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PLANNING ARTIFICIAL LIGHT AT NIGHT FOR PEDESTRIAN VISUAL DIVERSITY IN PUBLIC SPACES

keywords

artificial light, night, planning, visual diversity, lightwalk

ABSTRACT

This paper makes the case for pedestrian visual diversity in planning artificial light at night in public spaces. A preliminary literature review showed that limited research and applications have been developed addressing and acknowledging pedestrian visual diversity, defined here as the condition and the needs of visually impaired pedestrians in public spaces at night. To further research this gap, open-ended interviews with experts in the field of artificial lighting and health were conducted by the authors. The interviewees confirmed the scarcity of studies and projects targeting pedestrian visual diversity and provided insights on five related issues, i.e., contrast, glare, illuminance, light colour and the use of new technology. Against this backdrop, firstly materials and methods of the study are illustrated, while the aforementioned five issues are discussed subsequently by reporting recommendations shared by the interviewees. In conclusion, a framework for the application of lightwalks is presented as an inclusive experiential method for involving visually diverse pedestrians in assessing and planning ALAN in public spaces.

INTRODUCTION

For decades planning artificial light at night (ALAN) has been mostly addressed as a technical issue to provide sufficient lighting levels in cities. More recently, municipalities have developed integrative lighting strategies and plans which account for ALAN from multiple perspectives, e.g., as an economic issue, as a prerequisite for activity extension into the night, as an environmental stressor for human and planetary health, and as a resource for shaping place identity and providing information and orientation in public space. Regarding the latter aspect, a preliminary literature review showed that little research and applications have been developed addressing and acknowledging pedestrian visual diversity, defined here as the condition and the needs of visually impaired pedestrians in public spaces at night. To counterbalance this lack of findings, open-ended interviews with experts in the field of artificial lighting and health were conducted by the authors. The interviewees confirmed the scarcity of studies and projects targeting pedestrian visual diversity and provided insights on five issues which can be problematic for visually diverse pedestrians, i.e., contrast, glare, illuminance, light colour and the use of new technology. Against this backdrop, this paper first illustrates materials and methods of the study and then discusses these five issues reporting recommendations shared by the interviewees. In conclusion, it suggests a framework for the application of lightwalks as an inclusive experiential method for involving visually diverse pedestrians in assessing and planning ALAN in public spaces [1, 2].

MATERIALS AND METHODS

A preliminary literature review and open-ended interviews were conducted to research pedestrian visual diversity and planning ALAN in public spaces.

2.1 A preliminary literature review

A preliminary review was conducted researching six pairs of key-words in several databases such as Google Scholar, Researchgate and Pubmed, taking into account results from the research fields of sociology, planning, disability studies, universal design and light planning. Specifically, the following pairs of key-words were used: artificial light and partially sighted adults, artificial light and visually impaired people, artificial light and disabled people, artificial light and impaired night vision, impaired night vision and public spaces, pedestrians at night and visual abilities. Publications of associations for blind and visually impaired people and institutions for integrative planning and design (mainly from the German speaking countries) were also scanned, including the "Lichtkonzept Berlin" - an exemplary urban lighting plan released by the Municipality of

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Berlin [3] which also does not provide lighting requirements for visually impaired pedestrians.

2.2 Open-ended interviews

Preliminary open-ended interviews were conducted with experts in the fields of artificial lighting and health, who were recruited through the authors' personal networks and via the "Allgemeiner Blinden- und Sehbhindertenverband" in Berlin and the "Unione italiana ciechi e ipovedenti". Overall, six experts were interviewed via email or over the phone. Interviews with other three experts are currently being held.

RESULTS AND DISCUSSION

3.1 Results emerging from the preliminary literature review

The results emerging from the preliminary literature review highlighted six main themes: 1) medical aspects of visual impairment and artificial light; 2) requirements and solutions for indoor lighting especially in the workplace; 3) the design of artificial light for traffic signs, signposts, the illumination of potential barriers (e.g. steps) or point of potential danger, legibility of lettering; 4) street lighting at night for driving performance and from the drivers' perspective; 5) design guidelines and standards of street lighting at night, e.g., the standards on accessibility which only tangentially refers to visual impairment issues [4, 5].

3.2 Results from the open-ended interviews

The outcomes from the interviews conducted with the experts confirmed the preliminary literature review's findings, i.e., the scarcity of studies and guidelines for planning ALAN in public spaces addressing the needs of visual diverse pedestrians. On the contrary, the experts highlighted the numerous studies addressing indoor lighting for workplaces, suggesting that individually diverse impairments can be addressed more easily in controlled indoor settings rather than in public spaces, where the variable factors to consider are numerous and complex. Furthermore, the experts provided insights on five topics which can be problematic for visual diverse pedestrians which deserve further studies to achieve inclusive planning of ALAN. These five issues are related to contrast, glare, illuminance, light colour and the use of new technology.

3.2.1 Contrast

Contrast perception depends on illuminance, and luminance-dependent contrasts that are sufficiently perceived during the day can no longer be recognized at night by visual diverse pedestrians, as can easily be observed (e.g., stairs). The experts agreed that crucial requirements, i.e., enough contrast and light uniformity, should be equally implemented both indoor and outdoor. For what concerns the lighting levels, the experts highlighted that providing general recommendations is difficult due to the various types of visual impairment with different degrees of sensitivity.

3.2.2 Glare

Glare depends on excessive luminance or extreme differences in luminance in the field of vision. Having physiological and psychological effects, limiting visibility and reducing comfort the visually impaired and the elderly are more sensitive to glare. To avoid it, the experts recommended that low bollard luminaires radiating upwards or floor luminaires in walking areas should be not installed. Moreover, the risk of glare depends on the shielding of luminaires and the ratio of height of poles to distance between light poles, i.e., the greater the distance between poles, the higher the poles have to be which increases the risk of glare. Accordingly, the experts suggested that uniform illumination should be provided in public spaces and islands of light and dark sections

in-between should be avoided. These measures can prevent the creation of areas perceived as dangerous (“Angsträume”) and solve problems with light-dark adaptation for visually impaired people.

3.2.3 Illuminance and light colour

The experts highlighted that it depends on the type of vision impairment whether higher – rather than the recommended minimum – illuminance levels might be required by visually impaired people.

Also, the adoption of light colour for artificial lighting similar to daylight was recommended to favour optimal contrast perception.

3.2.4 New technology in ALAN design and planning

New developments of digital technology for ALAN include the application of motion detectors or targeted lighting to provide lighting only when needed. The experts stressed that the implementation of these new technologies can be problematic for visually impaired people with delayed adaptation, because they make orientation for the further distance on the path more difficult, standing in a light- bubble in the midst of darkness. Moreover, caution is recommended in the application of the motion detectors for security-related reasons depending on the contexts. Similarly, other devices for lighting “on demand”, e.g., activating luminaires via apps or sms, should also be critically considered. In addition, the experts discussed the importance of “being seen” when planning ALAN, stressing that crossing aids such as pavement extensions or central islands should be illuminated similarly to pedestrian crossings.

CONCLUSION

Limited research and applications have been developed addressing pedestrian visualdiversity in planning ALAN in public spaces. This paper discussed five issues which can be problematic for visualdiverse pedestrians, i.e., contrast, glare, illuminance, light colour and the use of new technology, recommending that they should be further researched and considered in planning practice.

A study for the main train station in Munich developed by the Deutsche Bahn showed that the above-mentioned requirements are achievable, if they are carefully designed and specification of the luminaires are observed [6]. Further studies are recommended which may include a systematic literature review, additional interviews with experts in different knowledge areas, workshops, focus groups and lightwalks. Regarding the latter method, the authors are planning to conduct a lightwalk with visualdiverse pedestrians, building on the expertise gained through conducting lightwalks and combined sound- and lightwalks in the past years in Berlin, Rome and Florence [1, 2].

ENDNOTES

(1) We propose the novel term visualdiversity adapting it from the term “auraldiversity” coined by [7]

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