
Article:
Gorjimahlabani, S., Uttley, A. and Fotios, S. orcid.org/0000-0002-2410-7641 (2023) Measuring pedestrian reassurance. Lighting Journal, 88 (9). pp. 12-16. ISSN 0950-4559

Measuring pedestrian reassurance

Shahab Gorjimahlabani, Jim Uttley, Steve Fotios

University of Sheffield

Published as: Gorjimahlabani S, Uttley J, Fotios S. Measuring pedestrian reassurance. Lighting Journal 2023 (October): 88(9): 12-16.

PEDESTRIAN REASSURANCE

Pedestrian reassurance is the term defined by the CIE to encapsulate concepts such as perceived safety and fear of crime when walking [CIE 2019]. One aim of road lighting in residential roads is to enhance the reassurance that it is safe to walk, with a long-term goal being to support government initiatives to promote active travel.

Understanding pedestrian reassurance is useful to lighting design because it is a key determinant of optimal lighting design criteria [CIE 2019]. Many studies have been conducted to investigate optimal design criteria, most commonly the amount of light [for example, Boyce et al 2000, Fotios et al 2019, Peña-García et al 2015, Portnov et al 2022]. However, there is still no agreed consensus on the optimum light level for pedestrian reassurance in any given context.

One problem is that reassurance is difficult to measure [Fotios and Castleton 2016]. The most common approach is to ask people (typically either people passing by a specific location, or, test participants recruited to visit several locations) to make an evaluation using a rating scale. This is not an easy evaluation to capture. It is common for the way a question is asked or the context it is asked in to unintentionally bias the response. That may lead us toward the wrong decisions about road lighting design.

Shahab is investigating the measurement of pedestrian reassurance for his PhD research. We describe here his recent experiment.

FIELD STUDY

A field study was conducted around February 2023 in a residential neighbourhood of Sheffield. The 122 test participants were asked to evaluate how safe they felt when visiting each of twelve locations, three of which are shown in Figure 1. There were three questions about reassurance, with

responses given using a 6-point rating scale ranging from 1 to 6 (with higher values indicating a higher level of reassurance).

The locations were chosen to represent different light levels (arithmetic mean illuminances ranging from about 3 lx to 12 lx), different types of path (alongside a road, and a footpath through a wooded area), and different degrees of reassurance as estimated by the experimenter beforehand. Within this work, Shahab was able to question a number of factors about the measurement of reassurance.

Figure 1. Three examples of the 12 locations in which reassurance was evaluated: path through wooded area (left) and footpaths adjacent to a road (middle and right).

MORE LIGHT = SAFER?

Figure 2 shows the average after-dark safety ratings (average of the three questions about reassurance) at each location, plotted against the average illuminance. The best fit line to these data, a linear trend, shows that reassurance increased with higher illuminance. In other words, if the desire is to help people feel safer so that they choose to walk, then these results suggest road lighting is a benefit after dark.

One problem with after-dark evaluations is that they do not account for the underlying level of reassurance at a location. There will be variations due to the nature of the physical environment such as the presence of litter, graffiti or derelict properties. If a location feels unsafe in daylight (daytime) then it is likely to feel unsafe after dark regardless of the light level. A high illuminance in a location of otherwise low reassurance may feel less safe than a location of lower illuminance.

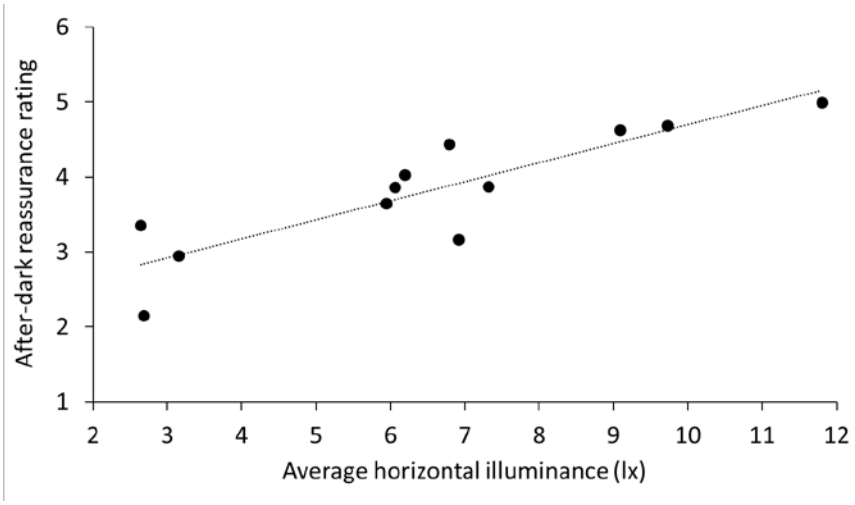

Figure 2. Average after-dark reassurance ratings plotted against average horizontal illuminance in the 12 test locations.

The field study therefore sought reassurance evaluations at each location on two occasions, once after dark and once in daylight, by the same sample of test participants. The effectiveness of lighting was then indicated by the difference between their daylight and after-dark evaluations (the day-dark difference) with better lighting being that which brings a smaller day-dark difference. Figure 3 shows the average day-dark difference at each location plotted against average illuminance. It can be seen that the day-dark difference approaches zero with higher illuminance. Higher horizontal illuminance increases reassurance towards the level experienced in daylight at that particular location. Analyses using both the average after-dark rating and the day-dark difference suggest that roads lit to higher average illuminances enhance pedestrian reassurance.

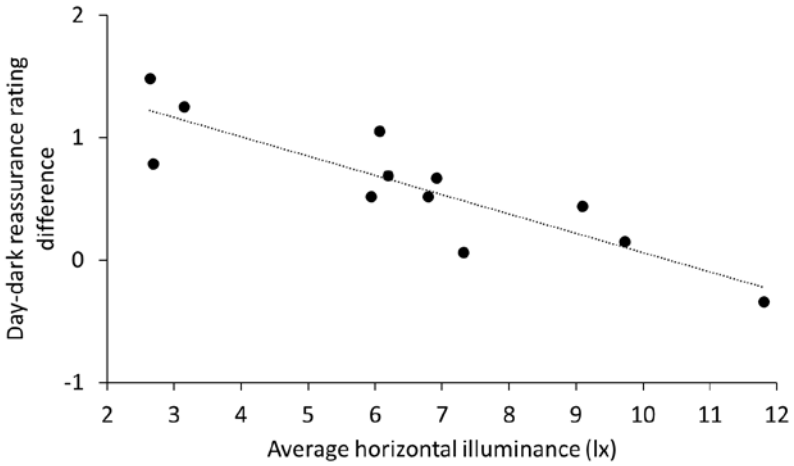

Figure 3. Average day-dark reassurance rating difference plotted against average horizontal illuminance in the 12 test locations.

DO FEMALES EXPRESS GREATER FEAR THAN MALES?

It is commonly found in reassurance-type surveys that females express a greater degree of fear than males [Foster et al., 2004; Gover et al 2011]. This, however, should not be taken as proven evidence of an underlying difference between the genders. For example, the responses may be affected by socially desirable responding, that males underplay their fear and report a higher level of reassurance. Furthermore, the (usually) small difference between male and female responses in daylight tends to become greater for evaluations after dark, suggesting that road lighting would be of greater benefit to females than males. However, if pedestrians are observed, rather than asked about how safe they feel, the difference between males and females is absent [Fotios et al 2022].

If the use of 'improved' road lighting is used as a tool to support females in response to violent attacks [Menendez 2021], much more research is needed to ensure that is a valid response, not a politically useful response, and has a positive effect on crime against females in addition to their perception of safety.

In his experiment, Shahab recruited similar numbers of males and females. In daylight, males tended to report feeling slightly safer than did females, and this difference increased after dark as expected, but in neither case was the male-female difference suggested to be statistically significant. Figure 4 plots the difference between male and female reassurance ratings against average illuminances. With higher illuminances, the male-female difference decreases and this association is statistically significant. In summary, Figures 2 and 3 show that higher illuminances lead to greater reassurance after dark, and Figure 4 shows that this is a greater effect for females than for males.

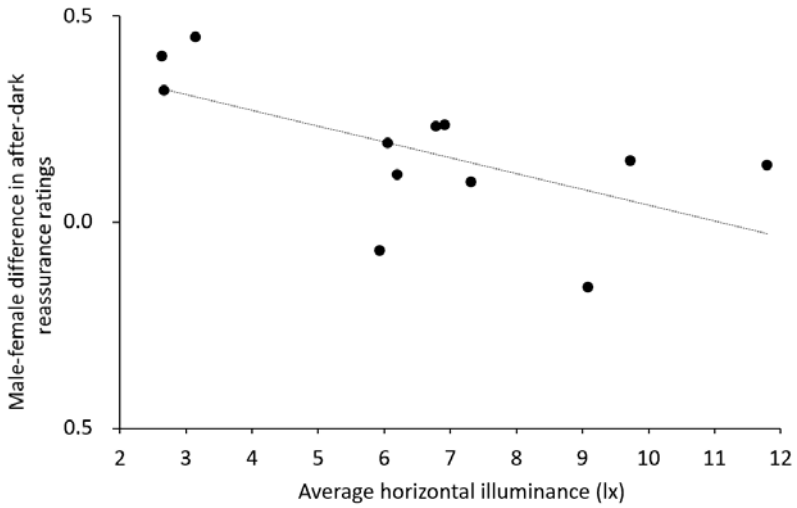

Figure 4. The difference between average male ratings and average female ratings in after-dark evaluations plotted against average horizontal illuminance in the 12 test locations.

WALKING ALONE?

Reassurance is defined by the CIE [2019] as the confidence a pedestrian may gain from road lighting (and other factors) to walk alone after dark along a footpath or road. While this definition refers to walking alone, and this is likely to be the more important situation, in many experiments the test participants are instructed to operate in small groups. There are good reasons for doing this. Taking participants in groups is more efficient and more responses can be recorded in a shorter period of time. Also, asking test participants to visit alone locations where the physical environment suggests a low feeling of safety may be too risky. However, people walking in groups and thus accompanied by others might feel safer than those walking alone, or their responses may be influenced by the presence of others [Schulman 1967].

In Shahab's experiment, the test participants were therefore assigned to one of two modes of evaluation (Table 1). For *solo* evaluations, each participant was instructed to visit the 12 locations alone: for *accompanied* evaluations, the participants visited the 12 locations in small groups (of up to 6 people) accompanied by two or three experimenters.

Table 1. Sample characteristics.

	Accompanied evaluations	Solo evaluations
Overall sample	61	61
Number of females	31	29
Age range (years)	18-37	18-38

Figure 5 shows the average after-dark ratings from the solo and accompanied participants. Of the 12 locations, accompanied participants gave very slightly higher ratings in some, indicating a higher feeling of safety compared to solo participants. However, the differences are small and were not suggested to be statistically significant. A similar trivial difference was found when comparing instead the day-dark differences for solo and accompanied participants.

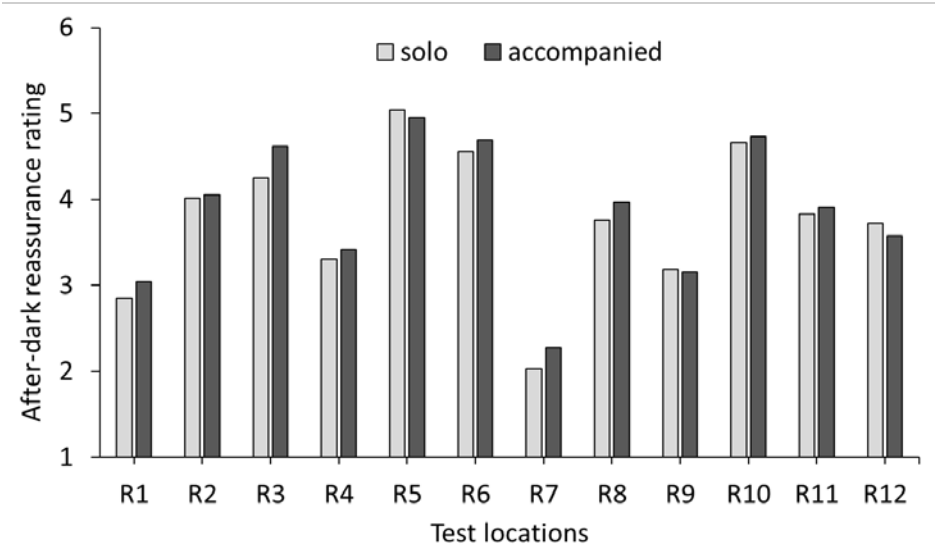

Figure 5. Average after-dark reassurance ratings in the 12 test locations for the solo and accompanied evaluations separately.

WHAT'S THE QUESTION?

A reassurance survey might ask "*How safe do you think this street is*?". One problem is that 'safe' might be interpreted differently by different respondents. They might, for example, assume it refers to the risk of being involved in a car crash. It is therefore good practise to use multiple questions and construct an impression of the benefit of road lighting from responses to all. Doing so gives a more reliable measure of the latent construct being investigated (in this case, reassurance) than just using a single question. In the field study, Shahab therefore used two additional questions – "*I would rather avoid this street if I could.*" and "*How anxious do you feel when walking down this street?*".

As seen in Figure 6, the question influences the evaluation. Participants tend to evaluate a street as being slightly safer when asked *How anxious do you feel when walking down this street?* than when asked *I would rather avoid this street if I could* or *How safe do you think this street is*? The choice of question can also influence the relative safety ranking of streets. For example, when asked *How safe do you think this street is*?, test location R11 was rated to be slightly less safe than location R8, but this ranking was reversed when the two alternative questions were asked. Note also that responses to the *avoid* question tend to indicate the lowest feeling of safety while the *anxious* question tends to indicate the highest level of safety. These differences are small but can be sufficient to change the outcome of a statistical analysis and hence the conclusions drawn from an experiment. We therefore measure reassurance through multiple questions, and in ongoing work are using principal components analysis to generate a composite rating of reassurance.

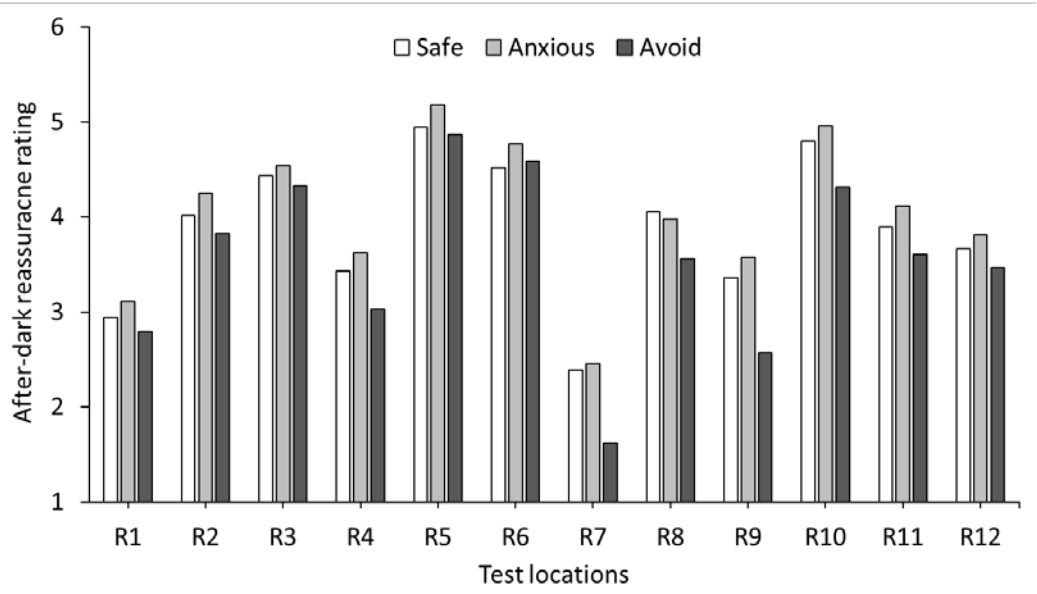

Figure 6. Average after-dark rating for each of the three reassurance questions in the 12 test locations (Safe = *How safe do you think this street is?*, Anxious = *How anxious do you feel when walking down this street?*, Avoid = *I would rather avoid this street if I could.*).

Summary

It is easy to measure pedestrian reassurance – anyone can draw up a questionnaire. But it is not easy to measure reassurance with minimal bias so that the findings are robust. As a PhD student, Shahab's focus is as much about questioning how reassurance is measured as it is the degree to which road lighting enhances reassurance. The results from this field study show that higher illuminance leads to higher reassurance and a reduction in the differences between the levels of reassurance reported by males and females. The results also show that evaluations by solo and accompanied participants lead to similar conclusions about the effectiveness of lighting, and that the choice of question can change the outcome of analysis.

REFERENCES

Boyce PR, Eklund NH, Hamilton BJ, Bruno LD. Perceptions of safety at night in different lighting conditions. Lighting Research and Technology 2000; 32(2); 79-91.

CIE 236:2019. Lighting for Pedestrians: A Summary of Empirical Data. Commission Internationale De L'Éclairage 2019; Vienna.

Fotios S, Castleton H. Specifying enough light to feel reassured on pedestrian footpaths. Leukos 2016; 12(4); 235-243.

Fotios S, Monteiro AL, Uttley J. Evaluation of pedestrian reassurance gained by higher illuminances in residential streets using the day–dark approach. Lighting Research and Technology 2019; 51(4); 557-575.

Fotios S, Uttley J, Gorjimahlabani S. Extending observations of ambient light level and active travel to explore age and gender differences in reassurance. Lighting Research and Technology 2022. First posted online on 20 June 2022 as doi.org/10.1177/14771535221080657

Foster C, Hillsdon M, Thorogood M. Environmental perceptions and walking in English adults. Journal of Epidemiology & Community Health 2004; 58(11): 924-8.

Gover AR, Tomsich EA, Jennings WG, Higgins GE. An exploratory study on perceptions of safety, fear of crime, and victimization experiences among faculty and staff at an urban university: A focus on gender. Criminal Justice Studies 2011; 24(1): 37-55.

Menendez E. Government vows £45 million fund for safer streets including lighting and CCTV. METRO. 15 March 2021. https://metro.co.uk/2021/03/15/ministers-vow-45m-fund-for-safer-streets-including-lighting-and-cctv-14249940/

Peña-García A, Hurtado A, Aguilar-Luzón MC. Impact of public lighting on pedestrians' perception of safety and well-being. Safety Science 2015; 78: 142-148.

Portnov BA, Fotios S, Saad R, Kliger D. Establishing optimal illuminance for pedestrian reassurance using segmented regression. Lighting Research and Technology 2022; 14771535221080649.

Schulman AI. 1967. Asch conformity studies: Conformity to the experimenter and/or to the group? Sociometry 1967; 30(1); 26-40.