PSIII-16 PERCEPTION OF SAFETY

059 Road lighting and reassurance - cognitive, emotional and behavioural responses
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Keywords: Road lighting, reassurance, perceived safety, physiological response

Abstract:
Introduction: A key purpose of road lighting for pedestrians is to make people feel safer and reduce fear of crime. Increasing feelings of reassurance after-dark can encourage more walking, reduce social isolation and improve physical and mental well-being. It is therefore important to understand what road lighting conditions are most likely to enhance feelings of reassurance after-dark.

Theoretical background: The experience of reassurance has three components: a cognitive appraisal, an emotional reaction, and a behavioural response (Gabriel & Grewe, 2003). Here we report an in-the-field experiment to assess the influence of lighting on these three aspects of reassurance, to identify optimal lighting conditions that make people feel safer after-dark. Our goal is to identify the impact road lighting has on feelings of reassurance. A common approach to evaluate reassurance on roads is to test different lighting levels: however this study suffers from a range of biases and offers only the trivial finding that more light is better (Fotios & Castleton, 2016). In contrast to this, our study uses the influence of lighting from factors that may contribute to feelings of reassurance, such as neighborhood, population, the day-dark method used is proposed by Boyce et al. (2000). This involves recording reassurance ratings during both day and after-dark conditions in a number of different streets. The difference between day and after-dark ratings provides a measure of the relative effectiveness of lighting on that street. A large difference would suggest the lighting may be relatively ineffective.

Method: Alongside category ratings of safety, we also record two further involuntary responses to reflect the combined cognitive, emotional and behavioural components of the experience of reassurance. First, electrodromal activity and heart rate variability of participants are recorded, to reflect the physiological data that reflects their emotional response to being on the street. Second, eye movements and fixation behaviour of participants are recorded using mobile eye-tracking, to provide a behavioural measure of reassurance. Twenty-four participants walked along ten separate streets in a residential area of Sheffield, UK, during daylight and after-dark. They completed a short questionnaire on each street that included questions about perceptions of safety. A sub-sample of these participants were also equipped with an eye-tracker and physiological measurement equipment to record skin response and heart rate data.

Results and Conclusions: We present results from a real-world experiment in which cognitive, emotional and behavioural measures of reassurance are recorded under daylight conditions and different road lighting conditions after-dark. This data will provide a deeper understanding of the impact road lighting has on pedestrian reassurance. We test the hypothesis that higher illuminances reduce the day-dark difference in measures of reassurance, but that a plateau is reached at higher illuminances.

References:

234 Measuring the effect of dynamic lighting on pedestrian speed by means of overhead Kinect sensors and continuous pedestrian tracking algorithms
Haans, A., Corbetta, A., Kurni, P. & Toschi, F.
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Keywords: Pedestrian behavior, Lighting, Crowd management

Abstract:
For centuries the main aim of public lighting has been to support human functioning at night by providing visibility and a general sense of safety. However, current developments in solid state lighting (e.g., LEDs), lighting controls (e.g., wireless communication protocols) and related developments in smart city technologies (e.g., data-driven city management) provide an impetus to think about novel, and hitherto largely unexplored lighting-based services that include, amongst others, the application of dynamic lighting for crowd management during large events (den Ouden et al., 2014). Although research has been conducted on the efficacy of dynamic lighting during emergency evacuation (e.g., Jin & Yamada, 1994; Ronchi et al., 2016), there is no research to date that has tested the efficacy of using lighting for crowd management in non-emergency situations, for example by 'nudging' crowds to adjust their direction and walking speed. In the present study we explore how different dynamic lighting patterns affect pedestrian flow—in particular walking speed—using an array of Microsoft Kinect® sensors and state-of-the-art continuous pedestrian tracking algorithms developed in-house (e.g., Corbetta et al., 2016).

The experiment was conducted during the GloW festival in Eindhoven, the Netherlands from November 12 to 19, 2016. Being a large scale event, GloW is a representative occasion for conducting a naturalistic study on the use of dynamic lighting for crowd management in a city. The location of the experiment was the living light lab Markthal of the Intelligent Lighting Institute (iLI); a 75 by 62.5 meters roofed space equipped with various LED light sources and an array of three by four Kinect® sensors. An approximately 12 meter wide path was demarcated by means of rope barriers, and an approximately 245,000 people passed underneath the sensor array during the experiment, as based on preliminary real-time analysis of data. Ten different dynamic lighting patterns and one static (i.e., non-dynamic) and more or less homogenous control pattern were displayed on an array of 26 by 26 ceiling-mounted LED modules and an additional 36 LED lamps directed towards the ceiling. Dynamic patterns consisted of a light wave which moved in one of four directions at different speeds; along with the crowd (at 0.5, 1.0, 3.0, 12.5, or 25 m/s), in the opposite direction of crowd (at 1.0, 1.25, or 25 m/s), and orthogonal to the crowd to both the left or the right (both at 12.5 m/s). All light patterns were displayed multiple times, each time for 8 minutes, in a randomized order for a total duration of 39 hours.

In our presentation we will present and discuss the preliminary results of the experiment. In addition, we discuss the potential of sensor technology and related data analysis algorithms for research in environmental psychology.

References: