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## Lighting as a universal design parameter in low vision rehabilitation

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### Introduction

Universal Design (UD) constitute a design strategy focusing on usability of design and a framework for evaluating how our built environment accommodate its users. The interdisciplinary nature of UD allow us to unite across rehabilitation professionals and building professionals in finding the best solutions for all.

The seven UD principles (Story, Mueller & Mace, 1998) seen in Figure 1, concern both design of products, buildings, and services, and focus on the practical use of a specific design.

- |                                   |  |                            |
|-----------------------------------|--|----------------------------|
| 1. equitable                      |  | 4. perceptible information |
| 2. flexibility in                 |  | 5. tolerance for error     |
| 3. simple & intuitive             |  | 6. low physical effort     |
| 7. size & space for approach and/ |  |                            |
|                                   |  |                            |

Figure 1. Use is a pivotal concern in all seven principles of Universal Design.

In collaboration with a range of specialists, a group of low vision consultants have developed a holistic lighting assessment, embracing the social and the physical context of the visually impaired with the aim to improve their quality of life (Øien et al., 2021). Based on documentations of the intervention of this assessment with 60 visually impaired participants, including observations of 15 of the consultations and interviews with two of the low vision consultants, in an associated postdoc study, lighting has been explored as a UD parameter and its role in rehabilitation.

### Findings

The study show that, in this holistic approach, the understanding of lighting as special aids for the visual impaired or specification of quantitative lux levels, was enhanced by an understanding of lighting as a qualitative and relational parameter. Consequently, the solutions were adjusted to the situated and contextualised aspects of light (Øien, 2021):

- Physical context (moving from the lab to the home environment)
- Social context (relating to e.g. the family)
- Embodied context (the individual and perceived).

The rehabilitation facilitated knowledge about light in all three aspects:

- Technical aspects (explaining aspects relevant in the specific setting, such as LUX, Ra, Kelvin, flicker, or concerning technology and design)
- Occupational aspects (discussing functionality and accommodation to the different users or the different social settings)
- Perceived quality of light (demonstrating different lamps and bulbs, encouraging reflections on its function through comparison - discussing positions of user, lamp and the activity of interest).

contextualised, part of:  
• the individual [needs and desires]  
• the environment [social & physical]  
• the human-environment interaction  
↳ relation, position, direction, thresholds, contrasts  
everyday routines, practices, activities

measured: lux, Ra, Kelvin  
**light** perceived: soft, hard, warm, cold, clear, comfortable, uncomfortable, directed, diffuse, sharp, relaxing, flexible  
luminant: open, closed, wide, narrow, 'stupid', 'neat', transparent, luminous, opaque

Figure 2. Light was identified and approached as contextualized; in the individual, the environment and the interaction of the two, as multiple versions of light.

As an UD parameter light was seen as an environmental factor that enabled or disabled the individual, to a greater or lesser extent, and in relation to the activity or function of concern (Øien, 2022). Another UD feature in the assessment is that the approach embrace different user perspectives or usability across different users: Acknowledging the diverse and changing role of light among family members, in different times and settings.

### Conclusion

Lighting is important in low vision rehabilitation; however, it is crucial to identify the appropriate light as it both enable and disable in different settings and situations. This study suggests that finding the best lighting solutions for visually impaired, need to take departure in the specific person-environment-interaction, the use, and why UD can help qualify the participants' everyday use of light by facilitating and demonstrating context relevant knowledge.



Figure 3. Lighting worked as a parameter for achieving UD in the process: Relating light to its context and use supported the learning and change processes of the participants.

In line with the UD principles, the approach involved working across levels of equitability, flexibility, simplicity, and the intuitive within the luminaire, as well as levels of perception, error tolerance and physical effort in the process.

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