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RELATIVE WEIGHTING OF LIGHTING ALONGSIDE OTHER ENVIRONMENTAL FEATURES IN AFFECTING PEDESTRIAN REASSURANCE

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Abstract

This paper examines whether lighting affects pedestrian reassurance after dark. While there are a few past studies investigating this issue, review of the methods used gives reason to doubt their findings. This article presents a new procedure in which participants were asked to discuss reasons for reassurance using photographs of real environments as visual prompts. These were photographs provided by participants to illustrate locations where they would, and would not, be happy to walk alone after dark. The results suggest that lighting does have a significant impact on pedestrian reassurance as it was mentioned with high frequency as a reason for reassurance, along with access to help and spatial features.

Keywords: Road Lighting, Reassurance, Perceived Safety.

1 Introduction

In residential areas it is normal to provide lighting that focuses primarily, but not exclusively, on the needs of pedestrians compared to those of drivers [CIE, 2010]. For pedestrians, road lighting is needed not only to provide a street which is safe for people to use but also is perceived to be safe. Reassurance is confidence when using a road and is used here as an alternative for the terms *perceived safety* and *fear of crime* that have been used in previous studies: lighting that promotes reassurance means higher perceived safety and lower fear of crime.

One reason for investigating reassurance is that there is a link with pedestrian street usage: a low level of reassurance (or, more commonly stated as a high level of fear) can lead to constrained behaviour such as deciding to use an alternative means of transport to walking or to avoid going out at all, and walking is of wider interest because it is a common means by which physical activity can be introduced into people's daily routines in order to encourage good health [Loukaitou-Sideris, 2006]. If good lighting can increase reassurance, this in turn may lead to an increase in walking. Data from the US reveals that a steady decline in walking with a concurrent increase in sedentary lifestyles higher rates of obesity [Alfonzo, 2005].

The decision to walk follows hierarchical factors: feasibility, accessibility, safety, comfort and pleasureability [Alfonzo, 2005]. If the needs of feasibility and accessibility are met, then the potential pedestrian can begin to consider the needs of safety, and this is driven by characteristics such as the presence of vandalism, graffiti, litter and threatening/loitering individuals. A reason why road lighting may be installed in residential areas is to increase pedestrian reassurance after dark. While several studies have suggested that lighting affects reassurance it is possible that fear of crime is exaggerated by the procedure with which it is measured [Unwin & Fotios, 2011]. For example, responses to a survey carried out before and after changes to the installed road lighting may be a reaction to an obvious change, exaggerating the impact of lighting. Improved lighting does not always aid reassurance [Mansfield & Raynham, 2005]. Lighting allows pedestrians to see their environment more clearly. However, if this makes graffiti, litter and other signs of disorder more visible, then better lighting may not improve reassurance.

2 Past studies

Loewen et al [1993] used two procedures to examine perceived safety in urban environments. The first study sought spontaneous comments as to what features of an environment contributed to making them feel safe or dangerous, and this was done without reference to any real or simulated locations. Three environmental features were mentioned most frequently, with light (either daylight or artificial light) being the most frequent (42 of the 55

test participants) followed by open space (30) and access to refuge (24). In the second study, test participants (n=100) were presented with 16 images of outdoor scenes and asked to rate them using a 5-point response scale ranging from not at all safe (1) to very safe (5). These 16 images were two different scenes for all eight combinations of the three critical safety features found in the first study (light, open space, refuge). The images were presented in a random order and each was observed for 30 seconds.

The results of the second study by Loewen et al [1993] are shown in Figure 1. It can be seen that in all four situations regarding the presence or absence of open space and refuge that lighting increases mean ratings of perceived safety. The presence or absence of light had a larger effect on mean ratings than did the absence or presence of either open space or refuge. The presence of either light, open space or refuge in a scene lead to higher ratings of safety than when they were absent: lighting alone, however, provides an approximately equal perception of safety than do open space and refuge together in the absence of light. It is of course possible that the presence or absence of light was the most obvious component of the images on which these judgements were made.

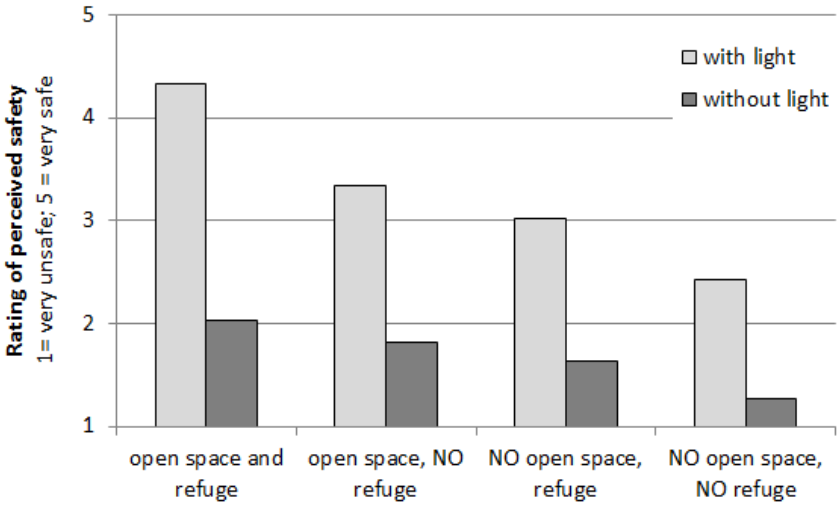

Figure 1 – Mean ratings of perceived safety of images of outdoor scenes as reported by Loewen et al [1993].

Hanyu [1997] sought judgements from 28 students regarding locations on their university campus (Ohio, USA), thus being a familiar environment to them. These judgements were gained from observation of colour photographs in a dark classroom. There were 20 locations, for which photographs were taken at night-time, and were presented on a 6 feet x 5.5 feet (1.8 m x 1.7 m) screen in a random order. Twelve items including brightness and uniformity were rated using a 5-point response scale (1 = not at all so; 5 = a great deal). Six emotional items including fear rated on a 5-point bipolar scale (3 = neutral). The test duration was approximately 25 minutes for whole task, therefore these were rapid judgements. Hanyu's analysis suggested a relationship between safe and well-lit where well-lit included uniform lighting, legibility, complexity and brightness. No raw data or summary data were reported.

Okuda et al [2007] investigated attitudes to safety and security using a survey carried out at night on streets in Hiroshima. The respondents were local residents (n=249), including a wide age range, 64% were female, and 14% reported previous experience of a traffic accident or attack on person. A questionnaire sought identification of the roads and road features considered to be the most insecure, and their opinion on what affects safety. Of the environmental factors mentioned by respondents, "dark street lighting" and an "empty street" were the two most frequently mentioned (36%), followed by "narrow street" (25%) and "no street light" (20%) (Figure 2). Note that the questionnaire was not presented in the report, and it is likely (but not certain) that it identified lighting as a potential factor: this may have contributed to the frequency of responses identifying lighting as a factor.

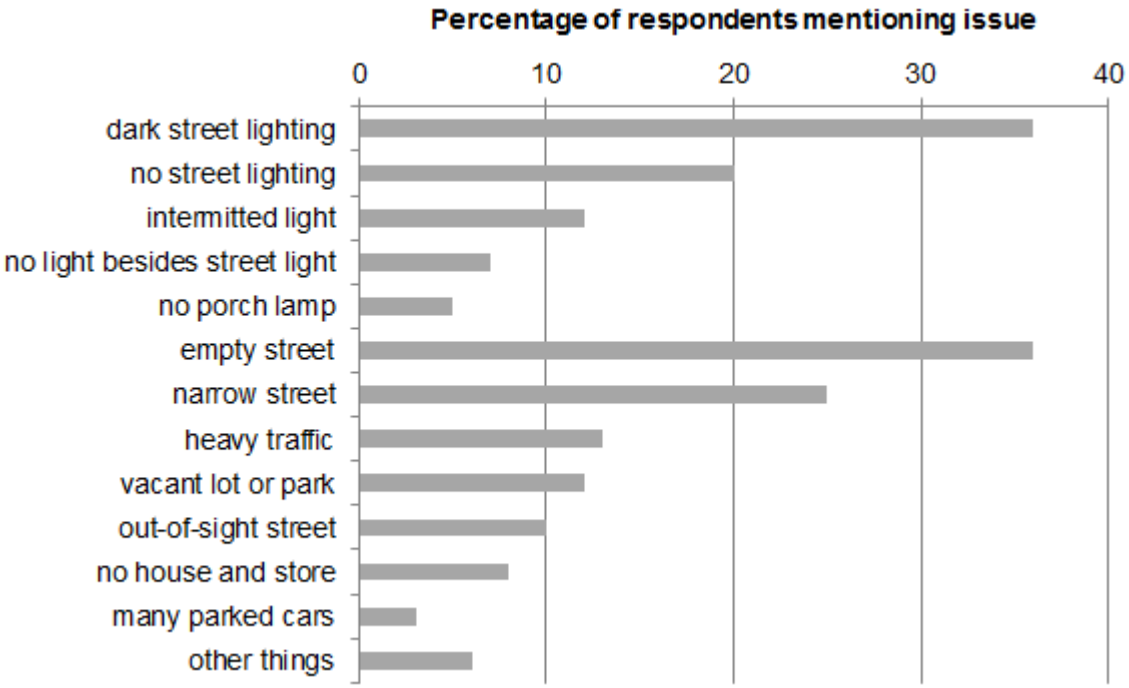

Figure 2 – Factors identified as contributing to feeling of insecurity [Okuda et al, 2007].

Koga et al [2003] asked test participants to rate 32 items when stood in streets in Fukuoka, Japan. Ratings were made of bi-polar scales (e.g. clean-dirty, light-dark, friendly-unfriendly, and want to walk through-do not want to walk through) having a 7-point scale with the middle value labelled neutral. It was concluded that feelings of security increase in light and busy streets. Factor analysis derived five common factors from the evaluated items. These were named liveliness, order, openness, intimateness, and unity. Lighting was essential to every factor. There are however three potential problems with this study: the full set of questions and their analyses were not clearly reported; conclusions from some of the rated items may be misconstrued through translation; and the time of day at which ratings were made is not reported.

Măierean [2012] sought judgements of outdoor lighting from 200 people (95 males, 105 females, aged 18 to over 65 years old) in the Romanian city of Cluj-Napoca. It was reported that 63% agreed with the statement “Public lighting creates feeling of safety?” (19% strongly agreed; 44% agreed; 25.5% were neutral; 11.5% either disagreed or strongly disagreed). However, the report does not present the questionnaire used (i.e. questions and response options) and it is not clear whether respondents were reporting the current lighting (in which case, this is not described) or their ideal preference.

2.1 Motivation to walk

The above studies investigated the effect of lighting from amongst other environmental features. An alternative consideration is the trade-off between reassurance and motivation behind the decision to walk and the destination.

A satisficing strategy suggests that people search for the first alternative that is ‘good enough’ [Fyhri et al, 2010]: in which case, the characteristics of lighting may not matter in real decision making situations. This may be related to habitual behaviour: many of the choices people make, for example travel mode choices, are a consequence of the execution of a habit. This perspective asserts that people are often found to base their choices for travel modes not so much on a deliberate evaluation of alternatives and their qualities, but rather on the execution of their habit [Fyhri et al, 2010].

Bernhoft and Carstensen [2008] surveyed 1905 people (1017 older people aged >70 years old, 888 people aged 40-49 years old) in two Danish cities. One question asked "Which of the following conditions are most important for your route choice when walking/cycling in your hometown?" and respondents were asked to choose a maximum three of the eight given statements. The results are shown in Figure 3, these being the percentage of people identifying each of the eight statements including 'Good street lighting'. Bernhoft and Carstensen report (their Figure 1) the results for Male and Females separately, Figure 3 presents an estimated average of these (in only two case were the difference between male and female responses suggested to be significant).

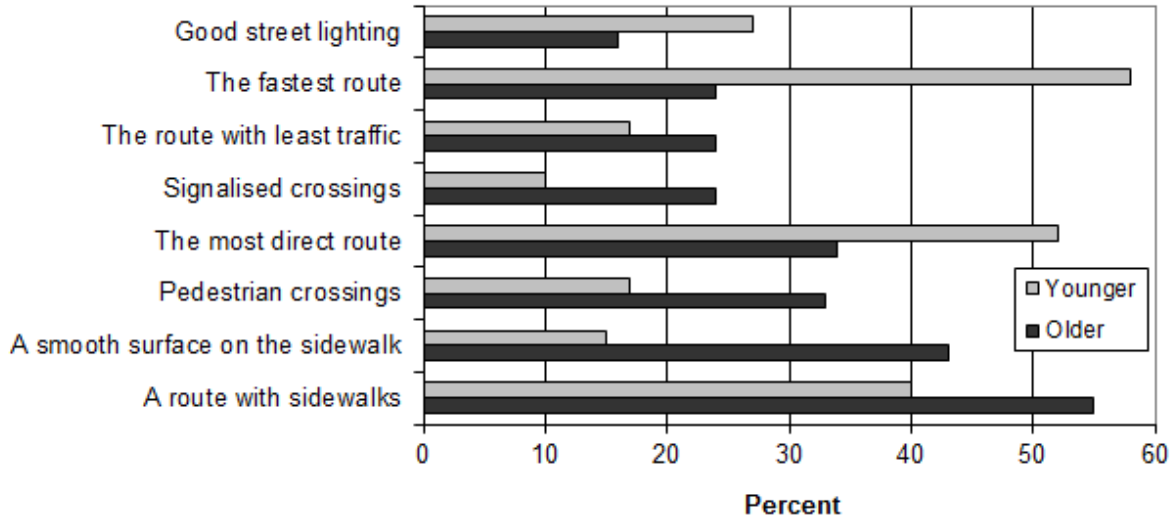

Figure 3 – Conditions of importance for pedestrians route choice, from Bernhoft and Carstensen [2008]. NOTE These values are estimated from their Figure 1 and are average values of the male and female responses presented.

The results show that good street lighting is not the most important condition. It was possible not to pick lighting as a criteria, but while many did not, some did. For the older age group it was the least important out of the options presented and for the younger age group it was the fourth most important after the fastest route, the most direct route and the presence of sidewalks. For the younger age group, getting to the destination quickly and by the most direct route were more important; for the older group, all items were more frequently important than good street lighting. There are four limitations with these data. Firstly, the respondents chose from a set list of reasons: we do not know if these are their most important route decision criteria. Secondly, the optional statements may have exaggerated their opinion of some issues compared with an open ended approach in which participants give their own reasons: the prominence of a 'possible' response may inflate its prominence. Thirdly, we do not know what locations or conditions the respondents used as their reference when making these decisions: if the road lighting in Denmark is already very good, then they might be less likely to consider this as a reason for route choice compared with a location where the road lighting is less good. Lastly, we do not know the relative importances, for example it may be that a route with sidewalks is the more important consideration by far for many people and their other choices were relatively minor considerations.

A potential limitation of the Loewen et al and Hanyu studies is that judgements were made from observation of photographs of outdoor scenes: it might be suspected that this does not give the same judgement as when made in the road itself [Foulsham et al, 2011]. In the Loewen et al study we have no information as to how familiar the test participants were with the scenes they observed.

This paper presents an alternative method for determining whether lighting affects reassurance developed in conjunction with an environmental psychologist and a criminal sociologist. The aim was to placing lighting in the overall context of reassurance at night time, by the consideration of other attributes such as spatial features, familiarity and the presence of other people, thus giving a holistic picture of the pedestrian experience.

3 Method

Test participants attended a three-stage interview during which different procedures were used to record their reasons for feelings of reassurance after dark in residential roads (Figure 4). This paper presents the results of the first and second stages.

Before attending the interview, participants were asked to photograph streets where they did, and did not, feel confident to walk alone at night-time. Their photographs were subsequently used as prompts during the second part of a three-stage interview.

Stage 1: Participants were asked to give general reasons regarding the issues that affect their confidence when walking alone at night and this discussion was carried out without the aid of any visual prompts.

Stage 2: Participants were asked to give reasons for the presence or absence of feelings of reassurance in locations of their own choosing, using their photographs of these locations as prompts. Thus, these discussions of reassurance focused on real locations familiar to the test participant, rather than being judgements based on photographs of unfamiliar locations.

Stage 3: Evaluations of safety in the scenes presented in five photographs of outdoor locations at night-time, these images having been pre-selected by the experimenter.

This approach was employed to avoid preconditioning with the notion that lighting might effect safety and to allow a discussion of environmental impacts beyond lighting in order to gauge the relative importance of lighting. Their photographs served as a reminder of the places they had chosen rather than being the target scene. The order of discussion (walk/not-walk streets) was counterbalanced. There were 53 test participants, including approximately equal numbers of younger (mean age 22 years old) and older (mean age 68 years old) people and genders.

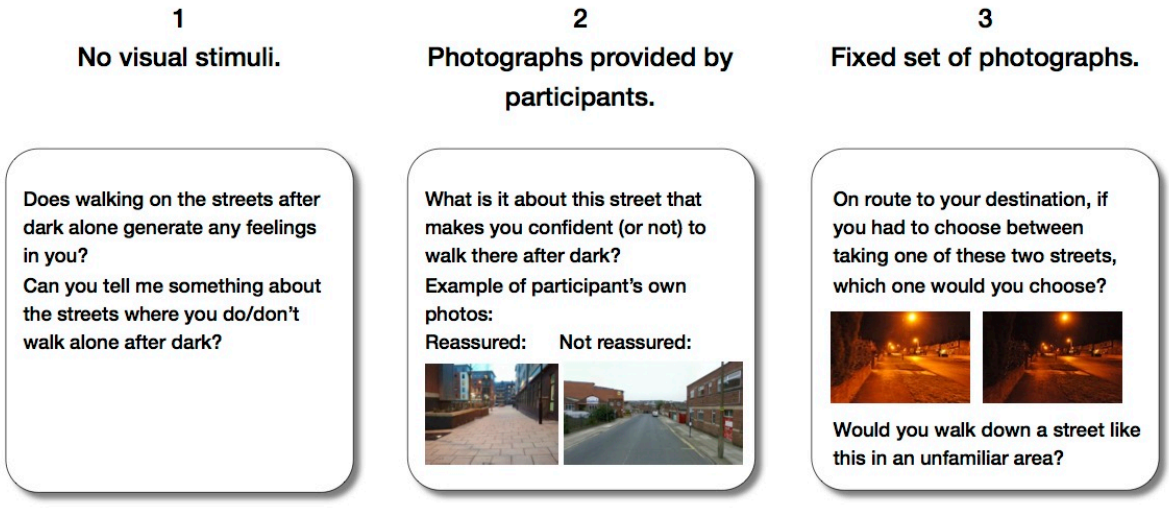

Figure 4 – Three stage interview used to investigate reassurance.

4 Results

Transcripts of the 53 interviews were analysed by identifying reasons given by participants for the presence or absence of feelings of reassurance, and the frequency for using these reasons were then counted. Reasons for reassurance were allocated into one of seven categories:

- presence of road lighting,
- access to help,
- spatial features,
- familiarity,
- mobility,
- presence of threatening others, and
- presence of CCTV.

Three were chosen to represent the factors contributing to reassurance identified in past work: access to help and light were noted by Loewen et al [1993], and spatial features includes environmental features linked to concealment, prospect and escape as identified by Fisher and Nasar [1992]. Four additional categories were identified during analysis of the results (familiarity, presence of CCTV, ease of mobility and presence of threatening others).

The respondents use of both positive and negative language was included, e.g. “it was really dark with just one street light” indicated that poor road lighting contributed to low reassurance, while “pretty well lit on both sides of the road” indicated that road lighting contributed to satisfactory reassurance. The frequency by which these reasons were used to explain feelings of reassurance were used to interpret their relative importance.

Figure 5 shows the frequency by which these categories were used to explain feelings of reassurance without the aid of visual prompts. 39 of the 53 participants mentioned adequate road lighting as a reason for feeling reassured; 37 people mentioned darkness or a lack of adequate lighting as a reason for not feeling reassured. Overall 49 people (92%) expressed the presence/absence of lighting as a factor contributing to reassurance. The presence or absence of access to help was the only factor mentioned with equal frequency as road lighting: spatial features and familiarity were mentioned less frequently.

Figure 6 shows the frequency by which the categories were used to explain feelings of reassurance in stage 2 of the interview which used photographs provided by test participants as prompts for particular locations, for each of the 210 locations. For 130 locations, road lighting was mentioned as a reason for the presence or absence of reassurance. This is a similar frequency to spatial features, less frequent than access to help, but more frequent than familiarity or the presence of threatening other people. Overall 46 (87%) of the 53 test participants mentioned street lighting as a reason for feeling reassured on two streets of their choice and 45 (85%) mentioned lack of adequate street lighting or darkness as a reason for not feeling reassured on two streets of their choice.

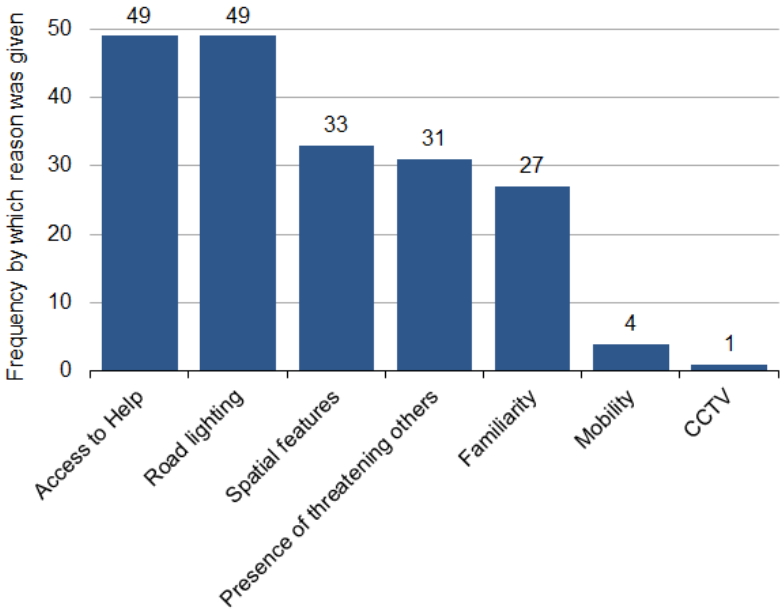

Figure 5 – Frequency of reasons given for feelings of reassurance in discussion without visual prompts (stage 1). (Maximum = 53)

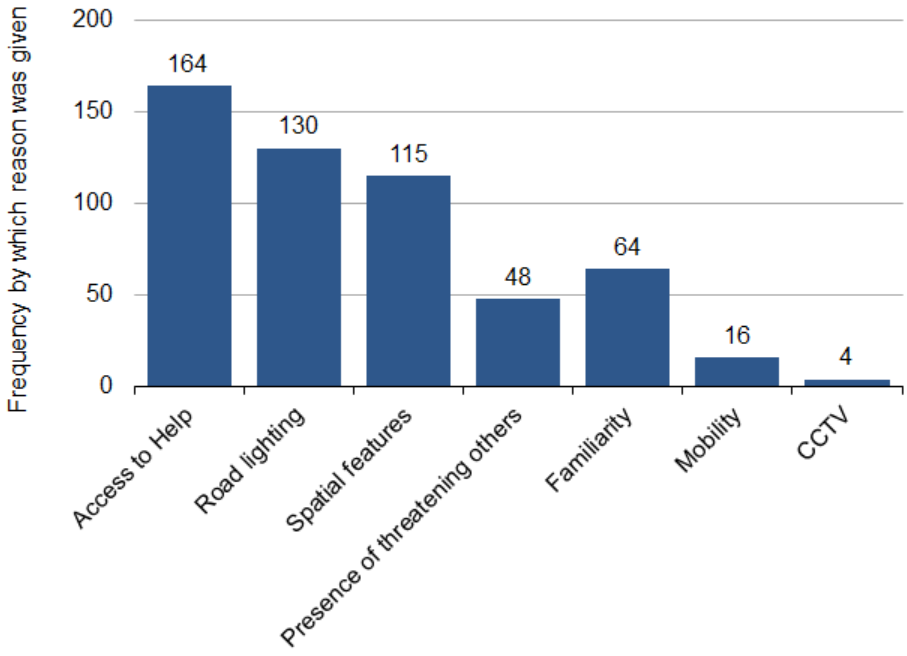

Figure 6 – Frequency of reasons given for feelings of reassurance in discussion prompted by photographs provided by test participants (stage 2).

5 Discussion

The results of the first two stages of the experiment described support the hypothesis that the presence of road lighting increases pedestrian reassurance. The method used provides

confidence that the effect of lighting was not enhanced by obvious changes of lighting in test images.

The results of the first stage support Loewen's study in that lighting is mentioned the most frequently in an open ended discussion with no visual prompts. We are not aware of past studies using participant's own photographs as a prompt for discussion of reassurance; Hanyu [1997] sought judgements directly of locations in photographs and there is no indication of whether their test participants were familiar with these areas, hence making the judgement based on their personal experience of the real location, or were providing a response only to the photograph. The results of the second stage of the current interviews demonstrate that, in areas familiar to participants, road lighting is considered to be an important reason for reassurance.

Table 1 summarises past studies of lighting and reassurance – note that these are studies of the presence of lighting and do not focus upon particular characteristics of lighting. In all seven studies, lighting is found to be an important factor behind judgements of reassurance. While personal factors such as fast and direct routes may be considered more important than lighting [Bernhoft and Carstensen, 2008], lighting tends to be considered as at least equal to other environmental features.

Table 1 – Summary of procedures and findings from past studies of reassurance

Study	Target	Method	Was lighting identified as a safety enhancer?	Most important features
Bernhoft and Carstensen, 2008	Real environment	Pick reasons (up to 3) from 8 given statements	Yes	Fast and direct routes
Hanyu, 1997	Photographs	Category rating, repeated measures	Yes	-
Koga et al, 2003	Real environment	Category rating	Yes	Liveliness and openness
Loewen et al, 1993	Photographs	Category rating, repeated measures	Yes	Light, open space, access to refuge.
Măierean, 2012	Real environment	Field study – rating scales	Yes	Not reported.
Okuda et al, 2007	Real environment	identify important environmental features	Yes	Empty street (no access to help), narrow street (spatial features), street lighting.
Current data (stage 1)	No specific location	Discussion of reassurance: no visual or location cues.	Yes	Access to help, road lighting
Current data (stage 2)	Real environment	Discussion of reassurance: photographic prompt of real environment	Yes	Access to help, road lighting, spatial features

6 Conclusion

An experiment was carried out to explore the contribution of road lighting to pedestrian reassurance after dark, using a novel procedure that aimed to avoid mention of lighting or fear and that allowed discussion of real locations where people would avoids walking after dark. The results suggest that road lighting is a factor contributing to reassurance: the presence of road lighting enhances reassurance and its absence impairs reassurance. These data confirm the findings of past studies that lighting matters, but where such conclusion is rendered less robust by the experimental design, for example judgements made by observation of photographs of unfamiliar locations. Further work is being carried out to investigate how judgements of reassurance vary with the amount of light.

Acknowledgement

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