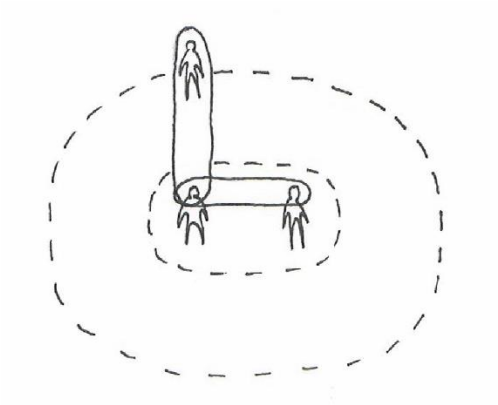

Figure 9. Concept sketch illustrating spatial and social interaction in local space and surroundings

The third theme relates to connectedness to people in the waiting area and in the surroundings. One participant contemplated; 'Now you can just see them better [people on the pavement] - see colors, and - just see them. And I feel that I am just as illuminated as they are….it is no longer the case that I am a target, exposed and they can only look at me - now we can just look at each other.' By lowering the light, both spatial and social interactions were improved, both at the station and in relation to the surroundings (Fig. 9). Participants expressed that they preferred people being present at the platform and in the surroundings for safety reasons, but they had no wish to interact in the co-presence situation (Lofland, 1998). They came to the platform to wait and wished to isolate themselves, mostly with their mobile telephones. They didn't see it as a criterion that the lighting should support these meetings between strangers. But during the interviews, several participants stated that facial expressions were more relaxed in the dimmed lighting. Commenting on how the lighting effected facial interactions, a participant exemplified this by saying to the interviewer; 'You look more 'normal' than last time we met, less scary. Because your skin is a skin color and your glasses look normal and your jacket is blue and … the colors are not blurred.' This indicated that the quality of the lighting has an impact on how we see other people's faces and thereby has an influence on the encounters between people in shared public spaces (Goffman, 1967) (Fig. 10). Ebbensgaard elaborates on visibility in the nocturnal urban space by stating that the role of lighting has to go 'beyond mere provision of visibility and a concern with *what* people see, lighting

design is increasingly recognized for its performative effects on *how* people see' (Ebbensgaard, 2019: 6).

Figure 10. Concept sketch illustrating light and the public transit situation

The fourth theme is linked to human activity in the mobile situation. Due to the nature of the go-along interview planned in this field study, the dimmed lighting setting was experienced while waiting, while walking at the station and while departing and arriving with the tram from the nearby station. This led to insights on how the dimmed lighting was experienced as part of a series of consecutive activities. Half of the participants who previously had expressed positive feelings towards the dimmed lighting changed their mind when stepping out of the tram with a high light level into the dimmed sheltered waiting area. Experiencing this transition between the two light zones, a participant exclaimed; 'What a contrast (stepping out of the tram). Crazy. The contrast is greater than when I first came here, where I did not come from a tram. I have to admit, it feels like something's wrong. It feels *very* dark now.' The reaction to the transition in the lighting conditions from the tram to the dimmed shelter exemplifies the fact that the lighting should be designed according to the mobile situation and the repetitive rhythms which the mobile situation consist of (Edensor, 2012b; Lefebvre, 2013) and to the variety of people's behavior in this specific urban setting (Slater, 2015).

Understanding the role of light as part of the contextual whole

This study advances on other explorations of light while moving in the urban context (Pink, 2018; Sumartojo, 2017, 2019; Edensor, 2019; Ebbensgaard, 2020), yet is specific in its design of the architectural experiment. The movement and discussion with research participants takes place in a specific context - a station *and* while doing a circular tram ride to the adjacent station and back. The study is an experiment, involving a comparison between how light is perceived before and after dimming in a specific place. By dimming the light the apparent contradiction between the negative and the positive feeling of darkness can be explored through interviews linked to a specific traffic

hub setting where a high light level is normally linked to improved (perception of) safety, but can also block the view of the surroundings and therefore led to diminished feelings of safety. The experiment is situated both in terms of time, place, surroundings and activity, The activities of waiting for (and riding on) the tram was chosen. Our point being that the perception of light and darkness should be evaluated according to a specific activity and with other relevant components taken into consideration rather than 'in the abstract'; by exploring the four themes from the analysis; 1) atmosphere, 2) connectedness to context 3) connectedness to people and 4) people's activities, we reached a situated understanding of the role of light in the architectural context of Nørreport station in Aarhus. That is, how a feeling of being a part of the contextual whole can arise when lighting is lowered, allowing less contrast and more balanced lighting levels in comparison to adjacent urban spaces. The majority of the participants indicated that the atmosphere in the space was more calm, relaxing and intimate in the dimmed light. This is parallel to Pallasmaa's insight (2012: 46) that bright light paralyses the imagination and wipes away the sense of place. Likewise, Jelle Brands explains that bright light reveals potential targets, in this case the station, and subdues visibility outside the bright area (Brands, 2015). All participants experienced a regained connection with the surroundings in the dimmed light, both buildings, objects and people passing by. This was perceived as an advantage.

Lighting and security issues in relation to the tram operation, and the risk of being hit by a tram, were important issues for some. While for others, personal safety, and the risk of being assaulted, was in focus. The level of the lighting in the experiment was valued to be *too* low; *too* turned down by the majority of the participants in the go-along interviews. It would have been ideal to have had the opportunity to further test a setting where the light level was less dimmed.

Holscher Design had the intention that their station design should adapt to the existing urban architectural surroundings and transportation system, both during light and dark hours. Due to a reduction in the lighting budget, however, and a lack of knowledge concerning the consequences, the lighting design at the tram station ended up with a continually high lighting level. This design does not adapt to the immediate surroundings in the dark hours as was initially planned and which our experiment shows the importance of. Based on this study, we see potentials for further development of combining architectural and anthropological theory and methods to get closer to an understanding of where and how we can dim lighting around everyday urban activities. Future studies could use the architectural values of light and darkness in the urban spatial hierarchy by programming

dynamic lighting settings in relation to the architectural situation, and explore how the dimming of light as experienced in relation to other everyday activities and in other contexts.

Conclusion

We know that we need light to see as humans. However, we do not know much about how little light we need to be able to see and at the same time experience the darkness at night, opening up possibilities to see and sense the contexts in which we are located. Our analysis showed that dimmed lighting sharpened the senses and also led to a relaxed atmosphere among the majority of the research participants. Furthermore, dimmed lighting strengthened the experience of connectedness to the surroundings, while the increased spatial and perceptual interaction with the immediate surroundings increased feelings of safety. Some participants, however, felt unsafe in the dimmed light, unsafe in relation to people and unsafe in relation to tram traffic. As the illuminance level on the ground was lowered to approximately 80% of the existing illuminance level, a less drastic dimming could be appropriate in this specific situation.

The results of this research call for attention to the potential in lowering and balancing urban lighting levels between adjacent urban light zones to be able to preserve the atmosphere in an urban space and support improved feelings of safety. Furthermore, by adjusting the lighting to the situation, it is critical to consider the atmosphere, connectedness to context and people, behavior and the rhythm of people and traffic in the specific lit space. Participant-produced photos in the collaborative exploration of light paired with interviews conducted while moving were effective in gathering sensory impressions. Such impressions are not as easily elicited in question-answer interviews that are commonly used within engineering and architectural lighting research. This study has drawn on architectural and anthropological approaches by structuring and framing an architectural experiment with two lighting levels (existing and dimmed) and by using ethnographic methods for elicitation of experiences of darkness, light and atmosphere in the tram waiting area and as part of the tram ride. We suggest there is further potential for such a combined approach.

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References

Boyce, P. R. (2019). The benefits of light at night. *Building and Environment,* Volume151, January 2019: 356-367

Böhme, G. (2013). The art of the stage set as a paradigm for an aesthetics of atmospheres. *Ambiances*. (October 2013): 2-8.

Böhme, G. (2017). *The Aesthetics of Atmospheres* (edited by Jean-Paul Thibaud). London: Routledge.

Brands, J., Schwanen, T. and Van Aalst, I. (2015). 'Fear of crime and affective ambiguities in the night- time economy', *Urban Studies*, 52(3): 439–455.

Cullen, G. (1997). *The Concise Townscape*. London: Architectural Press

Dattatreyan, E. G. and I. Marrero-Guillamón. (2019). Introduction: Multimodal Anthropology and the Politics of Invention. *American Anthropologist* 121(1): 220–228.

Dunn, N., Edensor, T. (2020). *Rethinking Darkness: Cultures, Histories, Practices*. London and New York: Routledge

Ebbensgaard, C.L., Edensor T. (2020). Walking with light and the discontinuous experience of urban change. *Transactions of the Institute of British Geografers*. 2020:1-14.

Edensor, T. (2012a). Illuminated atmospheres: Anticipating and reproducing the flow of affective experience in Blackpool. *Environment and Planning D: Society and Space,* 30: 1103–1122.

Edensor, T. (2012b). Introduction. In Edensor, T. (Ed.), *Geographies of rhythm: Nature, place, mobilities and bodies* (1-20). Surrey: Ashgate.

Edensor, T. (2015a). 'The gloomy city: Rethinking the relation between light and dark', *Urban Studies,* 52(3): 422–438.

Edensor, T. (2015b). Light design and atmosphere. *Journal of Visual Communication,* 14(3): 331-350.

Edensor, T., Hughes, R. (2019). 'Moving through a dappled world: The aesthetics of shade and shadow in place', *Social & Cultural Geography*, 2019, 1–19.

Gaver, B., Dunne, T., Pacenti, E. (1999). Design: Cultural Probes. *Interactions,* Vol. 6, Issue 1, Jan/Feb: 21-29.

Gibbons, R., Guo, F., Medina, A., Terry, T., Du, J., Lutkevich, P., Corkum, D., Vetere, P. (2014). *Guidelines for the Implementation of Reduced Lighting on Roadways*, Report FHWA HRT 14 050, Federal Highway Administration, Washington DC.

Gibson, J. J. (2014). *The Ecological Approach to Visual Perception*. London: Routledge.

Goffman, E. (1967). *Interaction ritual: essays on face-to-face behavior*. Harmondsworth: Penguin

Goldschmidt, G. (2003). The backtalk of Self-Generated sketches. *Design Issues*, vol.19: 72-88

Hansen, E.K., Mullins, M. (2014). Lighting Design: Towards a Synthesis of Science, Media Technology and Architecture. *Smart and Responsive Design*, (2): 613-620.

Hvass, M., Hansen, E.K. (2020). Architectural and social potential of urban lighting, a field study of how brightness can affect the experience of waiting for public transportation. *Proceedings PLEA Conference*, September 2020.

Hvass, M., Wymelenberg, K.V.D., Boring, S., Hansen, E.K. (2021a). *Intensity and ratios of light affecting perception of space, co-presence and surrounding context, a lab experiment.* Building and Environment, Volume 194, 2021: 107680

Hvass, M., Hansen, E.K. (2021b). Potentials of light in urban spaces defined through scenographic principles. *Proceedings NAF Symposium*, June 2019. In press

Jensen, B. (2017). *Aarhus Letbane, fra vision til virkelighed*. Aarhus: Aarhus Letbane I/S

Kvale, S., Brinkmann, S. (2015). *InterView*. *Introduktion til et håndværk.* København: Hans Reitzels Forlag.

Lefebvre, H. (2013). *Rhythm analysis, Space, Time and Everyday Life*. London: Bloomsbury

Lofland, L.H. (1998). *The Public Realm. Exploring the City's Quintessential Social Territory*. New York: Routledge

Madden, R. (2017). *Being Ethnographic: A Guide to the Theory and Practice of Ethnography*. London: Sage

Pallasmaa, J. (2012). *The Eyes of the Skin: Architecture and the Senses*. Chichester, UK: Wiley-Academy.

Pallasmaa, J. (2014). Space, Place and Atmosphere: Emotional and Peripheral Perception in Architectural Experience. *Lebenswelt* 4(1): 230-245.

Pink, S. (2021). *Doing Visual Ethnography*. London: Sage

Pink, S. (2015). *Doing Sensory Ethnography*. London: Sage

Pink, S., Sumartojo, S. (2018). The lit world: living with everyday urban automation. *Social & Cultural Geography* 19(7): 833-852

Rasmussen, S.E. (1966). *Om at Opleve Arkitektur*. København: Gads Forlag

Schön, D. (1991). *The Reflective Practitioner - How Professionals Think in Action.* London and New York: Ashgate Publishing Group

Slater, D., Sloane, M., & Entwistle, J. (2015). *Configuring light: Staging the Social.* http://www.configuringlight.org/. (Accessed 10. October 2020)

Spradley, J.P. (1979). *The ethnographic interview.* New York. Holt: Rinehart and Winston

Sumartojo, S., Edensor, T., Pink, S. (2019). Atmospheres in Urban Light, *Ambiances.* Vol.5 (5)

Sumartojo, S., Pink, S. (2017). Moving Through the Lit World: The Emergent Experience of Urban Paths. *Space and Culture* 21(4): 358-374.

Thibaud, J.P. (2011). The Sensory Fabric of Urban Ambiances. *Senses and Society* 6(2): 203-215.

Waltorp, K. (2021). Multimodal Sorting: The flow of images across social media and anthropological analysis. i AB & B Winthereik (eds.). *Experimenting with Ethnography: A Companion to Analysis*. Durham: Duke University Press. (Experimental Futures Series).

Waltorp, K. (2020). *Why Muslim Women and Smartphones: Mirror Images*. London and New York: Routledge.