An Investigation of the Effect of Street Lighting on Pedestrian Reassurance in Residential Environments

Jemima Unwin

A thesis submitted in partial fulfilment of the requirements of the University of Sheffield for the degree of Doctor of Philosophy.

School of Architecture

October 2014

Abstract

Two studies are used to demonstrate the effect of street lighting on pedestrian reassurance in residential environments. Study 1 - Three Stage Interview, asked 53 participants what mattered to them when walking alone after dark asking them to recall their feelings from memory with and without reference to places of their own choosing. The most common combination of reasons for reassurance were perceived access to help, lighting and spatial features. The presence of threatening others was added to this combination in areas participants found unreassuring. An image study demonstrated the resounding effect of lighting and drew attention to the possible simplification of the issue of reassurance in an experiment with tightly controlled variables. Therefore Study 2 took participants into real environments to see what matters there.

Study 2 - Residential Street Surveys, took 77 participants to 9 residential streets in Sheffield and asked them to rate their perception of safety among other factors such as the presence of hiding places and perceived access to help. Photometric measurements revealed that the pattern of light expressed in the length and level of areas of low luminance matters to reassurance, as does vertical illumination and the lit appearance of the whole surroundings, not just the path ahead. It was found that low uniformity is acceptable in some circumstances. However street lighting cannot always be presented as a solution to the problem of the fall of darkness as it had less of an effect in environments with low perceived access to help and who else is on the street matters to reassurance regardless of lighting. An effect of seasonal variation in lighting conditions was also found.

To summarise, Study 1 found that people think lighting matters, and Study 2 reaffirmed that it does, indicating possible minimum acceptable lighting conditions, which may be different to good practice. Further research is necessary to further explore the circumstances in which these minimum acceptable conditions apply and to define good lighting practice.

Acknowledgements

Contents

List of Figures and Tables

Figures

Tables

Glossary and abbreviations

ANOVA	Analysis of variance
BS EN	British Standard European Norm
BSI	British Standards Institution
cd	Candela
CCT	Correlated colour temperature
CRI	Colour rendering index
E	Illuminance
HPS	High pressure sodium
Illuminance (lux)	Luminous flux per unit area at a point on a surface. Lux is the unit of illuminance (lumen/m^2).
K	Kelvin
L	Luminance
LED	Light emitting diode
LPS	Low pressure sodium
Luminance (cd/m^2)	Luminous flux divided by unit solid angle emitted in a given direction (luminous intensity) divided by the projected area of the source element perpendicular to that direction.
Luminous flux (lm)	Quantity of light (radiant flux that can be seen) emitted by a source, measured in lumens.
MH	Metal halide
Ul	Longitudinal uniformity
Uo	Overall uniformity

1. Introduction

1.1. Social, economic and historical context

Britain's night-time appearance is changing. Major cities such as Sheffield and Birmingham are amongst others replacing existing street lighting stock with LED luminaires. The lighting community, shocked by the lack of debate on public lighting before such changes are implemented unquestioned, acknowledge that improved perceptions of safety and security are grounds for this transition (Major 2014). To understand how this has happened, it is necessary to delve into the social, economic and historical context of street lighting.

The distribution of electricity for the purpose of street lighting has been synonymous with the civic pride of an industrialised society ever since its invention. A trial of electric street lighting took place on Victoria Embankment in 1879, lighting over one mile of road from Westminster to Waterloo in London (Electricity Council 1987). Since then, as technical obstacles were overcome and the price of electricity dropped, infrastructure installation ploughed forward, which meant the role of street lighting in allowing people to continue their activities after dark was undeniable. However, the observation that this so-called progress cannot continue forever without depleting the earth's resources was more recently canonised in the Kyoto Treaty of 1997 in which industrial nations voluntarily committed to reducing greenhouse gas emissions, mainly carbon dioxide, by 5.2% in a decade. The main source of energy related greenhouse gas emissions is electricity generation and one fifth of this is used for lighting (International Energy Agency 2006). The proportion of this that is street lighting is unknown, however the figure excludes other effects of lighting such as the embodied energy in luminaire manufacture.

Figure 1.1 is a juxtaposed view of the world from space and is often used to demonstrate the issue of excessive energy consumption in the developed world. Most of the light in this image is light created by electricity and reflected by roads. The 'brighter is better' mantra is demonstrated by adjacent property owners use of external facade lighting to compete for the buyers' attention and encapsulated by the Southern electricity advert shown in Figure 1.2. However, the detrimental effects of light pollution are publicised by many groups. For example, scientists report the adverse chronobiological effects of exposure to electric light during the night such as obesity (McFadden, Jones et al. 2014); astronomers want to preserve the dark night sky and wildlife protection groups are concerned for the welfare of creatures such as newly hatched turtles heading the wrong way up the beach towards lit towns rather than moonlight reflected by the ocean.

Figure 1.1. Juxtaposed view of the world from space showing light reflected from roads (Mayhew and Simmon 1994).

Against a background of conflicting messages, on the one hand energy wastage is unjustifiable and on the other hand street lighting is necessary, came the economic crisis of 2008. This resulted in a necessity for energy consumption conscious local authorities to cut costs, as their funding from central government was reduced just as energy prices increased. Government figures show that between 2012 and 2013, average industrial electricity prices increased by 4.3% (Department of Energy and Climate Change 2014). In a quest for energy efficiency, older low pressure sodium and high pressure sodium luminaries are being replaced by LED fixtures often sold on the basis of lumen per watt efficiency. As part of large-scale renovations, for example those which have and are taking place in Birmingham and Sheffield, centralised management systems are installed as part of the switch over which enable streetlights to be dimmed or turned off remotely. Energy bills are used as evidence of the success of the recently installed systems. However in the event of traffic accidents on these streets, the finger is often and quickly pointed at inadequate illumination. For example, the coroner on a case where a student was hit and killed by a taxi driver said the street light switch off contributed to the death (The Telegraph 2013).

The issue goes much deeper than quantifiable life or death, as a result of traffic accidents. Street lighting may have an effect on not only the safety, but also the perceived safety of an environment. Improved perceptions of safety have a positive impact on mental health and well-being (Blackman, Harvey et al. 2001) because when people feel safer in their environment, they are more likely to use it (Alfonzo 2005). For example, if people are concerned about going out then they may become restricted in their own homes, leading to more sedentary lives. It was taken for granted that lighting could create a safer environment as long ago as 1405 when the Court of the Common Council proclaimed that a lit lantern should be placed outside each house for the Christmas Watch, a period of increased activity (O'Dea 1958). In 1461 in Paris, Louis XI commanded his subjects to place lanterns at crossroads and in the windows of houses with the purpose of deterring bandits (O'Dea 1958). Many other laws were passed in both England and France, with the underlying assumption that street lighting is desirable, even if difficult to enforce with no infrastructure in place. As this assumption is at least six centuries old, it is ingrained in popular opinion. However popular opinion is fickle and easily influenced by

the media, as demonstrated in a recent paper which found that if more environmentally conscious individuals are presented with facts relating to the negative effect of street lighting then they will also judge darker streets to be safer than their less environmentally motivated counterparts (Boomsma and Steg 2013).

Figure 1.2. Southern Electric city service advertisement (Southern Electricity Service 1939).

If an area is perceived to be safe then a pedestrian will not have any qualms about using that environment. The contribution of lighting to this reassurance is difficult to pinpoint because of contradictory messages given by the environment. For example, CCTV requires higher than pedestrian lighting levels to record footage so that criminal activities can be distinguished against the background. This may lead to the perception that high lighting levels mean higher likelihood of crime resulting in suspicion of bright areas (Postlethwaite 2003). The question of whether lighting can assist criminals in identifying victims and burglary sites has been raised (Webster 2003). On the other hand, the Outdoor Lighting Guide (The Institution of Lighting Engineers 2005) states that good lighting enhances the safety and security of people and property and uses two reviews (Farrington and Welsh 2002, Welsh and Farrington 2002) to conclude that improved lighting is four times more likely to be effective in reducing crime than the installation of CCTV. As can be seen by Figure 1.3, the idea is not new. If an environmental feature such as lighting can be shown to increase perceived safety then it could be used as a means of reassuring pedestrians that an environment is safe to use, increasing the probability that they walk on the streets after dark.

It is important to establish the circumstances in which it is worth making changes to lighting. In 1990 street lighting was raised in Parliament as a neglected area and one that should not be compromised even when facing cost cuts (Parliament 1990). At the large scale of street lighting across Britain, small differences matter to cost. It is estimated that energy efficient policies implemented between 1990 and 2005 saved 12.6% of the lighting energy use around the world (International Energy Agency 2006). Therefore policy has a role in energy saving and needs to be informed by research. Therefore, in a climate of increased awareness of environmental issues, coupled with mounting cost pressures, examining the role of street lighting in pedestrian's perceptions of the safety of their environment is worthwhile.
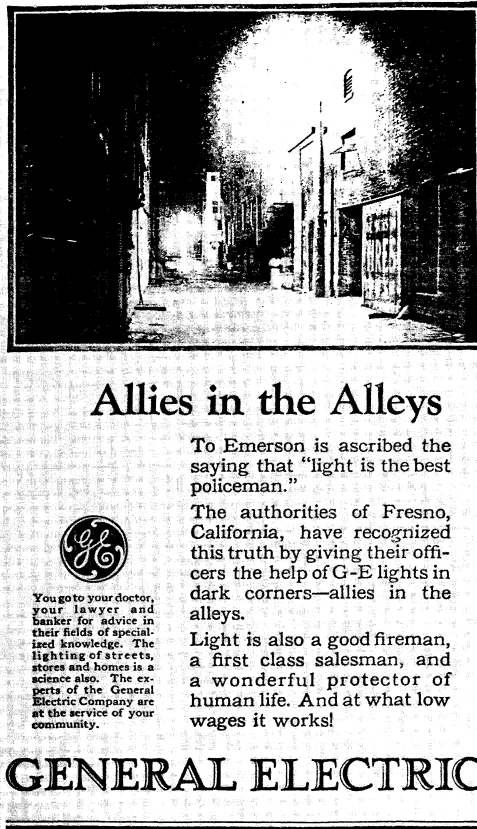
Figure 1.3. 1924 General Electric advertisement (Bouman 1991).

1.2. What is a pedestrian looking for in their environment?

The main task of street lighting is to present road users with the information they need as clearly as possible (Waldram 1962), so that they can decide whether it is safe to walk down the street. It is very difficult to prove whether a brighter environment could encourage people to walk more after dark. Therefore we need to understand what information pedestrians need to confidently navigate the environment and how this information may be conveyed by lighting.

The amount of light required by pedestrians at night is unknown (Waldram 1962). In order to establish how to light an environment, it is important to determine what it is that the pedestrian wants to do and see in their environment. An obvious pedestrian task is to walk without tripping over. Cuttle (Cuttle 2009) referred to an experiment in an open plan office demonstrating that at mean illuminances of 1 lux participants were able to leave the room at the same speed as under normal office lighting conditions (Boyce 1985) to make the point that humans can function without a lot of light. Participants experienced some difficulty in moving at mean illuminances of 0.2 lux (Boyce 1986). This demonstrates that the ability to walk is not necessarily impeded by mean illuminances of 1 lux, which is lower than that of the lowest mean illuminance recommendation of BS 5489-1:2013. A reason to light to higher illumination levels is that people do not only need to walk in an environment, they need to obtain other information from that environment through sight.

Impeded visibility leads to more unknowns in the environment which may lower perceptions of safety as the physical and sociological characteristics of the street are more difficult to assess. Therefore street lighting should in theory have an impact on pedestrian reassurance because it enables pedestrians to see their environment more clearly and make a decision about whether to use it. An example of being able to judge the safety of an environment is in the ability to identify any escape routes in the event that the environment becomes unsafe. The following paragraphs sum up physical and sociological dimensions of an environment which may matter to this judgement.

In order to be able to glean enough information about an environment pedestrians need a clear view of their surroundings. This may be impeded by the street layout. Bends, large tree trunks and tall hedges, amongst other spatial features, may prevent a pedestrian from identifying and monitoring potential threats presented by other street users. In order to navigate the environment its envelope should be clear because identification of boundaries leads people to see the available options presented by the environment. Visibility of more subtle variations in the physical environment such as buckling pavements may be relevant to safe movement, as is the ability to identify safe places to walk and cross the road.

Whether the land use enables surveillance by other users of the environment may also be of interest to pedestrians (Jacobs 1961). For this, sociological factors come into play as a judgement is made regarding the type of area and whether the pedestrian would be supported by other street users should anything happen. In unfamiliar areas, environmental cues may matter to this judgement for example if a place looks well kept, then by extension people may assume they would be cared for if anything happened (Wilson and Kelling 1982). The extent to which physical and sociological factors matter to an individual, depends to some degree on their personal disposition and whether they perceive themselves to be a likely victim of crime. Experience counts because if a pedestrian or an acquaintance has recently been mugged, then they may be more hesitant to go out after dark. The impact of psychological factors is difficult to isolate from other factors and may not be consistent within one individual. It may be that some pedestrians see themselves as being so vulnerable that no matter how bright the environment it will have no effect on their perceptions of safety.

The key question is: What is the minimum illumination level at which pedestrians can glean enough information to judge whether an environment can be safely navigated? Whether lighting can change behaviour by encouraging more people to walk after dark is more difficult to assess. Lighting the streets at night presents a two-part problem. Firstly, is there enough light to walk the streets at night and secondly, is there enough light to choose to walk the streets at night? This thesis concentrates on the latter problem.

1.3. Street Lighting Standards

In Britain the illuminance levels recommended for the night-time lighting of residential streets (2-15 lux) are higher than in some other countries, for example Australia and New Zealand (Standards Australia 2005), where the range is 0.5-7 lux. As energy wastage is not justifiable, the question of whether there is any basis for the higher UK requirements is asked. This section begins with a brief history of street lighting legislation which may have informed the direction of the current standards.

1.3.1. Brief history of street lighting legislation

Street lighting was originally introduced for pedestrian travel, as there were no motorised vehicles when the first laws regarding street lighting were passed. Street lighting existed before man made electricity, the earliest mention was probably by the poet Propertius in approximately 23 BC who was the first to record that torches were used to light the streets (Curran 1968). Since then, the evolution of lighting legislation was ad hoc, and how the street lighting standards evolved is a long story with many missing pieces. Previous lighting research (Boyce and Gutkowski 1994) mentions laws passed as long ago as 1558 when the City of Paris decreed that all citizens who had houses fronting the streets should burn lights in the windows.

The foot candle was devised as a means of quantifying light, defined by the illumination emitted by one candle at a distance of 1 foot, and equal to 1 lumen incident per square foot. This was used in the British Standards regarding street lighting. B.S. 307 (British Standards Institution 1931) listed minimum illuminances between lampposts for eight lighting classes (A-H). The highest classes A and B recommended a mean test point illumination of 2 foot-candles (22 lux) and 1 foot candle (11 lux).The lowest is class H, specifying 0.1 foot candles (0.11 lux) for streets with no through traffic. Classes F and G specified the equivalent of mean illuminances of 0.54 lux and 0.22 lux. At this stage differentiation had not been made between urban centres, motorised vehicle and pedestrian environments. By 1938, roads had been categorised into class A, for main traffic routes, and class B for subsidiary routes (Cook, Colquhoun et al. 1935).

Since the 1950s, motorised vehicles have increasingly dominated transport routes. It could be argued that this has resulted in the needs of pedestrians becoming secondary to those of drivers responsible for fast-moving vehicles which could cause traffic accidents. The route of this shift in emphasis is the safety of all road users, however it has also resulted in the neglect of the less tangible issue of a pedestrian's perception of safety, which cannot be measured by accident counts or crime statistics. In 1962 Waldram (Waldram 1962) published an influential paper which demonstrated that fixed lighting could provide the necessary information for safe motorway driving in the case of emergency, rather than relying on headlights. He stated that the task of street lighting is to give the driver and other road users the information that they need clearly, unambiguously and with the proper emphasis. He identified the eleven items listed in Table 1.1 to be the tasks of the street lighting. These justify the approach of installing lampposts at regular intervals. A column has been added to this table to comment on whether this task is applicable to pedestrians and if so how. Over half of these tasks also apply to pedestrians demonstrating that conventional street lighting may be a necessary compromise between the two sets of requirements.

	Necessary task of lighting identified by Waldram (1962)	Design implication of task identified by Waldram (1962)	Does the task apply to pedestrians? If so, how?
1	Show the carriageway ahead and the vehicles and obstacles on it.	-	Yes, pedestrians need to see where they are going, what is ahead and any obstacles on the pavement.
2	Rearview should also allow distance and speed of over taking traffic to be judged in the mirror.	-	No, pedestrians do not use rearview mirrors, however they need to be aware of what is going on behind them as well as in front.
3	Luminance of the road surface should be free-from patchiness, even on a wet surface. Suggest light coloured surface to the assist with lighting.	Single row of columns for each carriageway. Spacing–height ratio not exceeding 3.5 (depending on running surface). Long luminaires.	Consistent luminance of the road may help contribute to the legibility of the environment.
4	Good visibility of the limits of the carriageway and the margins beyond.	Distribution narrow in azimuth.	Yes, pedestrians need to see the extent of their environment.
5	Good visibility of vehicles near the crest of a rise, where no road surface background.	Distribution with a cut-off.	Yes, as pedestrians have to cross the road at night.
6	Avoid discomfort glare given increased visibility of luminaires compared to normal traffic route.	Distribution with a cut-off. Low luminance luminaires.	Yes, discomfort glare should be avoided for pedestrians.
7	Avoid repetitive effects from the luminaires, avoiding sharp cut-off angles.	Cut-off angle should not be too hard. High mounting.	No, pedestrians are not moving fast enough.
8	Not placed on the central reservation, should be as far as possible from the hard shoulder. Columns constructed for minimum damage to vehicles on impact, and ease of removal if need be.	-	No, although placement of lamp post should not be in the middle of pavements as that would inconvenience pedestrians.
9	Use it for way finding at complex junctions emphasising vehicular routes, possibly by the use of coloured lights.	-	Yes, way finding is a pedestrian task because it contributes to orientation on the street.
10	Clearly indicate motorway course for a long way ahead. Give warning of density of fog.	Cut-off angle should not be too hard. Providing some light up to horizontal. Single row of columns for each carriageway.	Yes, a clear view ahead is important for pedestrians.
11	Inconspicuous lighting equipment, columns should not clutter up the motorway.	-	Yes, uncluttered environments may improve coherence and legibility of an environment.

Table 1.1. Drivers' visual tasks identified by Waldram (Waldram 1962), and whether these tasks apply to pedestrians.

Methods of lighting which differed to the approach laid out by Waldram were tested. For example Waldbauer (1959) tested a unidirectional installation, pointing the luminaires in the direction of traffic flow for improved obstacle detection, at mounting heights of 9.1 metres. However, as pointed out by Nagel in the discussion of Waldbauer's paper, alternative approaches generally found that the disadvantages outweighed the advantages. It was recognised by the early 1960's (Waldram 1962) that specifying street lighting on the basis of the horizontal foot candle was out of date, because it is brightness contrast which is seen by both pedestrians and drivers. Therefore luminance was adopted for drivers. This was not possible for pedestrian lighting because direction of view is unknown. Therefore for the practical reason of ease of calculation, mean illuminance on the horizontal plane is used for the lighting classes relevant to pedestrians (van Bommel and Caminada 1982).

By 1971, there were five classes for subsidiary roads, the lowest of which could be met by spill light. In 1989 and 1992 BS 5489–3 listed three lighting classes for pedestrians, the lowest targeted at residential roads, recommending mean illuminance of 3.5 lux and minimum of 1 lux, and the other two classes recommending mean illuminances of 10 and 6 and minimum illuminances of 5 and 2.5 lux respectively. By 2003, this had been increased to 6 classes, the lowest being class S6 specifying 2 lux average and a minimum of 0.4 lux. This very brief story tracking changes in the standards shows a variety of recommended mean illuminances, however no corresponding research into what pedestrians require could be found to support these developments. The form street lighting has taken is more likely to have evolved through practical and commercial considerations and the necessity to increase visibility to reduce the likelihood of traffic accidents, rather than investigation of the needs of pedestrians.

1.3.2. Summary of current street lighting standards
Lighting Classes
Categorisation provides a means of managing recommendations for a range of conditions presented by different environments. BSEN 13201-1 2013 categorises street environments into traffic routes, conflict areas and subsidiary roads. Traffic routes are defined as being those where the speed of the main user is greater than 30mph, therefore the requirements of motorists are paramount. The ME classes address these by specifying luminance, overall and longitudinal uniformity and maximum threshold increment as a means of limiting disability glare. Areas of conflict of interest of different users (for example shopping streets and roundabouts) are covered by the CE classes which specify minimum maintained average horizontal illuminance and minimum overall uniformity. Requirements for subsidiary roads, or those where the speed of the main user is less than or equal to 30mph can be selected from either the P classes specifying minimum maintained average illuminance and minimum maintained illuminance or HS classes, specifying minimum maintained average hemispherical illuminance and minimum overall uniformity. On subsidiary roads, SC (semi cylindrical illuminance) classes can also be adopted for "purposes of improving facial recognition and increasing the feeling of safety". The use of EV classes (vertical illuminance) is an option in areas where vertical surfaces need to be seen. P, SC and EV classes are replicated in CIE 115:2010. Only the EV classes differ in CIE 115:2010 as opposed to BS5489-1. BS5489-1 states that EV classes are for areas such as interchanges, where visibility of vertical surfaces is a necessary function of the

environment, whereas in CIE 115:2010 lower minimum vertical illuminances corresponding to P classes are presented as an optional extra if facial recognition is necessary.

In lighting practice it is the P classes that are most commonly used for residential streets. This maybe because the calculation method for horizontal illuminance is simpler than hemispherical illuminance. A spreadsheet of the lighting classes used for all streets in Sheffield provided by Amey (the PFI contractor responsible for the replacement of existing lighting stock with LED luminaires) only listed ME and P classes, demonstrating that recently in Sheffield SC and EV classes are not implemented. Table 1.2 summarises the lighting classes used for pedestrians. It excludes the rarely used HS classes however it does include SC and EV classes because it is implied in CIE 115:2010 and BS5489-1 that they contribute to a feeling of safety.

Lighting classes for subsidiary roads						
From BS5489-1					From CIE115:2010. (Table 7).	
P classes			SC classes		EV classes	
Calculation surface formed of a grid of points (10 points between lanterns and 6-10 points across the road) on the horizontal surface of the pavement and road (EN13201-3).			Calculation point (1.5 metres above pavement) located in a plane orientated at right angles to main direction of pedestrian movement (EN13201-3).			
Class	$\bar{E}$ in lx^a [min. maintained]	E_{min} in lx [maintained]	Class	$E_{SC,min}$ in lx [maintained]	Class	$Ev_{,min}$ in lx [maintained]
P1	15	3	SC1	10	P1	5
P2	10	2	SC2	7.5	P2	3
P3	8	2	SC3	5.0	P3	3
P4	5	1	SC4	3	P4	2
P5	3	1	SC5	2	P5	1
P6	2	0.4	SC6	2	P6	0.6
P7	Performance not determined.		SC7	1		
a To provide for uniformity the actual value of the maintained average illuminance must not exceed 1.5 time the minimum $\bar{E}$ value indicated for the class.			SC8	1		
			SC9	0.5		

Table 1.2. Summary of relevant tables (3-6) on pages 11 & 12 of BS EN 13201-2:2013. Boxes highlight classes repeated in CIE 115 (Table 7).

BS 5489-1 suggests that the driving motivation for the P classes is safety and perceptions of safety. The commentary in 4.2.2. Visual tasks for pedestrians – Recognition and personal safety, states that light is needed to create:

1. A street which is safe for people to use by detection of potential trip hazards and to judge the intent and/or identity of other people at a distance sufficient to make a decision regarding whether evasive action is necessary.

2. A street which is perceived to be safe to use by general feeling of safety, visual comfort (absence of glare) and perceived ability to judge the intent and/or identity of other road users.

3. Ability to read signs (for navigation).

This thesis explores the role of street lighting in creating a street which is perceived to be safe to use.

P Classes

Once the appropriate lighting class is chosen, then a decision is made regarding the appropriate sub class for example P3 or P4. The selection of the specific class depends on the environmental zone and the traffic flow. The environmental zones range from E0 to E4 of increasing district brightness and population. Many residential streets fall into E3 which is defined as suburban surroundings of medium district brightness (Institution of Lighting Professionals 2011). Table 1.3 recommends how the P class be selected based on ambient illuminance and traffic flow in areas where the typical speed of the main user is ≤ 30 mph. The class can be dropped by one or two (depending on the environmental zone) if the road is subsidiary with mainly slow-moving vehicles, cyclists and pedestrians, rather than a typical speed of main user of ≤30mph.

| | Lighting class* | | | |
Traffic flow	Ambient luminance: very low (E1)	Ambient luminance: low (E2)	Ambient luminance: moderate (E3)	Ambient luminance: high (E4)
Busy[a]	P3	P3	P2	P2
Normal[b]	P4	P4	P3	P3
Quiet[c]	P5	P5	P4	P4
Note 1	Table A.5 assumes no parked vehicles.			
Note 2	If facial recognition is important then an ES lighting class from BS EN 13201-2:2003, Table 5, or an ESC lighting class from CIE 115:2010 [N1], Table 7, can be selected as an additional criterion. Good colour rendering contributes to a better facial recognition.			
Note 3	To ensure adequate uniformity, the actual value of the maintained average illuminance is not to exceed 1.5 times the value indicated for the class.			
Note 4	It is recommended that the actual overall uniformity of illuminance Uo be as high as reasonably practicable.			
Note 5	Grey highlighting indicates situations that would not usually occur in the UK.			
Note 6	The ambient luminance descriptions E1 to E4 refer to the environmental zone as defined in ILP GN01 [N5].			
[a]	Busy traffic flow refers to areas where the traffic usage is high and can be associated with local amenities such as clubs, shopping facilities, public houses, etc.			
[b]	Normal traffic flow refers to areas where the traffic usage is of a level equivalent to a housing estate access road.			
[c]	Quiet traffic flow refers to areas where the traffic usage is of a level equivalent to a residential road and mainly associated with the adjacent properties or properties on other equivalent roads accessed from this road.			
*	Lighting class may be reduced by one on E1 and E2 subsidiary roads and by two on E3 and E4 subsidiary roads with mainly slow-moving vehicles, cyclists and pedestrians. For example, in an E4 area P4 becomes P6.			

Table 1.3. Lighting classes for subsidiary roads with a typical speed of main user v ≤ 30 mph. Table A.5. From BS 5489-1:2013.

The selected P class specifies the minimum maintained average horizontal illuminance and minimum maintained illuminance (Table1.2). These are both measured on the horizontal surface of the road and pavement using a grid of 10 points between lanterns and 6 points across the road as defined in EN:13201-3. "Maintained" is an expression of the allowance made for the degradation of the installation over time which is subject to a predefined maintenance plan (for example a six monthly cleaning programme). This usually leads to over specification at the beginning of the lifetime of an installation to account for grime which it is expected will build up until the first cleaning and checking of the installation.

Other considerations

Under equal illuminance environments lit by lamps which have an SPD strong in the blue end of the spectrum appear brighter than those which are weaker in the blue end. S/P ratio divides the scotopic lamp lumens by the photopic lamp lumens in an attempt to address the fact that at night, vision is more sensitive to short wavelength light. In order to account for this, BS 5489–1 2013 recommends small reductions in illuminances as the S/P ratio increases, as long as the CRI is greater than 60 (Table 1.4).

Lighting class	Benchmark (e.g. Ra < 60 or when S/P ratio of light source is not known or specified)		S/P ratio=1.2andRa ≥60 (e.g. some types of warm white lamp such as metal halide)		S/P ratio=2andRa ≥60 (e.g. some types of cool white compact fluorescent or LED)	
	$\bar{E}$	Emin	$\bar{E}$	Emin	$\bar{E}$	Emin
P1	15	3	13	3	12	2.5
P2	10	2	9	2	8	1.5
P3	8	2	6	1	6	1.1
P4	5	1	4	1	3	0.7
P5	3	1	2	0	2	0.4
P6	2	0	1	0	1	0.4

Table 1.4. Table A.7. BS 5489-1:2013 (page 56).

Practical realities

The implementation and maintenance of the recommendations of the relevant standards is up to local authorities and depends somewhat on funding availability (Shaw 2012). Photo electric cell control means that at predetermined daylight illuminances (also affected by weather conditions such as cloud cover) street lighting can be switched on and off. These are increasingly controlled by centralised management systems (CMS) which enable remote control. Switch off and dimming is also approved in BS5489-1:2013 as long as undefined uniformity requirements are met. The extent of dimming or switch off in the early hours of the morning depends on local policy decisions at council level.

Summary

To summarise, the P classes commonly used in lighting practice specify minimum and average maintained illuminance levels. Their implementation may be ad hoc and depends on subjective judgements of environmental zone and traffic conditions. The reason for the P classes is to ensure pedestrian safety and perceptions of safety. This reinforces the choice of research topic because no evidence could be found to link the recommended illuminances to perceived safety.

1.4. Key definitions and concepts

1.4.1. Night vision

The human visual system adapts to lighting conditions below a day lit environment. The eye's visual response is the mechanism by which people see and depends on how much illumination enters the cornea. Illumination received by the eye is measured by luminance in candelas per metre squared. Scotopic (below about 0.001 cd/m^2), mesopic (between 0.001-3 cd/m^2), and photopic (above around 3 cd/m^2) conditions (CIE 1989), have a role to play in the responses of people to their environment, for example the fovea responsible for visual acuity is blind in scotopic conditions. The night vision of the pedestrian on a residential street typically falls into the mesopic range which means that the eye optimises for semi darkness using both rod and cone photoreceptors simultaneously. In this range small changes in light level, spectral distribution and location in the visual field have been shown to make a difference to visual response (Lennie, Pokorney et al. 1993).

The fact that the eye adapts so well to mesopic conditions means that after about 20 minutes the image on the back of the retina is brighter, due to the rod curves passing the cone plateau (Sekular and Blake 1994, Gregory 1998). However, the gradually increasing image brightness during adaptation does not necessarily mean that the perception of the environment is also brighter. However an increase in lighting illuminance is expected to result in an increase in brightness perception (Stevens 1961) and this may have a part to play in pedestrian reassurance.

In a dark environment stimuli seem brighter than they do in a light environment, the effect of this is clear when street lights are on during the day and are barely noticeable. This is known as the "adaptation" effect, and emphasises the importance of the surrounding areas, not only the stimulus. Equal changes in luminance does not mean equal changes in subjective brightness. The relationship between an increment of energy and apparent brightness is non-linear (Hopkinson 1957). Street lighting has an effect on visual perception at night because there are greater reflective luminance differences at night than during the day when roads and footpaths are uniformly bright. Therefore the conditions for producing contrasts with less light are better at night than during the day.

1.4.2. Definitions

The research question is: What is the effect of street lighting on pedestrian reassurance in residential areas?

Pedestrian reassurance could be described as their confidence to use a street. The amount of reassurance required depends on the location, and regardless of relighting, some areas will still feel unsafe (Raynham and Mansfield 2005). Residential streets are important because they are where most people begin and end their daily activity. They form routes to access local facilities and provide a conveniently local environment for jogging and walking. Although reassurance is synonymous with perceptions of safety, because if a person does not perceive the environment to be safe they will not feel reassured, this is the preferred term throughout this thesis, because it omits the necessity to define whether safety is real or imaginary. The word "reassurance" reinforces the distinction between actual safety, which could be judged by procedures such as

risk assessments referring to incident statistics, and perceived safety, which may be influenced by knowledge of above however also by emotions. Reassurance addresses the root issue of confidence and is defined in the following table along with other key definitions used throughout this thesis.

Word	Definition	Source of definition
Street	A road in a city, town, or village, typically comparatively wide (as opposed to a lane, alley, etc.), and usually running between two lines of houses or other buildings; such a road along with the pavements and buildings on either side.	Oxford English Dictionary. Definition 2a
Pedestrian	A person who goes or travels on foot, esp. as opposed to one who travels in a vehicle; a walker; one who walks as a physical exercise or in athletic competition.	Oxford English Dictionary. Definition 2Ba noun
Reassurance	A thing or fact which, or a person who, removes or allays doubts or fears	Oxford English Dictionary. Definition 2b
Residence	The circumstance or fact of having one's permanent or usual dwelling place or home in or at a certain place; the fact of residing or being resident. Also in extended use.	Oxford English Dictionary. Definition 2a
Residential street	Street with the majority of frontages comprising private dwellings	CIE dictionary. Ref. 17-1091
Residential area	Area of a village, town or city which is suitable for or is occupied by private dwellings	CIE dictionary. Ref.17-1089
Residential property	Land upon which a dwelling exists or may be developed, e.g. land zoned for residential development	CIE dictionary. Ref.17-1090
Light	That natural agent or influence which (emanating from the sun, bodies intensely heated or burning, and various other sources) evokes the functional activity of the organ of sight.	Oxford English Dictionary. Definition 1.
	Viewed as the medium of visual perception generally. Also, the condition of space in which light is present, and in which therefore vision is possible. Opposed to darkness.	Oxford English Dictionary. Definition 1a.

Table 1.5. Key definitions.

1.5. Summary

Street lighting uses electricity which if produced by burning fossil fuels contributes to global warming. One reason to install street lighting is that it may contribute to pedestrian reassurance, their confidence to use a street after dark. Establishing whether and how street lighting effects pedestrian reassurance could contribute to informing decisions regarding when, where and how to relight. At the large scale of residential streets in the UK, small differences have a large impact on cost. Current P class illuminance levels have resulted from an ad hoc evolution of standards probably more a result of the requirements of driver than pedestrian tasks (Fujiyama, Childs et al. 2005). Pedestrian needs are largely neglected as they are less a matter of immediate life and death than those of drivers, and the eye is effective in using the amount of light available.

The first aim of this thesis is to ascertain whether street lighting effects pedestrian reassurance. If street lighting is found to have an effect, then the second aim is to determine which lighting characteristics matter. If illumination is shown to make a difference to reassurance then how this increased effectiveness is achieved could contribute to finding the cost benefit threshold of changing existing lighting. The next step is to investigate whether existing literature points to an effect of lighting on pedestrian reassurance, and whether the findings of existing research are convincing. Examining existing research means that gaps in knowledge can be identified and addressed.

2. What Matters to Pedestrians? A Literature Review

2.1. Introduction

Chapter 1 showed that the effect of street lighting on pedestrian reassurance is a worthy area of research. Street lighting policy has evolved informally ever since lighting was used for way finding. The evolution of the relevant standards may have been more a result of politics and practicalities rather than careful consideration of what pedestrians require, and this is probably because it is so difficult to define what people need as that is tied in with their expectations which are culturally and socially constructed. However, against the background of melting ice caps and a planet consumed by material and energy wastage, the complexities of the issue should not deter research which might contribute to the understanding the role of street lighting in pedestrian reassurance. This literature review addresses pedestrian reassurance in an environment, why it is needed and what effects it, covering both social and physical aspects of the environment. Nightfall adds a new dimension, as it changes the appearance of the world in which we live, and this affects behaviour causing some to worry about what might happen to them after dark (Jansson 2007). Street lighting can be presented as a solution to the effect of darkness. This review summarises relevant work in and beyond the field of lighting research and identifies gaps which inform the proposed experiments.

When examining reassurance after dark, acknowledging the convergence of three entities: A person; in a place; at a particular time, helps break down the complex interacting factors at play and is used to structure the first part of this review. Figure 2.1, although simplified, summarises the situation of people in the environment at a particular time. Lighting forms a obvious part of "place" and the challenge is to understand how important lighting is in the context of not only the specific location, but also the individual and the circumstances which place them in that environment at that time.
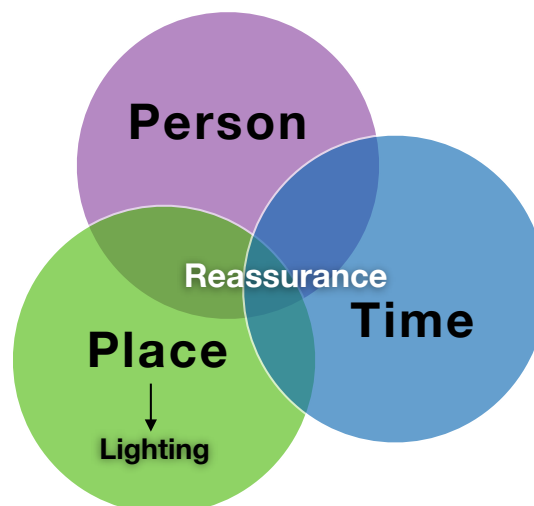
Figure 2.1. Placing lighting in context.

2.2. Environment

The field of environmental psychology was first studied by psychologists such as Egon Bruswick who ascertained that an organism's environment effects it's psychological processes at a subconscious level. The field envisages human behaviour as a function of the individual and the environment (Sansone, Morf et al. 2003). If the environment is a determinant of behaviour, then it follows that environmental interventions should be effective.

Space Syntax is a theory developed in the 1970s by Hillier by which an attempt is made to break down the idea that the physical and social city act independently of each other, arguing that the assemblage of space affects movement, rather than individual psychology. By observing and analysing the movement of people on urban grids, it was found that movement is best predicted by (1) taking the route with the least sharp angles, (2) fewest turns, followed much further behind by (3) shortest path (Hillier and Vaughan 2007). This research showed that pedestrians have a geometric and angular model of how areas of the town connect to each other rather than a model of metric distances (Hillier and Vaughan 2007). This builds on earlier work by Lynch which identified that pedestrians form mental maps of cities defined by paths, edges, districts, nodes and landmarks (Lynch 1960).

Environmental psychologists also addressed the issue of mapping. Spencer identifies two types of mapping that occur when the environment is navigated by humans: Cognitive and Affective (Spencer and Gee 2011). Cognitive mapping defines the geometry of an area, and knowledge of this geometry may influence behaviour. However lighting is more likely to influence the affective mapping process which establishes feelings in a place. Visual properties including lighting have been linked to affective appraisals of areas(Johansson, Rosén et al. 2011), for example Hanyu linked visual properties to affective appraisals and found that "Active/safe" appraisals were linked to "Well lit/visible" (Hanyu 1997).

A recent review (Lorenc, Petticrew et al. 2013) of the effectiveness of environmental interventions in reducing the fear of crime found no convincing evidence that street lighting changes, closed-circuit television or environmental crime prevention programs had any effect. It examined 14 studies of mixed results and found lack of experimental rigour in both cases showing a trend towards decreasing fear of crime post lighting change, and those which showed the opposite.

Other research has identified various aspects of the physical environment which can negatively affect perceptions of safety. The presence of enclosed spaces which could be used as hiding places, spatial features such as bends in the street which obscure the view ahead, an absence of refuge in case of trouble, and low levels of illumination from street lighting have all been identified as reasons for wariness (Fisher and Nasar 1992). However, there are many contradictions present in the environment. For example cars symbolise occupancy; maintained foliage gives good impression of a well-kept suburban area; front gardens provide "Defensible space" for residents (Newman 1972) however all these features also present an opportunity for hiding places. Perceptions of a street are also affected by familiarity and the acoustic environment (Adams, Cox et al. 2006).

Despite conflicting opinions and evidence, the following aspects of the environment were identified as affecting reassurance; (1) prospect and refuge provided by the environment; (2) signs of dilapidation, (3) land use and (4) informal surveillance. These are discussed in turn below.

Prospect refuge theory

Prospect (open view)-Refuge (protection) theory was developed by Appleton (Appleton 1975). It refers to a necessity of a good view and ability to hide from danger for survival. This was taken a step further in the identification of 'concealment' or hiding places as beneficial to offenders but not victims (Nasar, Fisher et al. 1993). An extensive environmental study into the effects of prospect-refuge theory on perceptions of safety was completed by Fisher and Nasar (Fisher and Nasar 1992) who observed behaviour on sites of varying prospect and refuge, obtained participant responses to site plans and completed a field survey at the locations.

The first part of study one asked 20 students to rate eight sites for prospect and refuge on a university campus in Columbus, Ohio (Figure 2.2) so that a ranking of the environmental conditions of the sites could be made (Table 2.1). Low prospect/higher refuge was found to be the least safe and high prospect/low refuge was found to be the most safe by 149 participants during the day (86 males, 70 females) and 129 participants at night (74 males and 55 females). The mean age of participants was 21. The significant effects were less clear amongst the variations in lower levels of refuge and higher levels of prospect. Only people familiar with the site were selected for the study.
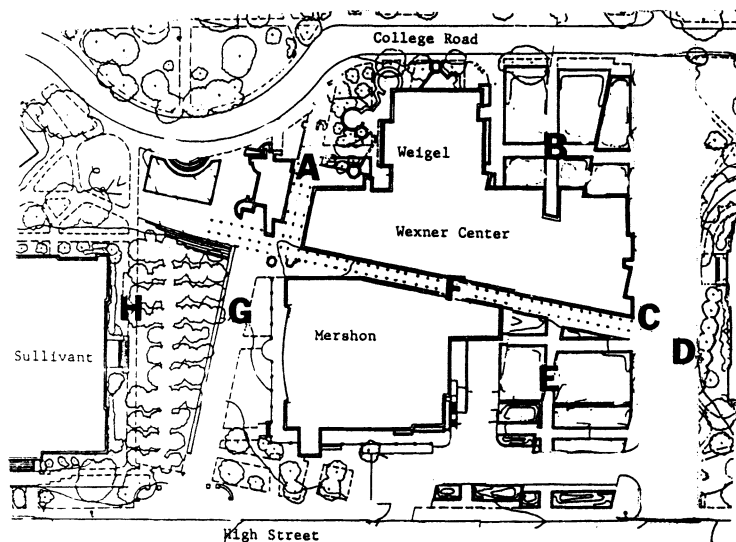
Figure 2.2. Site plan for the Wexner centre and nearby buildings (Fisher and Nasar 1992).

Judgement of site characteristics**

Prospect (for victim) (1 = Limited, 5 = Open)		Refuge (for offender) (1 = Much, 5 = None)		Escape* (1 = Limited, 5 = Easy)	
H	**4.45a**	*G*	*4.10a*	G	4.50a
G	**4.40a**	*D*	*3.45b*	D	4.35a
D	**4.30ab**	*F*	*3.35b*	H	4.25ab
C	**4.00b**	*H*	*3.20b*	C	4.10b
A	*2.40c*	*C*	*3.10b*	A	2.8c
F	*2.05c*	A	2.40c	B	1.65d
E	*1.6cd*	**E**	**1.55d**	E	1.60d
B	*1.40cd*	**B**	**1.10d**	F	1.40d

Key:	**High,** fairly high, *moderate*, **low**.
*	**"high" or "low" label not given in paper**
**	Means with different subscripts did differ significantly from each other using a p sampled t test. Means with same subscripts do not differ significantly from each other. (After Table 1 - Judgements of site characteristics and figure 3 - Wexner Centre Areas Arranged in Terms of Prospect and Refuge Fisher and Nasar 1992).

	Resultant 5 categories of areas			
1	High prospect/low refuge	Area G	Most safe	
2	High prospect/moderate refuge	Areas H, D, C.	↑	
3	Low prospect/fairly high refuge (better escape)	Area A		
3a	Low prospect/moderate refuge (worse escape)	Area F	↓	
4	Low prospect and high refuge	Areas B, E.	Least safe	

	Rank of sites		**Comment**
	Area G	Most safe	At night G was perceived to be significantly safer than all other areas. During the day it was only significantly safer than E, B,F.
	Areas H, D, C.	↑	During the day and night, H,D,C & A were significantly safer than E,B & F. No other differences except significantly less safe than G at night.
	Area A		
	Area F	↓	During the day and night E,B & F were perceived to be significantly less safe than all other areas.
	Areas B, E.	Least safe	

Table 2.1. Summary of Fisher and Nasar's study one findings (Fisher and Nasar 1992).

The second study involved an opportunity sample of 27 females after dark who completed an on site survey. Questionnaires included a safety question on a seven point scale. A similar ordering of sites was found as Study 1, with low prospect/higher refuge being the least safe and high prospect, low refuge being the most safe. As a supplementary exercise, nine graduate students rated lighting on a five-point scale of well lit–dark. It found that lighting did not account for the difference in safety score. Sites F, A, H and G were judged to be significantly better lit than areas E, C and D. The darkest site was perceived to be area B. A plot of the subjective impression of lighting (mean of nine people) on a five-point scale against the Day minus Night safety rating (of the whole sample of their first study) revealed that the correlation was weak ($R^2=0.23$). One criticism of this approach is that as the lighting was not measured it is not known whether the subjective impressions of 9 people are related to real conditions.

The third study examined behaviour on the campus after dark. It found that people avoided low prospect/higher refuge areas and the areas nearby. The paper reports 87 observation periods however the duration of the observation period is unknown. Another criticism is that although the studies were used to establish the effect of higher refuge for offenders and low prospect and escape for potential victims, they do not consider refuge for potential victims in the form of occupied buildings or passing people.

Signs of dilapidation and Broken Window Theory

Low levels of maintenance indicate symbolically that a place is uncared for which may create feelings of discomfort. Broken window theory states that minor signs of incivility induce other forms of more serious crime, and many studies have been completed to prove this (Wilson and Kelling 1982). An interesting study found that there was no significant difference between perceptions of safety in an ordered and disordered virtual reality environment, unless the sound was turned off in which case participants felt significantly more concerned in the disordered environment (Toet and Schaik 2012). As a dilapidated environment does not itself present a danger then a pedestrian's interpretation of this is more to do with who they are and why they are in that environment (Acuña-Rivera, Uzzell et al. 2011). Modifying the physical characteristics of an environment including lighting may not be enough to reduce feelings of insecurity. Many studies have shown that safety ratings decrease as physical disorder ratings increase, when rating scales are used to judge an environment (Skogan 1990). However, if participants are asked to describe the same environments using their own words beforehand, only one quarter of participants referred to unsafe feelings when describing a photograph of an environment showing signs of incivility (Acuña-Rivera, Uzzell et al. 2011).

Land use

Areas with shops open late, may attract people at night and therefore increase reassurance that other street uses may help should anything happen. However a study carried out in Western Australia (Foster, Wood et al. 2013) found that strangers attracted to a neighbourhood which had shops were perceived as a threat to safety by locals. The study analysed surveys from 1159 people before and after relocation to a new area, and found that neighbourhood aesthetics, well lit streets and neighbourhood cohesion corresponded with decreases in perceived crime risk ($p=<0.001$). Foster identifies a paradox in that areas which encourage walking may also increase perceptions of crime risk. The subtleties of land use should be

explored further because the type of retail outlet may have an effect. A large shopping centre may attract people who arrived by car, whereas a small local shop may only attract locals residing in the area.

Informal surveillance/social context

An individuals' perceptions, attitudes and actions are a result of both the social and physical environment (Gifford 2007). The social meaning of space and whether that invokes fear of crime has geographical, economic, social, cultural and psychological dimensions (Pain 2000). The role of informal surveillance or 'Guardianship' was identified by Jacobs the originator of the expression "Eyes on the Street" (Jacobs 1961) as a means of expressing the role of strangers as safety assets on the streets after dark. This implies a type of area where the community is seen to be one that may step in should anything untoward occur to an unsuspecting pedestrian. Lack of capable guardians are also identified as part of the reason for crime (Cohen and Felson 1979).

It is also important to acknowledge the importance of social networks. For example, if a resident who knows the area well sees signs of incivilities, for example broken glass on the curb edge and associates that with individuals that they know, ("the neighbour's kids were messing about again"), then the warning signal which might normally be given may be discounted. The relationships which residents have with differing local communities and cultures, may also affect how they feel in the area (Pain 1995).

2.2.1. Affective appraisals

Reassurance is an affective response. The first experiment to identify a connection between affective responses, lighting conditions and health and well-being, using rigourous experimental procedure was by Veitch et al. who proved that if an individual likes the lighting attributes within a space then their mood will be affected in a positive way (Veitch, Newsham et al. 2008). This was a turning point in approach, looking beyond (1) Visibility (whether you can see a task) and (2) Avoidance of discomfort. This experiment is described briefly as it was one of the first pieces of large-scale work which used statistical power to prove an effect of subjective impressions and lighting conditions on feelings of health and well-being.

The experiment examined the distribution of luminance within a space, surface luminance within the space and the control of the lighting to ascertain how behavioural outcomes were affected by changes. The result was a strong causal chain between appraisal, preference, mood and effect on health and well-being. The results were expressed in a linked mechanisms map (Figure 2.3). Each of the attributes on the linked mechanisms map were tested by either a rating scale or by involving the participants in a test within the office environment. Inter-correlations between each of these variables were examined to identify statistical significance.

The experiment discovered that personal control leads to a positive effect which improves mood and visual task competence. The main path found was between appraisal and well-being. There is an additional line shown from preference to motivation and task performance. The study concluded that lighting conditions to support employees should achieve lighting quality in terms of (1) luminance provided, (2) control of glare and (3) appearance of the space. The study supports research into affective responses to the appearance of environments.
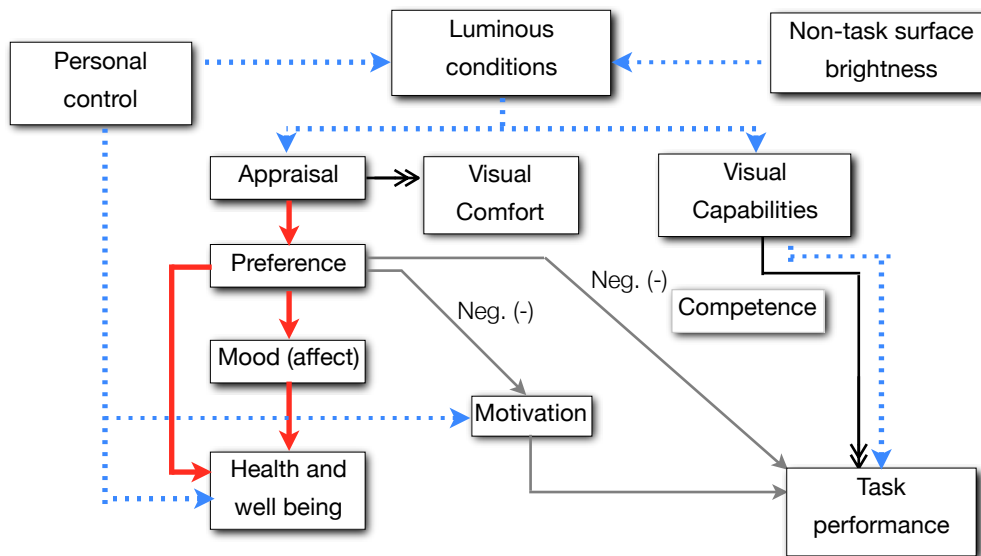
Figure 2.3. Final linked mechanisms map, showing lighting condition test results with dotted lines, and mediated regression test results with solid lines. Heavy solid lines show the Appraisal path, and black solid lines with double- headed arrows show the Vision path. The light grey solid lines show extra links, with small effect sizes, added to the model on the basis of the mediated regression results (Veitch, Newsham et al. 2008).

2.3. Individual

The previous section demonstrated that opinions about the environment can not be isolated from their social context. Social context is subjective and depends on who is making the judgement. Therefore it is important to understand the significance of lighting in the context of not only the specific site, but also the individual and the circumstances which place them in that environment at that time.

The person we are affects our perceptions. A review of public perceptions of security found that individuals identify threats at global, international, community and personal/family level and that those who see more threats at a global level will also identify more threats at other levels for example personal, and that some people are chronically threatened, meaning that they see threats at all levels (Stevens 2012). Four principles of identity which vary between individuals guide an adult's action: Self Esteem, Continuity, Self Efficacy, Distinctiveness (Twigger-Ross and Uzzell 1996). The personality of an individual is not static, as experiences lead to ideas which could affect how somebody sees themselves and the world. How experiences are interpreted changes with time. When people are asked whether they feel at risk of crime, that notion is embellished with the face of the potential criminal and the location in which the crime might occur, all of which are rooted in the everyday (Jackson, Farrall et al. 2008).

Some individuals feel more vulnerable to harm than others. Research has found that some groups for example young females and the elderly feel more vulnerable than other groups (Warr 1985, Sampson 1987, Smith and Jarjoura 1989). Higher levels of reported fear in women, compared to men have been reported (Loewen, Steel et al. 1993) however other studies have

found no difference between the sexes (Fisher and Nasar 1992). Valentine argues that women's fear of crime is related to their fear of men (Valentine 1989). Some studies have found that older people feel less safe than younger people (Mansfield and Raynham 2005) whereas others have found no difference in concerns between young and elderly women (Pain 1995, Johansson, Rosén et al. 2010). It is generally thought that elderly people are least likely to be the victims of crime (Clarke and Lewis 1982), however domestic violence against elderly people is endemic (Pain 1995). The specifics of the local social and immediate environmental contexts are likely to be far more important than generalisations made when using the term 'old age'(Pain 1997). Recognition of individual differences has been addressed in previous research. For example, before questioning participants about their perceptions of safety van der Wurff carried out a personality inventory (Table 2.2) to gauge differences in confidence between individuals. He chose perceptions of attractivity, power, evil intent and criminalisable space as a means of judging this (Wurff, Staalduinen et al. 1989). The first question is interesting because it raises the issue of people seeing themselves as objects of desire. If this is the case, a woman jogging may feel safer in a darker environment where she is less likely to be seen by potential offenders.

List of questions used to measure the factors in the Social Psychological Model

Factor	Question
Attractivity	Do you think that people who are up to no good are likely to fix especially on you and your possessions?
	Do you think that there are people who are jealous of you?
Power	Do you think that you're capable of chasing off a possible assailant?
	Do you generally steer clear of rows?
Evil Intent	Do you generally trust strangers?
	Do you distrust particular people in your surroundings?
Criminalizable Space	If you're on your way somewhere, do you ever imagine that someone could obstruct your path?
	If you have to go somewhere, do you watch out that you take a safe route?

Table 2.2. Testing a social Psychological Model (Van der Wurff, Van Staalduinen et al.1989).

Fear

For reassurance to be understood, 'fear' should be acknowledged. Many studies suggest that lighting helps reduce crime and fear of crime (Painter 1988, Painter 1996). However, Figure 2.4 adapted from Farrell (Farrall, Jackson et al. 2009) demonstrates that "fear of crime" is an ill defined term that could mean anything from vague concerns to feeling scared. If a participant is asked a question about "fear of crime" it is difficult to identify to which type of fear they refer in their answer resulting in conclusions which have little meaningful application. Farrall's definition "Awareness of the possibility of crime - Precautions sensible" is possibly the most relevant to this discussion because the decision not to walk down a dark street is a precaution against the perceived possibility of crime.

The different dimensions of fear were explored by Furstenberg who identified differences in types of fear, one of general concern about developments in the area of crime and the other specific fear of being a victim (Furstenberg 1971). This differentiates between existential fear meaning deeper universal anxiety and situational fears, meaning moments of fear which relate to immediate threats (Rachman 1978, Hankiss 2001).

Awareness of the possibility of crime. Precautions sensible.

Puncturing of security by sudden shock events. Actual victimisation/hearing about victimisation.

Diffuse set of concerns.

Immediate sense of threat.

Attitudes/opinions. 'Expressive'

Fearful in specific situation - 'Experiential'.

Feelings about the problems of crime for society. Separate emotionally from ones own experiences but linked experientially.

Nagging doubts that ebb and flow.

Situation where victimization is a serious possibility.Immediately prior to victimisation or immediately after the threat is recognised.

Figure 2.4. Different definitions of fear (Farrall, Jackson et al. 2009).

Other work has argued that fear of crime is a socially constructed and politically motivated statement, coined in America in the 1960s after rioting, as a means of influencing public opinion of government policy (Lee 2001). Others have argued that as middle class security has increased since the 1970s, so have their feelings of insecurity (Garland 2001). The role of the media in influencing people is difficult to measure. Swinton town centre was re lit however subsequent surveys of visitors and local businesses showed no effect of the new lighting. This result could have been affected by local headlines such as that shown by Figure 2.5 (Mansfield and Raynham 2005).

Figure 2.5. Headlines which may affect survey responses regardless of lighting.

Surveys and socially desirable responding

Socially desirable responding is found in previous research. For example when participants were asked to evaluate the potential effects of relighting an existing street, one experiment reported that 93% of participants stated that the number of people walking would increase, and 80% said that fear of crime would decline (Nair, McNair et al. 1997). Socially acceptable answers may differ between the sexes as what is socially desirable for men and women may be different. Another study found that men who give more socially desirable responses report lower levels of fear however if the "missing" fear is calculated then men are found to be more fearful than women which makes sense because they are more likely to be victimized (Sutton and Farrall 2005).

Perceptually Contemporaneous Offences

Also relevant to the discussion is the concept of "Perceptually Contemporaneous Offenses" (Lane and Meeker 2003). This idea has been used to explain why women give higher levels of fear of burglary than men. The theory is that when a woman is asked about burglary, she gives an answer about rape, because most people wrongly assume that they will be in a house when it is burgled, and that the burglar would attempt to harm them. Another example is that when asked about assault, women may answer with sexual assault in mind. Their answers are inadvertently not to do with how worried they are about the likelihood of assault happening but rather, if it did happen how much would it affect them (Lane and Meeker 2003).

2.4. Reassurance in previous lighting research

The issues around reassurance outside the field of lighting have been discussed. The term is not new in lighting research. Cuttle used the term "reassurance" in lighting when referring to the visual constancy found in familiar environments of a human scale (Cuttle 2003). He defines the architecture of reassurance as that which reinforces constancy and allusion. Allusion is the opposite of illusion and seeks to provide visual information which is easy to understand, rather than stimulate the senses. Visual constancy means the "process by which perceived objects maintain more or less stable attributes despite changes in the retinal images by which they are recognised". Cuttle summarises Lynes's (1994) contributors to visual constancy. These are listed in Table 2.3 which demonstrates that not all are possible in a typical P class installation. This may mean that those which are possible become more important. For example the definition of a term such as "adequate" is important at night and has a role in reassurance.

Other factors beyond the visual scene and outside the remit of lighting may also affect reassurance. This is why the definition of reassurance used in this thesis (Table 1.6) was defined in the introduction as being something which allays fears or doubts and within a residential street after dark is that which gives the pedestrian confidence to use the environment. It is important to address issues broader than visual constancy precepts if the role of lighting in pedestrian reassurance is to be understood.

Visual constancy precept	Is this possible on a typical suburban residential street in Sheffield?	Can this be achieved by a typical P class installation?
Adequate light	Yes.	Yes.
No disability glare	Yes. Except for passing car headlights.	Yes.
High croma, particularly on dimly lit surfaces	No. Unless parked cars are considered.	No.
A variety of colours	Yes.	No.
Small white surfaces ("separators")	Yes. In road markings.	No.
Natural organic materials with characteristic colours and textures	Yes. On streets with trees and vegetation. Also buildings made of brick.	No.
No large glossy areas	Yes except when it rains and large puddles may create a large glossy area.	No.
Sources of light should be obvious (but not necessarily visible)	Yes.	Yes.
Recognisable texture	Yes.	Yes.
Good colour rendering	Yes.	Yes.

Table 2.3. Lynes visual constancy precepts and whether these are possible by a typical P class installation.

2.5. What happens after dark?

So far the complex entities of the environment and the pedestrian have been touched upon. Here, a third dimension is added to the discussion, which is that of time and what happens after dark. The effect of darkness is the problem to which lighting can be presented as a solution. Idioms of the English language reveal an underlying cultural assumption that light is good and dark is bad. For example, the sayings "seeing the light" or "he was in a dark place" have nothing to do with illuminance levels. Recent work claimed that a brighter indoor environment has morally beneficial outcomes in a study demonstrating that a higher proportion of participants offered to return undeserved money in an environment of increased illuminance, lit by 12 rather than 4 or eight fluorescent lamps (Chiou and Cheng 2013). On the other hand, it has also been suggested that darker environments promote creativity and freedom from social norms (Steidlea and Werth 2013).

The negative effect of darkness on affective appraisals of places has been established for some time (Box, Hale et al. 1988). People need more reassurance at night time compared to day time because after dark affective/emotional appraisals are more negative (Hanyu 1997). Warr describes the transformation of the street into 'lurk lines' behind which people can hide after dark (Warr 1985, Warr 1990). The assumption may be made that it is possible see more at

higher illuminance levels and that may reduce anxiety. However this might not be true because in darkness signs of incivility leading to negative judgements may also not be seen.

2.5.1. The effect of lighting on crime

Darkness brought by nighttime brings on a range of emotions from excitement and intrigue to more opportunity for mischief. One way of quantifying what happens after dark is to examine crime figures. Research into the effect of environmental interventions on crime is not straightforward. As soon as quantifiable data such as number of attacks and vandalism to property is addressed, then the question of how it is recorded, counted and categorised is brought into question. Manipulation of crime figures is obviously a sensitive political issue as no government wants to report an increase in crime under their watch. Once again, lighting presents a paradox because although it may be used to deter crime, the more crime is seen the more it is reported due to improved conditions for surveillance (Tien, O'Donnell et al. 1979).

The Chicago Alley Lighting project (Morrow and Hutton 2000) found that after increasing the power of the lamps from 90W to 250W and increasing the number of luminaires in alleys in Chicago, reported night time crime increased by 21% one year post installation. In the six months post lighting installation, all reported crime (day time and night time) increased by 40%, whereas in the adjacent control area it increased by 19%. It concludes that this is possibly due to residents being more aware of offences taking place. A break down of offenses showed that substance abuse at night time increased by 60% in the experimental area whereas daytime violations decreased by 19%. In the control area the increase was 73% during the evening and the daytime decrease was 53%. Therefore there is no conclusive evidence of the effect of increased alley lighting on crime.

Many studies have suggested the opposite, that lighting helps reduce crime and fear of crime (Painter 1988, Painter 1996). Crouch found that an increase from 2-3 lux, to 8-10 lux, has an impact on crime however above that an increase in lighting levels does not make much difference (Crouch, Shaftoe et al. 1999). Previous lighting studies have surveyed residents before and after a change in street lighting (Akashi, Rea et al. 2009), or have asked them to rate lighting and safety (Boyce, Eklund et al. 2000) and have concluded that lighting does affect perceived safety. Crime Prevention Unit paper no. 28 (Atkins, Husain et al. 1991) examined police databases of 100, 816 reported crimes; studied areas of increased lighting one year prior to and one year after those changes; carried out a social survey in the form of surveys questioning travel behaviour, reactions to lighting and experience of harassment. It found that improved lighting had no effect on crime levels after dark. It identified the positive effect of the increased lighting levels on the perception of safety of women when walking alone after dark however the description of lighting improvements is vague.

The Campbell Systematic Review , supported by the Home Office, published a report titled 'Effects of improved street lighting on crime' which found through a literature review that street lighting is effective in preventing crime in public areas in some undefined circumstances (Welsh and Farrington 2008). The review examined studies where at least one outcome was a measure of crime (minimum of 20 crimes) and ensured that in intervention studies reported, the main intervention was street lighting. It also filtered out before and after studies which did not

use control areas. Altogether only eight studies from the US and five UK studies passed the quality criteria of the review. It carried out a meta-analysis of these 13 studies and found that overall crimes decreased by 21% in experimental areas compared to control areas. In three of the studies crime increased after the intervention however the increases were not significant. On this basis the report rejects the hypothesis that more lighting causes more reported crime. Two reasons were given for the overall decrease in crime. Firstly, crime reduction through reduced opportunity and increased risk of being seen, resulting from physical changes to the environment, including lighting. Secondly, by increased community pride and therefore informal social control, with reference to two studies where both nighttime and daytime crimes decreased after a street lighting change. The review draws attention to the inherent contradictions in the perceived benefits of increased street use which may also lead to greater opportunity for perpetrators to choose victims (Cozens 2008). The review also noted that as crime is usually a result of behaviour patterns of specific individuals in the community, rather than spread evenly throughout a neighbourhood, therefore location specific situations need to be understood before lighting is applied as a solution. For example if a street on which houses are frequently burgled at night, is relit, this may move the criminals' activity to another less well lit street. This is sometimes called displacement which means that crime does not decrease, it moves to another area instead.

The authors conclude that future research should concentrate on investigating whether improved street lighting has a greater effect as a symbol of community pride or as a deterrent, and proposes using the installation of CCTV as a comparison. It states that it is important to understand the extent to which street lighting acts as a catalyst for a change in resident's and offender's perceptions of the area. One of the problems with a concept such as community pride is its vague definition. It could mean social connectedness, participation in community activities or simply being happy to live in a particular neighbourhood (Foster, Wood et al. 2013).

Once the measurement of crime is scrutinised thoroughly and objectively, it is difficult not to become embroiled in the politics of crime figures and how they can be used to manipulate the public. It is for this reason and the fact that the subjective impressions of safety are not necessarily related to crime figures that the issue of crime and lighting is not the subject of this thesis and is not explored further.

2.5.2. Summary so far
To summarise, many factors contribute to the metaphorical feel of an area and what that symbolises (Spencer and Gee 2011). The person, the environment and the effect of time of day on both create an infinite number of variables from which the effect of lighting on reassurance is difficult to isolate from other factors. The problem with subjective impressions such as reassurance is that they are difficult to quantify and may be seen as inferior to more easily quantifiable measures such as visual performance. One solution to this problem is to use a combination of (1) a carefully planned experiment and (2) statistical power to generalise across populations which enables trends to be identified regardless of individual differences. The review so far has focused on the big picture of what matters to pedestrians in the environment, presenting lighting as a potential solution to the problem of the effect of darkness on human behaviour and the consequent change in subjective impressions of the environment. The fact

that preferences directly affect subjective health and well-being which also effects visual performance, gives reason to take research into subjective concepts such as reassurance seriously. The following section examines existing work in the field of lighting research.

2.6. Examples of relevant studies in lighting research

Lighting research into the impact of lighting on pedestrian's perceptions of safety can be loosely grouped into the following categories: (1) Field surveys including before and after surveys and dynamic lighting studies, (2) facial recognition studies and (3) image studies. It is also worth mentioning (4) eye tracking studies which aim to identify what matters to pedestrians by examining what they look at and (5) obstacle detection experiments which attempt to address safe movement which may form part of pedestrian reassurance. These are discussed below.

2.6.1. Field surveys
Perceived safety in car parks

Field studies provide a good balance between external and internal validity, and are replicable however there is limited experimental control. Using sites in New York and Albany, Boyce et al. carried out four field studies in order to ascertain the amount of light required to provide a perception of safety at night in urban and suburban areas (Boyce, Eklund et al. 2000). The effect of light spectrum on that perception was also examined. The first two field studies addressed perceptions of good security lighting, the first in New York City, with 23 people visiting 10 sites and the second in Albany, using 20 people visiting 15 sites. The sites were exterior areas for example public streets and paths around housing, commercial developments and industrial buildings. Participants were driven to sites in a minivan and then after walking around the site they stood at a specified viewing position to complete surveys using 5 and 7 point scales. Measurements were made using a cubic illuminance meter at 1.5 m above the ground, at the points of brightest, dimmest, and average perceived brightness, within the field of view of the participant. The horizontal illuminance at the viewing position was used in the discussion of the findings. The correlation coefficients between cylindrical, scalar and horizontal illuminance were all high, therefore horizontal illuminances were reported as that is used for design purposes. It found that good lighting ratings increased with bright, even, comfortable, extensive in area, well matched to the site ratings. Only the glaring/not glaring scale moved independently of the others. The results suggested that for a mean agreement of 3+ (which meant that the average person moderately agreed with the statement "this is a good example of security lighting"), an illuminance of 40 lux is required. When this was broken down by gender it was found that males required 35 lux and females 60 lux.

The third field study took 18 subjects to 24 car parks in Albany and New York City to address whether lower illuminances are more acceptable in suburban areas. Prior to the experiment, a panel of 10 people were asked to judge photographs of the parking lots and categorise them into overall impressions of urban, suburban or rural. This time illuminances arriving on the surface of each parking lot were measured at 20 randomly chosen points in a 30 x 30 m area which the participants faced when filling in the surveys. As before, participants walked around the site before standing at the viewing position which gave them a view across the centre of the car park. Participants visited the locations during the day and at night, filling in surveys which asked them questions such as "how safe would it be to leave their car parked in the parking

lot” using a seven point scale. The results identified illuminances of 20 lux in an urban car park and 10 lux in a suburban car park for moderate agreement of mean +3 with the statement “this is a good example of security lighting”. The study found that day minus night safety ratings decreased as median illuminance increased. Figure 2.6 reproduces the graph in this field study which plots day minus night safety ratings against median illuminance. The logarithmic curve is is slightly shallower than the original and is used because it is nearest to the hyperbolic curve.
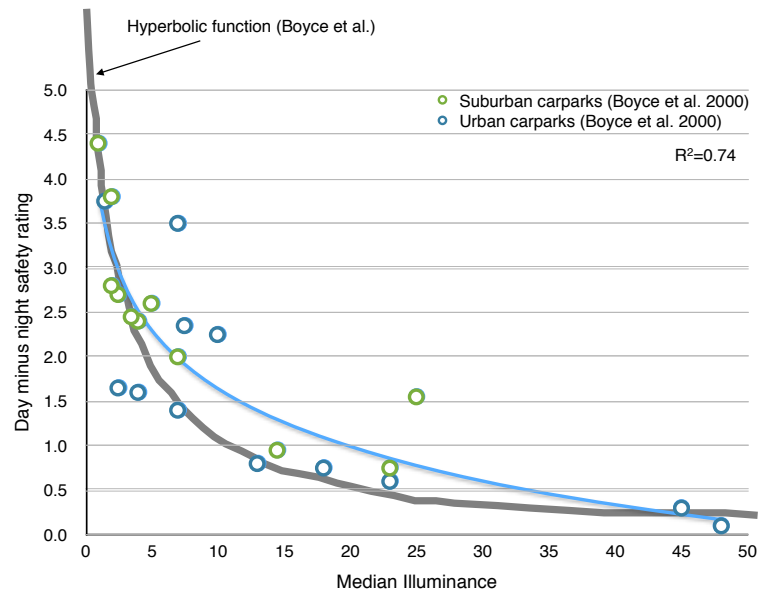
Figure 2.6. Day minus Night safety rating plotted against median illuminance after Boyce et al. 2000 Figure 7, using logarithmic function instead of hyperbolic function.

The steep slope of trend line at median illuminances of 0-10 lux shows that small increases in illuminance produce larger increases in Day minus Night safety rating which is used to express the effect of lighting on perceived safety. Between 10-45 lux the shallower slope demonstrates that increasing illuminance results in smaller Day minus Night safety ratings. It can be seen that above 45 lux illuminance makes little difference to perceived safety (less than half a scale point on a scale of 1-7).

The fourth field study took 15 subjects to a parking lot and tested the effect of different light sources in three bays of the car park. The light sources were 2 x 400W HPS, 2 x 250W metal halide, 2x250 W high pressure sodium mounted on 10 m poles at the same position in each bay. The mean pavement illuminances were 49 lux, 22 lux and 29 lux respectively. Participants completed surveys wearing glasses with a transmittance of 0.10 regarding lighting, appearance of people, safety and safe to leave car (on a 7 point scale). They ranked the bays in order of preference, when viewed side-by-side. The results found that perceived safety, appearance of people, brightness and comfort are linked to mean illuminance regardless of lamp type. The study found that 400 W HPS was the most preferred and 200 W MH was the least preferred.

The interesting point made by this paper is that an increase in illuminance does not equate to an increase in reassurance above certain levels and in some environments. The use of the Day minus Night safety rating is an effective means of controlling for different levels of perceived safety due to factors other than lighting.

Before and after studies

As colour rendering index may affect perceived brightness and facial recognition, many before and after studies have involved changing lamps of existing luminaires and examining the effect. Only two studies (Akashi, Rea et al. 2004, Morante 2008) describe the before and after lighting change conditions thoroughly.

Morante 2008

Using two suburban residential streets in the city of Groton in Connecticut, 100W HPS lamps were changed to light sources with a higher S/P ratio. On Meridian Street, HPS lamps giving a mean horizontal illuminances of 8.72 lux were changed to induction lamps, of S/P 2.88 and CCT 6500k, resulting in mean illuminances of 2.69 lux. On Shennecosett Road, HPS (mean illuminance of 3.2 lux) lamps were changed to 70W metal halide lamps of 4000k, S/P ratio 1.6 providing a mean illuminance of 3.1 lux. Before and after surveys delivered by post were completed by residents using a five point scale. On both streets, participants reported higher visibility, safety, security, brightness and colour perception after the lighting change. On Meridian Street uniformity was similar before (Uo=0.4, Ul=0.11) and after (Uo=0.3, Ul=0.14) street lighting change. On Shennecosett Road uniformity cannot be reported post-lighting change because the lowest illuminances were reported as being 0.0 which means the calculations of minimum/maximum and minimum/average do not work. If the reported 0.0 lux is amended to 0.01 lux then uniformity decreases by a factor of 10 post lighting change, for example overall uniformity decreases from 0.03 to 0.0032. On Meridian Street, of the 30 people asked to complete surveys, 14 returned the before survey and out of those only 7 returned the after survey. On Shennecosett Road 50 residents received surveys, 34 responded the the before survey and of those 23 also completed the after survey. Statistical significance was not reported.

Akashi et al. 2004

In East Hampton, Massachusetts, a rural residential street called Clark Street, was selected for investigation. 70W HPS lamps (CCT 3900k, CRI 22 and S/P 0.65) giving a mean horizontal illuminance of 3.4 lux were replaced with 49W fluorescent lamps (CCT 6500k, CRI 78 and S/P 2.88) giving a mean horizontal illuminance of 2.8 lux. Analysis completed using a paired samples t test found that the 25 residents who completed both before and after postal surveys reported increased brightness perception (p=0.015), perceptions of safety (p=0.05) ability to see other pedestrians more clearly (p=0.047), ability to see faces clearly (p=0.001), comfort (p=0.02) and less gloomy (p<0.001) after the lighting change. The experiment reported that after the lighting change the environment appeared too dark therefore flat lenses were replaced by drop lenses to cast more light sideways and increase the brightness perception of the street. Participants were informed of this change by post and had previously been invited to a meeting in which they were told about the lighting change. 15 people attended the meeting. The effect of reinforcing the change to residents is unknown, however may have exaggerated the positive reporting post lighting change. It is interesting to note that overall uniformity decreased from 0.06 to 0.01 post lighting change and longitudinal uniformity decreased from 0.014 to 0.0012 over the measurement area, the resolution of which was 3.6 m traversally and along the edge of both pavements and down the centre of the road longitudinally. Despite this, the change was seen to be positive.

One problem with the studies by Morante and Akashi et al. is that they do not consider a change from whiter light sources back to the original, and therefore the results may be due to a positive interpretation of any change, regardless of whether this involves relighting lighting or not. Another problem is that people were informed of the lighting change, which would have the effect of reinforcing the response as being one to the effect of change rather than what that change involved. Thirdly, environmental independent settings such as questionnaires delivered to an address are the most cost-effective method for reaching large populations however there is no opportunity for causal inferences or manipulation of variables (Steg, Berg et al. 2012). Finally, the sample sizes were limited. These four problems were addressed by Knight in the study described below.

Knight 2010

A large field study involving 356 participants across three European countries is described by Knight (Knight 2010). Of the 111 Spanish participants 60 completed a before and after study, the rest an after only study, and in the Netherlands 55 of 120 participants completed the before and after study. As no significant differences were found between the after responses of the before and after and after only groups, in the UK 125 participants only completed after lighting change surveys. The condition of participation was that people walked or cycled outside after dark three times a week. Interviews and surveys were completed on the streets after dark, by people who lived in the vicinity but not on the streets on which the lighting had been changed. The lighting change was not mentioned in interviews however most participants mentioned the lighting change spontaneously. In interviews the most important aspect of lighting was identified as brightness.

The light sources used in the experiments were high pressure sodium (SON CCT 2000k, CRI 25), warm metal halide (CDO, CCT 2800k, CRI 83) and cool metal halide (CDM, CCT 4200k, CRI 90). In Spain, the mean horizontal illuminance provided by both before and after conditions was 81-82 lux. In the Netherlands, the mean horizontal illuminance of the SON condition was 16.5 lux, with a vertical illuminance of 3.3 lux. This was reduced in the after condition using CDO lamps which gave mean horizontal illuminances of 14 lux and a vertical illuminance of 1.4 lux. In St. Helens in the UK, before (9.1-12.7 lux) and after (8.9-12.6 lux) horizontal illuminance conditions were comparable.

Analysis (independent one sampled t test) showed no significant difference between a change from the cooler to a warmer metal halide lamps. However a change from SON to CDO or CDM resulted in a significant increase in perception of safety, comfort, brightness and light quality ($p < 0.05$). When CDO was changed back to SON (in the UK only) there was a significant reduction in light quality and brightness ($p < 0.05$) however there was no change in perceived safety. Analysis of the results from all countries found a high correlation between perceived brightness and perception of safety. Knight found that most people can identify gender at 15 metres and interestingly that facial recognition increased under high pressure sodium compared to metal halide. One criticism of this study is that the reported mean horizontal illuminances are the equivalent or higher than P class P1 and P2, therefore the work does not consider lower illuminance conditions of many residential streets.

Other before and after surveys

A study in Glasgow (Nair, McNair et al. 1997) reports that when illuminances were increased from an average of 10 lux and a minimum of 7 lux to an average of 35.5 lux and a minimum of 24.5 lux, the number of pedestrians being followed or pestered dropped by 48% (from 112 to 58 people), and the perceived likelihood of being mugged dropped by 54% (from 41 to 19 people). The surveys took place two years apart and involved interviewing 102 people before the lighting change and 117 people afterwards. Although leading questions were asked, any impact of bias in question design was less effective after the lighting change.

The Outdoor Lighting Pattern book (Leslie and Rodgers 1996) presents details of lighting installations ranging from those on alleys to rows of terraced houses and reports before and after lighting change ratings of security and appearance. In all examples both the rating of security and rating of appearance increased post-lighting change. Other studies using the before and after approach have missed out crucial information such as the details of the lighting change and other details of the method. One example is a study in Nuneaton, Warwickshire (Bennett 2000) in which it is claimed that 100% of men and 73% of women felt that risk of crime decreased after the lighting change, and three quarters were more inclined to walk out after dark, however the survey questions and what the change involved were not reported.

Koga et al. 2003

A study on busy streets in downtown Fukuoka asked 36 participants in their 20's to walk through areas and photograph aspects of the environment which attracted their attention, marking them on a map (Koga, Tanaka et al. 2003). Participant labelled photographs to identify whether the scenes were perceived to be good or bad and wrote down comments regarding the features they had identified and their resulting impressions. Examples are "lights are turned off", with the impression "miserable"; "there is enough light from the surroundings", impression is "useless"; "it is dim", impression of "lovely, friendly, calm" and "fluorescent light" impression is "cold". The second study presented participants with preselected reasons in the form of 32 pairs of adjectives, which were used to rate real street scenes from set vantage points rating items such as light–dark, friendly–unfriendly, clean- dirty, using a bi polar seven point scale. 38 students completed the second experiment. A semantic differential method found the highest correlation coefficient (0.748) between evaluation item "want to walk through–do not want to walk through" and lighting/people/sidewalks. The second highest correlation coefficient (0.666) was between rich–poor and lighting and the third highest (0.663) between secure–anxious and lighting/people. These results point to the importance of lighting to perceptions of the environment. It is interesting to note that in the first study in which participants use their own words, neither safety nor danger were identified as impressions of the streets. This may be because the streets were busy. One of the criticisms of this study is that the environments are not shown or described therefore the type of area for example whether it contained residences, is not known.

Okuda et al. 2007

249 residents of Hiroshima were questioned on streets in areas perceived to be unsafe near a station, schools and a supermarket (Okuda, Ishii et al. 2007). Half the respondents were over 60 and two thirds were female. Horizontal illuminance was measured along the centre line of the road (at 10 points between streetlights) on the street perceived to be the least safe. Vertical illuminance was measured at 1.5 m high facing north and south. It is difficult to read the graph provided at illuminances below 2.5 lux due to the scale, and it is not known what orientation north and south have on the street in question. The study takes into account other light sources such as dispensers. Participants were asked to give reasons for feeling unsafe on certain streets and lighting was not mentioned in the question. Figure 2.7 reproduces the results, identifying dark or no street lighting, and empty or narrow streets to be the main causes for concern.
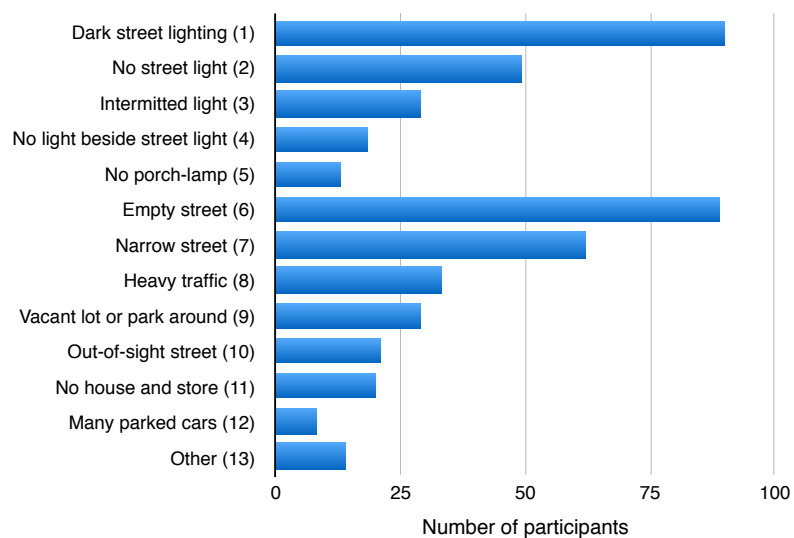
Figure 2.7. Results of study which asked people for reasons for feeling unsafe (Okuda, Ishii et al. 2007).

Figure 2.8 clusters the reasons into groups of key issues, showing lighting to be the most important factor.
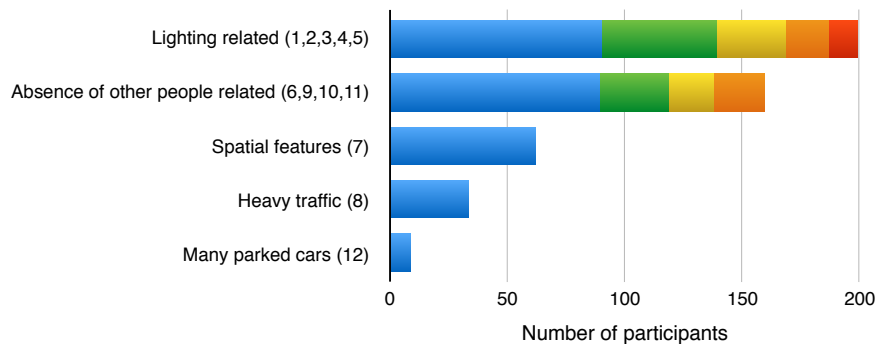
Figure 2.8. Clusters of reasons from Figure 2.7.

1

1

34

When asked for suggestions to improve perceived safety, 82% of 198 participants said that turning on porch, garden or store lighting was a good solution. Most residents asked said they would be happy leave the porch lights on.

Ishii et al. 2007
In a follow up study using residential areas of single-family housing (Ishii, Okuda et al. 2007), two lighting conditions were tested, firstly two traditional pole top mounted luminaries housing fluorescent lamps were used (condition 1) and secondly where residents of the street were asked to leave the porch light on (condition 2). Horizontal illuminance at the subjects position in condition 1 was 0.7 lux, and vertical illuminance was 0.1 lux. Under condition 2, horizontal illuminance was 1.4 lux and vertical illuminance was 1.1 lux. 12 subjects rated brightness, security, surveillance from residences, and visibility of a familiar male pedestrian at 4m and 8 m, to be higher under condition 2.

Eye tracking
Using eye tracking, it has been demonstrated that pedestrians tend to scan the environment for other people or objects of interest such as cats or cars and spend most of the remaining time looking at the pavement (Davoudian and Raynham 2012). The problem with eye tracking is that the focus of gaze is not necessarily an indicator of what concerns pedestrians. For example a pedestrian may approach a street, notice a group of people in their peripheral vision, and then deliberately not to look at them in order to avoid confrontation. This happened in the eye tracking experiment carried out in London by Davoudian and Raynham.

Other studies worth mentioning
Other studies have attempted to address the complexities of the effect of lighting on affective judgements (Hanyu 1997). For example, using a suburban path in a small Swedish town, on which participants were invited to walk, Johanssen et al. found that a larger visual field resulted in an assessment of brighter lighting (Johansson, Rosén et al. 2011). People with a higher level of environmental trust reported higher visual accessibility of the footpath. Those with a lower level of environmental trust and also those who assess the lighting to be low in brightness and tectonic tone, also perceived the footpath to be more dangerous. Environmental trust is synonymous with reassurance.

2.6.2. Dynamic lighting studies
Two experiments on a university campus in Eindhoven tested a range of static and dynamic lighting conditions (Haans and de Kort 2012). Each experiment used three lighting conditions using LED luminaries at 30 m intervals mounted at 10m. The first of the three installations in the first experiment had the same lumen output over the five luminaires, the second placed participants in a bright spot, with descending illuminance into the distance and the third had increasing illuminance into the distance. The lighting conditions of the first experiment are shown in Figure 2.9. 29 participants completed the experiment in groups of four. Two road segments, east and west, were used to test pairs and each condition presented one by one in a random order. In order to judge pairs, participants were asked to state which segment of road they preferred whilst located centrally between the east and west segments of the street.

Using both methods, the experiment found that participants rated condition B to be significantly worse than the other two conditions (p<0.01). Overall, participants preferred light in their immediate vicinity, followed by equal illuminance distribution over the luminaires, and that the least preferred option was increasing illuminance into the distance. The difference between a uniform environment and one in which participants were in the bright spot was not significant (p< 0.07). High prospect and escape had a positive correlation with perceived safety and high concealment had a negative correlation. Interestingly prospect increased when participants were standing in the light spot, condition C. One explanation for this could be that as the campus is located in the city, lighting beyond the experimental area could have affected the judgement.
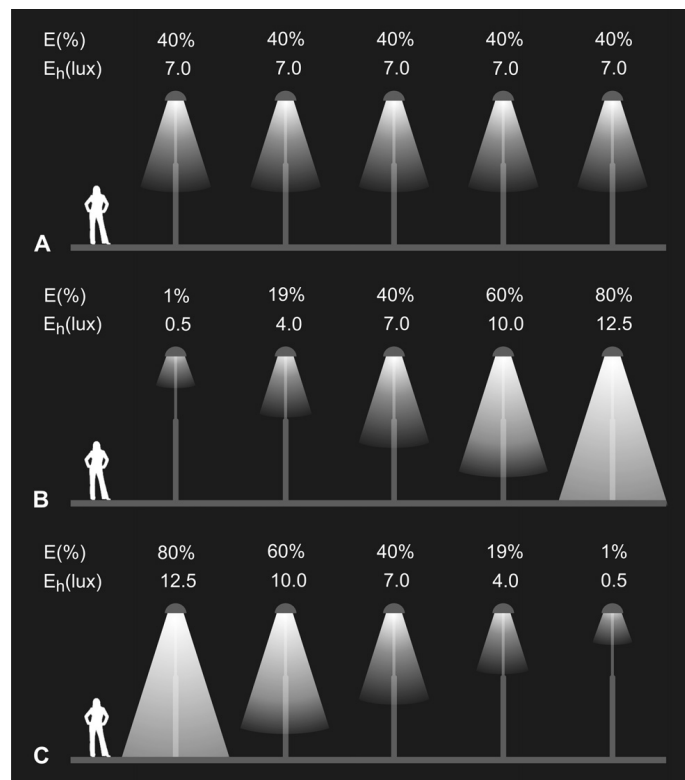
Figure 2.9. The conventional (A), ascending (B), and descending light distribution (C) in Experiment 1. E(%) is the percentage of the maximum output of a luminaire. Eh(lux) is the horizontal illuminance at street level straight underneath the lamppost (Haans and de Kort 2012).

In the second experiment a dynamic lighting installation was used in which the lighting condition responded to participant's movement down the street. 50 participants walked down the test area alone. After completing the route they were asked to fill in the survey which rated personal safety amongst other perceptions, using a five-point scale in response to statements such as "I would rather avoid this street". Again, the dark spot condition B (Figure 2.10) was rated significantly lower than conditions A & C. The dimming of the areas was pronounced, ranging from 1% to 54% to 80% resulting in illuminances under the lamp posts of 0.5, 9.5 and 12 lux. Lower illuminances may have been acceptable if the upper limit was reduced. Participants were asked to walk in the middle-of-the-road rather than on the pavement. This was probably normal on the campus situation however may be less likely in a residential environment.
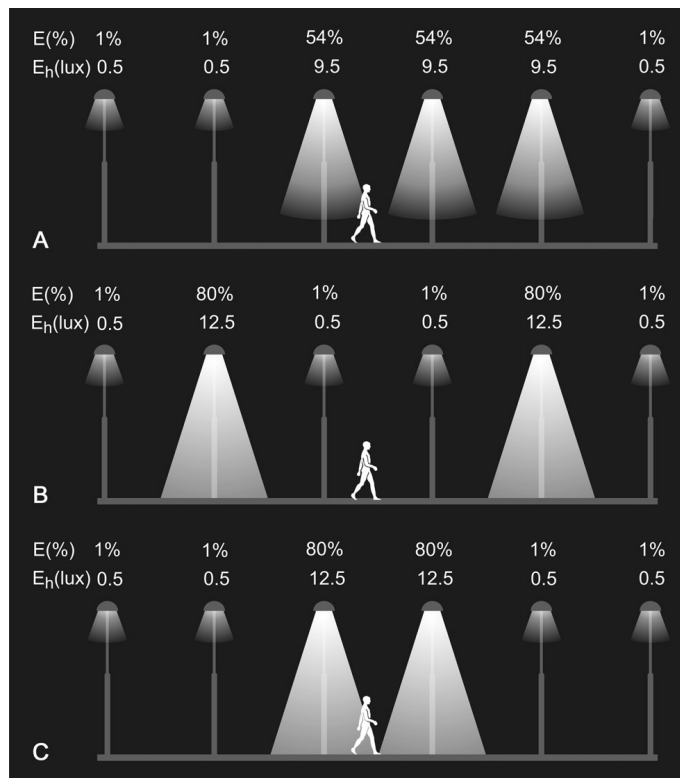
Figure 2.10. The control (A), dark spot (B), and spotlight conditions (C) in Experiment 2. E(%) is the percentage of the maximum output of a luminaire. Eh(lux) is the horizontal illuminance at street level straight underneath the lamppost (Haans and de Kort 2012)..

The street environment used was very open, has lit vertical surfaces on both sides, has car parks nearby, and trees with high canopies. The Dutch university campus obviously looks nothing like a typical residential street in the UK. Therefore environmental nuances created by the front gardens, hedges, poor pavement surfaces and unkept trees are not addressed by this study. Also, most participants were familiar with the site. However, despite this, when responding to surveys after assessing the environment from a stationary or transitory experience, they expressed decreased preference for 0.5 lux conditions in their immediate surroundings compared to 7 or 8 lux or 12 lux.

Matsui 2007

Matsui also tested the effect of dimming in an experiment in Japan (Matsui 2007). Four lampposts holding luminaires fitted by compact fluorescent lamps were installed at 20 m intervals along a busy street near a station. Upon entering the 40 m x 10 m sensing area, the lamp output was increased from 30% (average horizontal illuminance of 10 lux) to 100% over 10 seconds. Out of the 43 resident questionnaires returned, 40 noticed the change and 33 said that it increased their sense of security.

2.7. Facial recognition

Other people in an environment are of interest because they could pose a potential threat. The importance of the face in social interaction was recently recognised by law, as the European Court of human rights upheld France's ban on the niqab (BBC 2014). In lighting research it was assumed that facial recognition contributes to perceived safety (van Bommel and Caminada 1982), based on research demonstrating that people do not like to get too close to each other unless they feel comfortable with each other (Hall 1966). The idea that enough lighting should be provided so that people can recognise each other before they enter the critical 3-4 metre zone where people start to feel uncomfortable with strangers (Figure 2.11) (van Bommel and Caminada 1982).
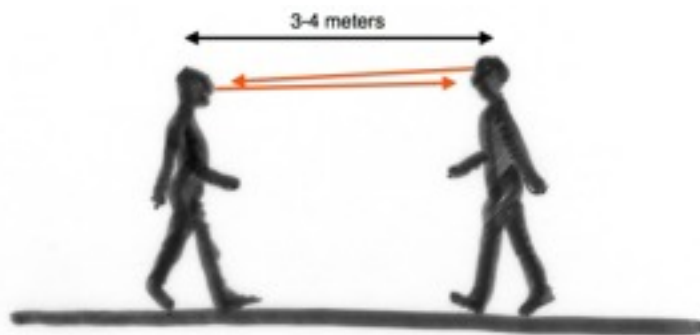
Figure 2.11. Approaching pedestrians.

However, as pedestrians do not necessarily want to interact with each other, they merely want to avoid danger, then the signals given by a face maybe less important than other factors such as whether the pedestrian is outnumbered by a group of people loitering who could pose a threat. When surmising the presence of others in environment, the pedestrian may ask "What are these people doing and are they likely to harm me?" Body language such as posture and orientation may answer this question rather than the face. For example, the characters illustrated in Figure 2.12 would send very different signals. Recognition of intent based on body language has been attempted through the automated analysis of CCTV footage aimed at recognising action and emotional state (Cohen, Morelli et al. 2008). The importance of being able to read body language is well documented in the field of behavioural science. In the field of lighting the importance of recognition of intent was raised by Rombauts (Rombauts, Vandewyngaerde et al. 1988) and more recently reiterated (Fotios and Raynham 2011) as a reason to question the emphasis placed on facial recognition in lighting research. This is relevant because out of the visual tasks identified for pedestrians: detection of obstacles, orientation and facial recognition, it is facial recognition that requires the most light (Raynham 2004). If this is no longer found to be a critical visual task then perhaps recommended light levels can be reduced.

Metrics which have been used to judge facial recognition are semi cylindrical illuminance (van Bommel and Caminada 1982) and colour rendering index. Some studies have found that spectral power distribution does not effect facial recognition (Alferdinck, Hogervorst et al. 2010). If facial recognition is not a critical visual task then the metrics used to judge its performance in BS5489-1 may not be relevant.

Figure 2.12. Demonstrating that intent of pedestrians may be gleaned from orientation and body language rather than facial expression.

Facial recognition work often requires participants to match emotions from a list to a face (Russell 1994). The problem with this approach is that the act of requiring participants to match emotions from a list to a face is inherently biased (Feldman-Barrett 2014). When asked to freely describe an emotion on a face, participants found the task much more difficult and were often unable to identify differences between faces which had previously been categorised separately according to predefined lexical categories (Lindquist, Feldman-Barrett et al. 2006) . Feldman-Barratt brings attention to a study by Aviezer et al. (Aviezer, Hassin et al. 2008), who using juxtaposed images, placed faces on bodies communicating a contradictory message, for example a happy face on a body in an aggressive posture. When asked to describe the emotion given by the whole collage, participants overwhelmingly chose the message given by the body rather than the face. The experiment showed that the identification of emotions is influenced strongly by body and scene context in the early stages of perception.

Work into recognition of facial expressions and body language is interesting, however it may miss the point in the area of street lighting because a criminal on a real street is unlikely to explicitly expose his or her intentions to the victim at any distance. Much of the skill of the criminal is in the art of disguise and surprise. Recognition of intent may be more to do with making an instinctive judgement of what somebody is doing and whether there is anything unusual in their behaviour for example, their walking pace or manner. Aspects as subjective as sensing whether something could be suspicious about another pedestrian, are very difficult to measure in laboratory conditions where participants know they are safe. However, ethical approval for experiments which placed participants in real danger would be difficult to obtain.

Using 100 participants Rombauts carried out an experiment investigating the effect of semi-cylindrical illuminance on facial recognition on residential streets, under HPS controlled by switching street lighting on and off (Rombauts, Vandewyngaerde et al. 1988). At set distances participants were asked to identify degrees of facial recognition on a scale of one (one is not able to see) to 9 (one is completely sure of distinguishing identity). On the 18 points on the road Esc ranged from 0.1 to 18.2 lux. Figure 2.13 read plots figure 5 in the paper indicating that for a recognition distance of 4m Esc should be a minimum of 0.6 lux. Further work could plot the other points on the scale for example 3 (one can see a silhouette) and 5 (one can say whether it is a man or woman) against Esc to see how much light is needed for recognition of the presence of other people and their gender.
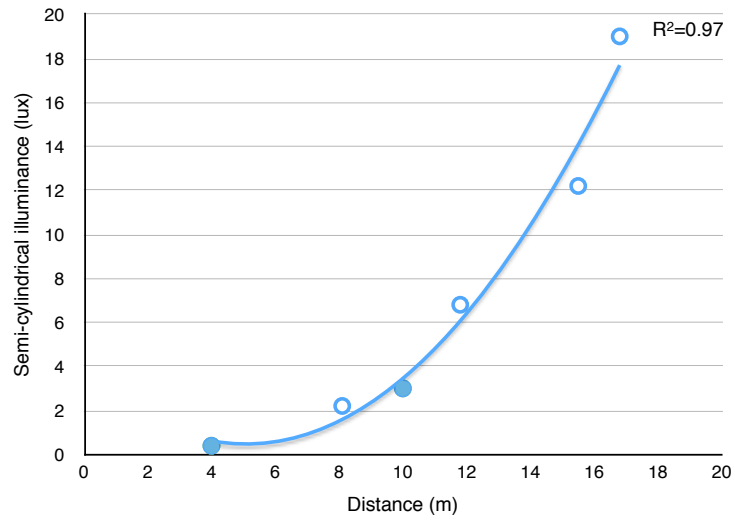
Figure 2.13. Function of "completely sure of distinguishing identity" plotted against semi-cylindrical illuminance after Rombauts, Vandewyngaerde et al. 1988. Shaded points are enlarged on the original paper to show the inferred semi cylindrical illuminances for facial recognition at 4 and 10 metres.

2.8. Image studies

The advantage of using representations of real environments is that variables can be controlled resulting in the possibility for more rigourous experimental procedure compared to field surveys. This section selected research which has used representations of real environments to explore the effect of lighting on perceived safety.

Loewen et al. 1993

A series of studies by Loewen (Loewen, Steel et al. 1993) tested Appleton's 'Prospect-Refuge' theory (Appleton 1975). The first was an open ended survey in a classroom context. Students were approached and told that the public opinion of environmental features and safety from crime was being studied. They were asked to list features that could make the environment safe from personal crime. Reasons given by 55 subjects are listed in Figure 2.14.
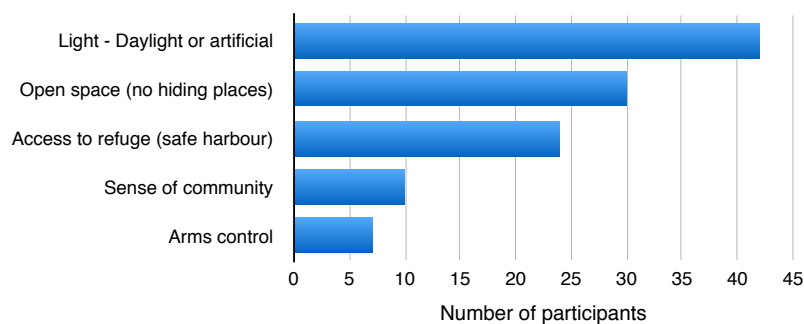
Figure 2.14. Responses to open-ended question (Loewen, Steel et al. 1993).

'Light' was mentioned by 42 out of 55 participants, followed by open space mentioned by 30 participants and access to refuge mentioned by 24 participants. 'A sense of community' was cited by ten participants and 'arms control' by seven. The three main reasons identified by the first study were used to chose images in the design of the second study. Participants were presented with 16 slides showing two variations of the eight possible combinations of the presence and absence of 1) light, 2) open space and 3) access to help. Participants (45 men and 55 women with a mean age of 20.6 years, range 18 to 43 years) were shown the slides for 30 seconds and asked to rate them using a five point scale ranging from not at all safe to very safe.

This study found that a combination of the three were considered safest, followed in order of importance by light and open space, light and access to help, light alone. These results emphasize that lighting cannot be examined in isolation from the rest of the built environment, and that interaction with other features it could be a factor in perceived safety. Due to the presence of light in the top four preferred combinations, it was identified as the main contributing factor to Appleton's prospect.

Studies using images are open to criticism because they take an environment out of the broader context which would usually inform participant's perception of a scene. However a study comparing urban perceptions of New York City, Boston, Linz and Salzburg in Austria,

confirmed that photographs taken in daylight can be used as a proxy for perceptions of real locations (Salesses, Schechtner et al. 2013). The study used a website to present pairwise comparisons between 4136 images and had responses from 7872 participants from 91 countries who contributed to 208,738 votes. It found that perceptual inequality was significantly correlated to violent crime statistics in New York City. Perceptual inequality was measured by the range of responses to a pairwise comparison of images using evaluative questions for example "which place looks safer?". Using judgement of images (which is safer) the study found a higher correlation between class and safety (R^2= 68.9%), than uniqueness and safety (R^2= 35.3%) or class and uniqueness (R^2= 37%). A Getis Spatially Filtered Regression (dependent variable was number of homicides in the neighbourhood) found that the strongest model (explaining 80% of the variation in homicides across zip codes) considering all variables of population, area, income, age, can be explained by average and standard deviation of perceptions of safety and class.

2.9. Obstacle detection

Reassurance may be affected by the pedestrians ability to move safely. Therefore, lighting research into obstacle detection is briefly mentioned here. Research has tested quickness of response to unexpected stimuli; attention and motor coordination under different lighting conditions on real streets and in laboratory conditions and found that performance of all three improved in less uniform environments (Burtt 1916). The experiments also showed that the improved effect of non-uniform illumination was not due to voluntary alertness as a result of heightened pedestrian awareness of potential objects that could be concealed in the dark areas. This work concluded that as safety depends on the recognition of, and quick response to a potential dangerous situation, then non-uniform illumination as opposed to uniform illumination is more conducive to safety on the street. To the author's knowledge, no work on the effect of illuminance distribution on obstacle detection has been completed since.

Using a full-scale laboratory, it was found that collision avoidance; minimum comfortable distance with other people and obstacle avoidance distance did not change significantly regardless of illuminance level (Fujiyama, Childs et al. 2005). The experiment was set up to test obstacle avoidance distance by placing a 1.5 m x 0.15 m obstacle on the route; collision avoidance distance by testing the point at which participants stepped aside for another oncoming pedestrian; minimum comfortable distance, by asking participants to say stop when they became uncomfortable due to the close distance; facial recognition, where participants stopped when they could first recognise the target face (wearing a helmet and body concealed behind a screen), and stop again when they were completely sure of the identity. There were five lighting conditions, using five fluorescent lamps, at 2 m intervals and mounted 3.6 m above the platform. Illuminances were 0.67, 2.8, 5.5, 12.3 and 627 lux. The results re-plotted in Figure 2.15 found that only facial recognition was proportionally affected by the range in illuminance.
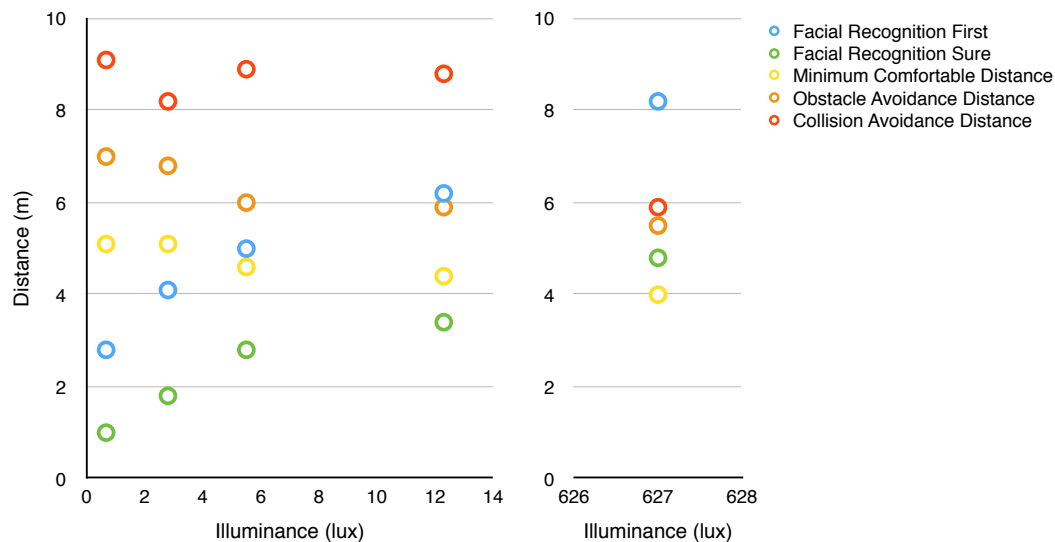
Figure 2.15. Mean distance plotted against facial recognition, minimum comfortable distance and collision avoidance distances after Fujiyama, Childs et al. 2007.

An experiment set up to detect off axis detection of obstacles found that at illuminances of 0.2 lux, the obstacle block height detectable by 50% of participants was 2-4 mm (depending on age and light source) whereas at 2 lux this was reduced to 1.5 mm (Fotios and Cheal 2009). This experiment was interesting because it showed light source had an effect in the 0.2 lux condition, however not in the 2 lux condition which is the lowest mean horizontal illuminance recommended for residential roads in Britain. The problem with obstacle detection experiments in laboratories is that the obstacles tend to have neat sharp edges using geometric shapes which bear little resemblance to the rough edges of buckling pavements around trees, loose pavement slabs and pot holes which form trip hazards on real pavements. Pavement surfaces are subject to a process of ageing and wear, often due to weather conditions such as frost. Reflection can change by exposure to air (Bodmann and Schmidt 1989) and there are many local variations of road surface reflection. These subtleties tend to be ignored in a laboratory situation. These experiments do however give a good idea of what can be seen.

The fact that blindsight people avoid obstacles means that something else is processed subconsciously and peripherally as they respond to stimuli which they do not see (Celesia 2010). Drivers cannot and do not fixate everything of importance therefore it must be accepted that significant information is received via peripheral vision. Johnson showed that drivers use peripheral vision for their driving positioning (Mota, Ros et al. 2004), however we do not know if this is the same for pedestrians.

43

2.10. Lighting characteristics in existing research

Most studies, particularly those in real environments are not thorough in their reporting of lighting conditions. Those which do take the time and effort required for this, report horizontal illuminance because that is specified by guidelines for pedestrians. Therefore the effect of other lighting metrics is unknown. The fact that the P class recommendations for street lighting focus on horizontal illuminance, means that the literature in the field of lighting and perceptions of safety, has no reason to explore any other aspects of the lighting.

Recent trends in lighting research

There is a divide in the lighting community between those who think luminance as the basis of the design can be a useful tool and those who say that in visual perception we register illuminance and reflectance independently, which is supported by physiological studies therefore we should design in terms of illumination and the specification of reflectances. Brightness constancy, or the ability of the eye to detect the difference between less light shining on a light surface, and more light shining on a dark surface, even if measured luminance values of the surfaces is the same, provides an argument to keep the status quo. The case for challenging the status quo has been made most convincingly by Cuttle.

Cuttle points out that outrage regarding dismal lighting has little to do with being able to cope with visual tasks such as walking (Cuttle 2009). He argues that in an age of increasing concern about energy wastage, guidelines should specify lighting for an adequately lit appearance, rather than encouraging practitioners to light the darkest (poorest reflecting) surface in the scene which is, inevitably, the pavement and asphalt road, the appearance of which may not be important to pedestrians. By measuring what people actually look at in their environment at night, recent lighting research suggests that horizontal illuminance on the pavement, despite being a fundamental concern of the lighting standards, is not a driving factor (Davoudian and Raynham 2012). Cuttle recommends rethinking how lighting is specified in his proposed mean room surface exitance theory, presenting a case against using the visual task to specify illuminance because of the disparity between the task plane and how a space is perceived by an observer. Mean room surface exitance theory cannot directly translate to outdoor environments because there is no ceiling outside. Measuring the light which bounces off a surface, entering the eye indirectly (i.e. not directly from the light source), rather than the measuring light which lands on a surface (direct illuminance) has been proposed as an improved method for specifying interior lighting, whilst saving energy (Cuttle 2013). One study which supports the idea that the horizontal plane may not be the most important has found that increased brightness perception at low luminance levels has a positive effect on the perceived restorativeness of an environment, whereas increased path brightness has a negative effect (Nikunen, Puolakka et al. 2014).

The importance of the surface was also identified by Gibson, who stated "there is literally no such thing as the perception of space without the perception of continuous background surface" (Gibson 1950). Vertical illumination has an impact on the visual scene as viewed by the pedestrian, also a vertical object. Occasionally research has reported vertical illuminance (Ishii, Okuda et al. 2007, Okuda, Ishii et al. 2007, Knight 2010) however details of the direction, height and location of measurement are often missed out therefore it is difficult to use this

information to interpret the lighting conditions of the space. The precise optical arrangement of LED fixtures recently installed in Sheffield, directs luminous flux toward the pavement, resulting in less vertical illumination on adjacent buildings which is often referred to as spill light. If this vertical illumination has a part to play in establishing a boundary condition for a pedestrian, then the environment may be perceived to be less safe, despite the spectral power distribution of the LEDs resulting in a whiter appearance of the lit horizontal surface.

2.11. Findings

This review has found an assortment of conflicting and often unconvincing evidence regarding the effectiveness of street lighting in contributing to pedestrian reassurance. The only study which thoroughly describes the environmental conditions of the experiment found that limited prospect and escape combined with hiding places overrode the effective of lighting judged by subjective impressions (Fisher and Nasar 1992). Research into perceived safety outside the field of lighting tends to neglect the effect of the change that the fall of darkness brings. On the other hand, research within the field of lighting tends to overemphasise its effect, as only one study (Boyce, Eklund et al. 2000) took into account daytime differences between sites being compared. Existing lighting research can be loosely divided into methods which are lacking in context (controlled laboratory experiments using images or obstacles), may not address what concerns pedestrians (eye tracking) or are setup as before and after surveys in which it is not known whether the response is due to the changing lighting conditions or the effect of the change itself. This review revealed a shortage of thorough descriptions of lighting conditions and many studies which lead participants towards the desired outcome. The following criticisms can be levied at existing research:

- Interviews asking participants what matters to their judgement of perceived safety of an environment state upfront that the topic of interest is safety or lighting. This means that participants may give answers that they perceive to be helpful to the research. For example, when asked the question "do you feel safer in a brighter environment", participants may be inclined to answer yes, if they think that might be a helpful response.

- Relighting of an area is often seen as a good excuse for a before and after study in which participants are asked to rate the recently refurbished environment. Due to expected enthusiasm regarding the local authority investing money into a neighbourhood, it is difficult to know whether participant responses indicating that lighting makes them feel safer are genuine or due to a desire to create positive feedback so that further investment is placed in the participant's locality. Before and after surveys do not necessarily take into account that the perceived improvement may be to do with the fact that any change has taken place, rather than the nature of that change.

- There are a limited number of studies on residential streets. No studies have examined the role that spatial features may have to play in the perceived safety of residential environments. No work in residential environments addresses the interaction of spatial features and lighting.

- Incomplete reporting of conditions of environments including the lighting conditions, for example limited recording and reporting of illuminances levels. No description of lighting

characteristics other than horizontal illuminances, CRI and colour temperature. Nobody has explored the effect of light distribution on perceptions of safety.

- The importance of lighting conditions on seasonal changes in the character of locations has been identified (Lynch 1972), however not explored in detail.

- Facial recognition and obstacle detection work take the issues out of context.

- Open-ended questioning has not been used in residential environments.

The findings show that the main gaps in existing knowledge are (1) probing for the effect of street lighting without being very leading, (2) investigation of residential areas and (3) field studies which thoroughly report the environmental characteristics including street lighting conditions. The proposed work attempts to address these gaps.

2.12. Summary

Deciphering the role of lighting in the environment presents a challenge because many factors contribute to the metaphorical 'feel' of an area and what that symbolises. The more that the topic of reassurance is dissected, the clearer it becomes that there are many interlocking factors. It is expected that lighting in interaction with some factors and not others will effect reassurance in pedestrians.

Previous lighting studies have primed participants with the concept of perceived safety and in this context lighting has been found to be relevant to varying degrees. What has not yet been examined is the extent to which lighting affects perceptions of the environment, without mentioning 'safety' beforehand. This approach may lead to a more realistic understanding of the effect of lighting on pedestrian reassurance. Existing research has found that median illuminances of around 10 lux provide the threshold above which illuminance make little difference to pedestrian's perceptions of safety in car parks (Boyce, Eklund et al. 2000). This has not been explored thoroughly in residential environments. Therefore the overriding aim is to identify the role lighting has to play in pedestrian reassurance in residential environments at night using a range of methods developed by identifying gaps in previous research.

2.12.1. Aims and objectives

The aims of this study are to answer the fundamental question: Does light matter to pedestrian reassurance in residential environments at night and if so, to ascertain which lighting characteristics might matter most. This involves finding out whether pedestrians think light effects reassurance and in what circumstances light can make a difference.

These aims are met by the following objectives:

- Conduct face-to-face interviews to find out what matters to pedestrian reassurance without mentioning lighting or safety, to understand the role that street lighting plays in the broad context of what matters to street users at night.

- Ask participants to provide information regarding locations themselves so that they are not influenced by preselected image choice.

- Repeat the method of using preselected images in existing research to see how the results of this compare to the above.

- Conduct street surveys on streets in which the lighting conditions are characterised by a range of photometric measurements to find out what may matter most in real residential environments.

- Repeat and build on previous research which has addressed differences in perceived safety during the day, in the conclusions made about the effect of lighting.

- To record and report the lighting characteristics of any environments chosen for study as thoroughly as possible within the timeframe of the project.

3. Three Stage Interviews

3.1. Introduction

The review of existing literature has highlighted a number of gaps in existing research. Firstly, there is a shortage of studies which by their design do not lend themselves to conclusions which show the positive effects of lighting on reassurance. Planning an experiment for which it is difficult for participants to guess the purpose may contribute to understanding whether light matters in the context of their overall concerns. An experiment which explores the effect of lighting in environments in which most people find themselves when walking at night in residential areas may be worthwhile as this approach ensures that relevant issues are discussed.

The aim of Chapter 3 is to describe an experiment which does not lead participants towards answers which exaggerate the importance of lighting. The proposed method enables concerns to be identified and categorised without preconditioning participants with notions of safety or the potential importance of lighting. Factors which influence reassurance were explored in familiar locations of participant's own choosing and in unfamiliar locations chosen by the author and presented as images. The study relied on participants' recollection of their feelings when walking through or avoiding an environment, and on their ability to imagine themselves in an unfamiliar environment. The results contribute to understanding the relative importance of lighting to pedestrian reassurance alongside other factors.

3.2. Method

One criteria for quality in qualitative research is that representations of experience are authentic (Farrall, Jackson et al. 2009). The interview was chosen as a method to discover what matters to pedestrian reassurance because it provides an opportunity for them to give a reliable description without being led towards a predicted outcome. Hopkinson said that "People have no difficulty in expressing the magnitude of intangible things" (Hopkinson 1957). An interview gives people the opportunity to do this.

The interview style was semi structured which meant careful wording was repeated between participants to minimise the variation in the questions, however the format was not completely rigid. Flexibility was allowed in the form of probing (asking more about a particular issue raised) depending on the information given by participants. When two styles of cognitive interviewing were compared, thinking aloud and verbal probing, there was little difference in the final draft questions asked using either approach (Priede and Farrall 2011). The questions were sequenced from general to specific, a technique known as funnelling (Berry 1999). Planning the questions is a means of obtaining consistency between participants, and limits the amount of information collected. The fact that the participant speaks in their own words contributes to the credibility of their reasons. An interview has been described as a speech event in which the natives own discourse rules infiltrate the interview (Briggs 1986). This is inevitably the case, as is the interviewer's awareness of the respondent's communicative competence (Briggs 1986) results in the rephrasing of some questions, if participants do not understand.

A survey question such as "how safe would you feel walking alone in this area after dark", assumes that safety is an issue, when it might not be. The interview questions ensured that the words "safety" and "lighting" were not used with the aim of reducing the possibility that the interviewee might guess the research topic from the vocabulary used. The purpose of this was to reduce socially desirable responding, a participant's tendency to give what they perceive to be helpful answers to please the interviewer (Paulhus 2002). As the research topic was unknown, participants discussed what mattered to them rather than discussing a predefined topic such as lighting which might over emphasise it's importance in relation to other aspects of the environment. It has been argued that there is less likelihood of socially desirable responding in interviews compared to surveys (Hammersley 2008, Steenkamp, Jong et al. 2009).

Asking participants to discuss specific places of their own choosing was used as a means of investigating into what really matters to reassurance. The interview approach was supported by a preselected image study in which the experiment design enabled the control of variables and specific hypotheses to be tested, providing quantitative data to support the qualitative data. It is good practice to mix methods to see if the results point to the same conclusion, sometimes known as achieving convergent validation, or triangulation. Previous lighting studies have used images (Loewen, Steel et al. 1993) to obtain information regarding participant's preferences and judgements of streets. This method is repeated as it enables comparison between participants which is more difficult when they are referring to places of their own choosing in the format of an open discussion. A short personality survey was used to test if personality might have an effect on responses.

The interviews were conducted in four stages. Firstly participants were asked to describe streets on which they did and did not walk alone at night, and give reasons. In the second stage, photographs provided by test participants were used as visual cues with which they were asked to recall and describe location specific reasons for the presence or absence of reassurance. This provides the opportunity to assess whether there is any change of emphasis when participant's descriptions focus on real streets with which they are familiar rather than general issues. Thirdly, participants were presented with five photographs of streets at night-time, and asked to (a) rank them in order of preference of walking alone at night on streets such as those presented, (b) state on which street they would prefer to walk alone at night in an all possible pairs forced choice task, and (c) decide whether they would or would not walk down a street like that, alone after dark in an unfamiliar area, ticking which given reasons applied to their choice. Using preselected photographs tests unfamiliar environments and controls the variables between participants. Previous research has combined different types of discrimination tests (forced choice of all possible pairs and ranking) to achieve triangulation within a quantitative approach (Haans and de Kort 2012). The last part of Stage 3 was a supplementary personality survey, acknowledging the existence of individual differences, the impact of which has been recognised in other work (Stevens 2012). The three stages of the interview were carried out in the same order for all test participants, and are shown in Figure 3.1.
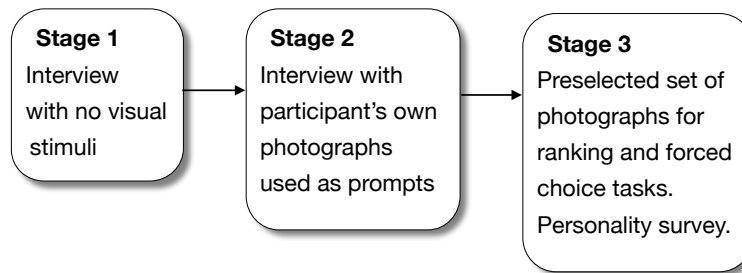
Figure 3.1. Three stages of Study 1.

3.2.1. Stage 1 - Interview with no visual prompts

The objective of Stage 1 was to ascertain participant's reasons for the presence or absence of reassurance, in general terms, without specific reference to place. Participants were encouraged to divulge what mattered to them, if anything, and the replies to the open ended questions were used as a starting point from which to ask more probing questions about their reasons for feeling reassured or not. The question structure of the first part of the interview is described by Figure 3.2.
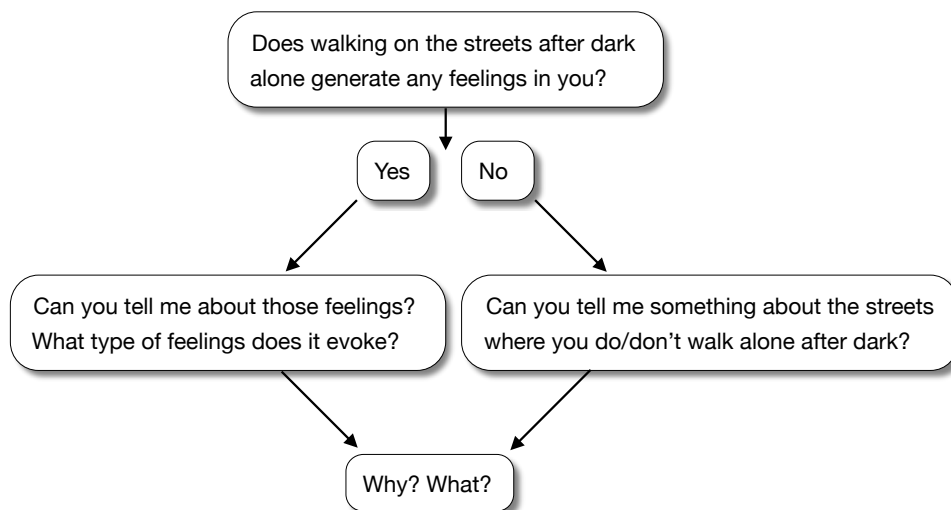
Figure 3.2. Question structure for Stage 1 (no visual prompts).

The questions were planned to encourage people to discuss their feelings and the reasons for these. If participants did not have any feelings, they were asked to describe areas where they did and did not walk and these descriptions revealed what mattered to them. Leading questions were avoided at the beginning of interviews. An example of a leading question is "would you walk there during the day?" This was amended to "are there any times that you would walk there?" By identifying an area of concern and asking for further information about that topic, the interviewer could be accused of leading the conversation in a particular direction. However, this is necessary to obtain the required information. There is a role for leading questions in interviews, as long as the interviewer is aware that the question asked may affect the response (Kvale 1996). Positively affirmed questions were avoided because they lead to answers which could be misleading as participants tend to agree with what they expect the interviewer wants to hear.

3.2.2. Stage 2 - Interview with visual prompts

The objective of the second part of the interview was for participants to give location specific reasons for identifying streets where they felt confident to walk alone at night, and streets where they did not. This stage of the interview was structured by their own photographs which were provided prior to interview, and used the same structure and style of questioning as used in stage 1. The use of participant's own photographs meant that the discussion could not be influenced by preselected images, as in previous research using images (Loewen, Steel et al. 1993).

It is important that the participant's task is clear and specific so that the participants know what to do. In order to manage the amount of data, participants were asked to select four streets, two where they felt reassured and two where they did not. They were asked to take two photographs of each street. The photographs were used to remind participants of their street choice, jogging their memory regarding an already familiar location, rather be used as a focus of the discussion. For example participants were never asked to discuss the photograph, they were instead asked to describe the place that they had identified, and to use the photograph as a reminder.

The question "What is it about this street that makes you confident (or not) to walk there after dark?" started the interview. Other questions were similar to stage one, aiming to be as open as possible. If a participant mentioned a big wall on a street which make them feel uncomfortable, they were asked "tell me about the big wall" rather than "what is it about that big wall which concerns you" or "does it make you feel trapped"? As the interviewer had chosen to discuss the "big wall" further, then this could be described as leading. Questions which could be described as leading were asked later in the interviews, in order to hone in on specific reasons.

3.2.3. Stage 3 - Pre selected photographs

In the third stage of the interview, five photographs of streets expected to be unfamiliar to participants were used to investigate reassurance when walking alone after dark. This was done without using the word "safety". Three methods were used:

- A forced choice discrimination test in which the five photos were observed in all possible 10 pairs. Participants were asked to state on which street they would prefer to walk alone after dark. The inclusion of four null conditions meant that the total number of pairs was 14.

- A rank order discrimination test in which participants were shown the five photographs simultaneously and asked to place them in a rank order of preference as a location to walk alone after dark.

- Participants were shown the photographs individually in a random order and asked to state whether they would walk down a similar street in an unfamiliar area after dark, selecting reasons for their choice from a list.

Selection of images

As the results of the discrimination test were to be analysed using the Dunn-Rankin Variance Stable Rank Sums test, after previous research (Quellman and Boyce 2002), a sample size was chosen to meet the requirements of the test. The number of judges necessary to ensure the possibility of five items (in this case, photographs of street scenes) being significantly different to the $p<0.01$ level, is 53.

If the number of images had been increased to 6 then the resultant number of participants required for highly significant differences between the images, would have been 80 for a significance level of $p<0.01$. A sample size of 53 using five items was chosen to manage the time the experiment took. Five photographs results in ten paired comparisons which is less time-consuming and less repetitive for the participant than a higher number of items. It also allows null conditions to be added without significantly impacting time taken.

The five photographs selected for the study are shown in Figure 3.3. Scenes 1 and 2 depict a wide open residential street. The scene was selected to determine whether lighting matters on a typical suburban residential street. The images are the same except for a difference in exposure (Figure 3.4).

1 - Residential street	2 - Residential street
Scene 1 - Higher exposure	Scene 2 - Lower exposure

3 - Gunnel	4 - Gunnel	5 - Woodland path
Original photograph	Scene 3 manipulated	Original photograph

Figure 3.3. Images used in experiment.
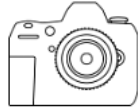
Camera settings	
Scene 1	Scene 2
Nikon D90 18-200mm f/3.5-5.6	Nikon D90 18-200mm f/3.5-5.6
f/5.6 22.4 mm	f/5.6 22.4 mm
0.4 ISO Hi 5000	1/6 ISO Hi 5000
Flash (off, did not fire)	Flash (off, did not fire)

Figure 3.4. Camera settings for scene 1 and 2, showing that the only difference is in exposure.

Scenes 3 and 4 depict a narrow alleyway of the kind often found between houses, known locally as a gunnel. This condition was chosen because it presents an extreme condition of high entrapment, to test whether lighting matters in an enclosed environment. The images are exactly the same except that scene 4 is a digitally manipulated version of scene 3. Using Adobe Photoshop the light source at the end of the alleyway was removed from the photograph (cut command) and the surrounding area was merged and smudged into the background so that the scene looked feasible when printed at A4. Manipulating two photographs to create two pairs in which the only difference between the images is the lighting, ensures control of variables and enables the testing of the hypothesis of whether light matters. The fifth image depicts a woodland with a lit path. It was chosen to test whether a lit path which is open on one side however has a dark wood on the other is preferred to a narrow alleyway with and without a light source at the end of the path. It deliberately presents a difficult choice to participants, as a means of checking the validity of the expected easier choices. The final purpose of this image was to detract from the presence of pairs of images which may alert participants to digital manipulation.

Stage 3a. Discrimination test 1 - Forced Choice all possible pairs

Participants were presented with all ten possible paired combinations of the five images (plus four null conditions), in a randomised order and asked which street they would prefer to walk down after dark. Key photo pairs and the hypotheses they are testing are identified in Table 3.1. All possible pairs are listed in Table 3.2. Half the subjects (odd number) were presented with the pairs in the order left/right, and the other half (even number) right/left, to counter position bias. Previous studies have found right bias when participants were asked to choose whether they would turn left or right at the end of a corridor (Chang 2009). If position bias is found then this method ensures that any effect of this is counterbalanced by the experiment design.

Key photo pairs	Predicted safer street	Hypothesis	Hypothesis reference
Scenes 1-2	1	Lighter is preferable and perceived as being safer.	1
Scenes 3-4	3	As above.	1
Scenes 2-3	2	Access to refuge is preferable to no access to refuge.	2
Scenes 3-5	5	More prospect is better than less prospect.	3

Table 3.1. Hypotheses tested by key pairs.

Null conditions

The inclusion of null conditions contributes to validating the experiment. Four null conditions were inserted randomly into the ten pairs of all possible combinations.

Null condition 1 and 2 - Test for position bias

Two null conditions which showed the same randomly selected image twice (in left and right locations) were added to the sequence of pairs to test whether left or right bias exists. These were scenes 2 and 3. Participants were informed at the beginning of the experiment that "the differences might be very small". If during the experiment they stated that the images were the same, they were asked to pick one regardless.
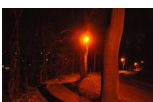
Null condition 3 - Test for effect of position bias

The first two null conditions quantify if left/right bias exists and the third null condition is used to test whether left/right bias affects their decision. If the differences are small, participants may tend to choose the right image more often than they choose the left one, or vice versa. If the differences are large enough, then they would not. In order to address this, one randomly selected pair was inverted and shown to the participant twice, to check for within subject consistency. The pair selected for this null condition was randomly selected for each participant.

Null condition 4 - Internal consistency

The fourth null condition tests for internal consistency within subjects by showing the same pair twice at different positions within the same set to see if the same response is given twice. When subjects are asked a question they may be biased by what they have seen previously which can lead to subjective evaluations being misleading (Poulton 1989). In order to test this the pair presenting the most difficult choice, not related to the main hypothesis, was used (scenes 4 and 5).

Pair	Left hand image*	Right hand image*	Hypothesis or null condition reference
1			Hypothesis 1 - Lighter is preferable
2			Hypothesis 2 - Access to refuge is preferable to none
3			Hypothesis 2 - Access to refuge is preferable to none
4			Hypothesis 2 - Access to refuge is preferable to none
5			Hypothesis 2 - Access to refuge is preferable to none
6			Hypothesis 2 - Access to refuge is preferable to none
7			Hypothesis 2 - Access to refuge is preferable to none
8			Hypothesis 1 - Lighter is preferable
9			Hypothesis 3 - More prospect is preferred to less prospect.
10			Hypothesis 3 - More prospect is preferred to less prospect.
11			Null condition 1 (position bias)
12			Null condition 2 (effect of position bias)
13	Randomly selected pair (1-10) position rotated.		Null condition 3 (position bias)
14			Null condition 4 (internal consistency)

* For odd numbered participant.

Table 3.2. All possible pairs and null conditions used in experiment. Boxes denote a key pair.

Stage 3b Discrimination test 2 - Rank order

The task of placing all images in a rank order was included to enable the response from two methods (stage 3b and 3c) to be compared. Participants were presented with the same five images simultaneously and asked to sort them in order of preference.

Stage 3c Predefined reasons

Participants were presented with the same five images in a random order and asked whether they would walk down a street like this alone after dark in an unfamiliar area, and asked to give reasons for their decision. Pre defined reasons were presented to participants in the form of a tick-box sheet (Figure 3.5). The preselected reasons were based on issues identified in previous research and pilot study transcripts (Table 3.3). Previous research has used the approach of ticking reasons from a preselected list (Johansson 2011, Hanyu 1997).

Category	Options	Identified in previous research
Spaciousness	Open	*Nasar and Fisher 1992*
	Enclosed	Loewen 1992
Light levels	It is light	Loewen 1992
	It is dark	Haans and de Korte 2012
The presence of houses	Residential	Appleton 1975, Loewen et al. 1992
	No houses	Foster et al. 2012
The type of area it is	Good area	Wilson and Kelling 1982, Koga et al. 2003
	Bad area	Jacobs 1961
I can see the path ahead	I can see where I am going	Appleton 1975
	I can't see where I am going	
Presence of other people	It looks busy	Okuda et al. 2007
	It looks deserted	Koga et al. 2003
View of my surroundings	I have a good view	Boyce 2000
	I don't have a good view	

Table 3.3. Preselected reasons based on previous research.

Tick which ones apply. Photo ..... (insert photo number).

Please leave blank if neither applies.

I would/would not (delete as applicable) **walk down this street because of:**

Spaciousness

Open ☐   Enclosed ☐

Light levels

It is light ☐   It is dark ☐

The presence of houses

Residential ☐   No houses ☐

The type of area it is

Good area ☐   Bad area ☐

I can see the path ahead

I can see where I am going ☐   I can't see where I am going ☐

Presence of other people

It looks busy ☐   It looks deserted ☐

View of my surroundings

I have a good view ☐   I don't have a good view ☐

Please comment on anything else that you think is important for your reassurance:

_____

Figure 3.5. Predefined reasons sheet used in stage 3c.

Stage 3d Personality survey

Previous research has shown that personality affects perceptions (Stevens 2012). A short personality survey (Figure 3.6) used in previous research was used to give an indication of how a participant sees themselves in relation to others, to test whether there was any relationship between this and their responses to Stage 3c.

The survey was chosen for it's attempt to identify differences in perceived vulnerability between participants. The results will contribute to understanding whether the environment itself is a greater determinant of behaviour than personality, as found in previous work (Hall and Hall 1975).

Tick which ones apply.

Do you think that people who are up to no good are likely to fix especially on you & your possessions?

Yes ☐   No ☐

Do you think that there are people who are jealous of you?

No ☐   Yes ☐

Do you think that you're capable of chasing off a possible assailant?

Yes ☐   No ☐

Do you generally steer clear of rows?

Yes ☐   No ☐

Do you generally trust strangers?

No ☐   Yes ☐

Do you distrust particular people in your surroundings?

Yes ☐   No ☐

If you're on your way somewhere, do you ever imagine that someone could obstruct your path?

No ☐   Yes ☐

If you have to go somewhere, do you watch out that you take a safe route?

No ☐   Yes ☐

Figure 3.6. Testing a social Psychological Model after Van der Wurff, Van Staalduinen et al. 1989.

3.2.4. Summary of method

The experiment described uses a range of methods enabling comparison between the results of each. Using participants own photographs and preselected images is a useful way of comparing the effects of familiar and unfamiliar environments. Figure 3.7 summarises the structure of the experiment, referred to throughout this thesis as study 1.

The following measures were taken to reduce bias, whilst recognising that it is impossible to avoid bias altogether (Tversky and Kahneman 1974, Briggs 1986):

• Care was taken with the choice of words when interviewing. No words associated with the reasons for the research are used in the questions for example "street lighting" and "safety".

• Participants were asked to identify places of their own choosing.

• Participants use their own words to test if they would mention lighting.

• The photo section, where participants might guess that the motivation for the study was lighting related, took place after the interviews, therefore could not influence earlier proceedings.

Stage 1 - Interview with no visual stimuli

General descriptions of feelings when walking alone after dark, reasons for these and general descriptions of types of places which evoke confidence or not.

Reassured ←→ Not reassured

Rotate order
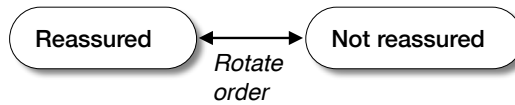
Stage 2 - Interview with participant's own photographs used as prompts

Description of streets where the participant is confident (or not) to walk alone at night based on their own photographs.

Example of participant's own photos:

Reassured

Rotate order

Not reassured
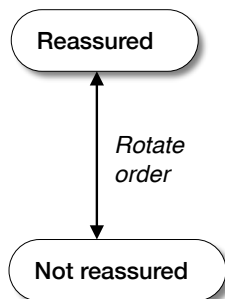
Stage 3 - Preselected set of photographs

a   Forced photo choice all possible combinations (discrimination task).

Rotate order

b   Ranking - Order of preference of walking there after dark (discrimination task).

c   "Would you walk down a street like this in an unfamiliar area". Yes or no giving reasons from a list.
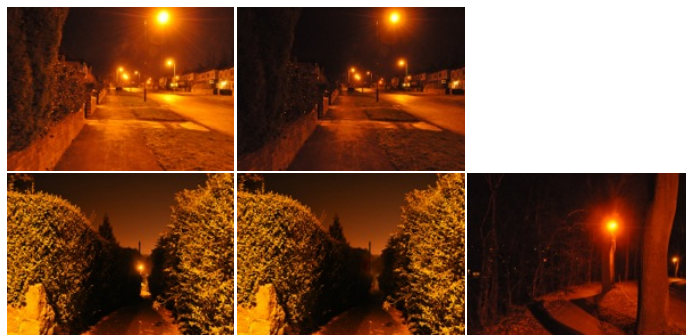
d   Personality survey

Figure 3.7. Study 1: Sequence of actions.

60

3.3. Procedure

Before being invited to interview participants were asked to take photographs of streets where they did, and did not, feel confident to walk alone at night-time. The relevant extract of the information sheet describing the task, is shown in Figure 3.8.

---

2. What will I have to do if I take part?

You will be asked to take photographs or provide descriptions of:

a) Two streets where you are confident to walk alone during hours of darkness.

b) Two streets where you purposefully choose not to walk during hours of darkness or would prefer to avoid.

It is up to you whether you take photos **or** provide a brief description (on the following sheet) of the streets. Photographs can be taken during the day or night.

This will be followed up by a 30 minute interview in which the photographs or descriptions will be used as prompts for a structured discussion about why these environments were selected. There will be a cash payment of £10 to compensate for your time.

Figure 3.8. Task instructions on information sheet.

Study 1 took place between late January and early April 2012. Disposable cameras for 15 participants were delivered, collected and developed prior to their attendance at interview. The remaining participants e-mailed photographs which were printed at A5 size prior to the interview. Between the 5th-13th February it snowed therefore participant photographs taken during this time period show snow. Most participants completed the photograph task in the manner in which it was requested, however not all. Exceptions and the responses are listed in Appendix A.1.

Upon arrival, the format of the interview and the approximate amount of time it would take, was described to participants. They were asked whether they minded the interview being recorded. Before starting the interview they were reminded that there are no right or wrong answers, and that whatever came to mind may be relevant to the discussion. They were informed that the interviewer was interested in their subjective responses. It was made clear that all questions referred to walking alone after dark. Stage one began with the question structure described earlier (Figure 3.2). When participants could not think of anything else to say and the author could not identify any more relevant probing, the second stage of the interview began. The participants own photographs were shown to them on a place by place basis, to ensure none were missed out. Half the participants were asked to comment on the reassuring areas first and the other half the not reassuring areas. This was to ensure that if the conversation is inadvertently steered in one direction by talking about one issue first, then any effect of this is counter balanced. Once the interviewee had established which photographs were of reassuring and unreassuring locations (if this had not been identified beforehand), the places not being discussed were hidden from view under a piece of paper. When the interviewee had nothing more to say about the topic, the next (third) stage of the interview began.

Participants were shown all possible pairs and asked "On route to your destination, if you had to choose between taking one of these two streets, which one would you choose?" They were also asked to rank the scenes in order of preference. These two discrimination tasks were

rotated between odd and even-numbered participants as shown in Figure 3.7. Participants were then shown the scenes one by one and asked "Would you walk down a street like this in an unfamiliar area?" and asked to complete the preselected reasons tick box sheet, giving reasons for their decision. Finally they were presented with a short personality survey. After the interview questions about the purpose of this study were answered. Participants received £10 compensation for their time. An example of the guidelines used by the author during the interview as a reminder of the interview structure, is shown in Figure 3.9.

Interview Structure

Pre interview

Explain the purpose of the study, and four stages of the interview. No right or wrong answers, would like as much information about your feelings as possible, if questions seem repetitive it's because I'm trying to get more information not because they gave the wrong answer. It will take about 25-30 minutes. Is it ok to record?

Consent form & information sheet.

Stage 1 - General

Does walking on the streets after dark alone generate any feelings in you?

Yes   No

Can you tell me about those feelings?   Can you tell me something about the streets
What type of feels does it evoke?   where you do walk alone after dark?

                                               Can you tell me something about the streets
Why? What?   where you don't walk alone after dark?

Can you give me a couple more reasons?

Objectives of stage 1: Reasons for feelings of reassurance or not. Rational and irrational reasons.

Stage 2 - Own Photos

Negative 1st.
- What is it about this street that makes you (not) confident to walk there after dark?
- Prompts: What; where; why; who; when; how. Why?–deeper but more general. What?–superficial but more precise.
- Are there any times that you would walk in that area?
- Could you tell me something more about that 'big wall (for eg).?
- Can you give me a more detailed description of what happened?

Stage 3 - Fixed Photos

Sometimes there are obvious differences, other times the differences may be very small.

a) Forced photo choice all possible combinations (without reasons).
On route to your destination, if you had to choose between taking one of these two streets, which one would you choose?

b) Ranking - Order of preference of walking there after dark.

c) 1 by 1 - "Would you walk down a street like this in an unfamiliar area" . Yes or no & give reasons based on pre selected words (tick how many apply).

Stage 4 - Personality survey.

Sign cash receipt form.

Figure 3.9. Example of interviewer's prompt sheet providing guidelines for an odd numbered participant.

3.4. Participants and groups

Fifty three participants formed two groups comprising of a roughly equal split between the sexes. The student group was formed of twenty six students under the age of thirty and the older group comprised of twenty seven people aged over fifty five. A summary of details of participant age and sex can be found in Table 3.4.

Older participant recruitment

Four participants were recruited following communication with thirteen sheltered housing complexes in Sheffield. One was found by a notice placed in an art gallery. Three participants were recruited by a notice placed on the University of the 3rd Age Sheffield website. The remaining participants were found at the University of the 3rd Age coffee mornings. No participants were recruited from notices placed in three libraries, the Hallamshire Hospital, the Botanical Gardens, two churches, and two cafes in Sheffield city centre, which is evidence of the difficulty in recruiting older participants. All the older participants were locals.

Student participant recruitment

A recruitment e-mail was sent to all students at Sheffield University who had not unsubscribed from the volunteer mailing list. Approximately 70 replies were received, participants were selected on a first come, first served basis, with an equal split between the sexes. 14 out of 26 students were non-native speakers of English (5 European, 9 non-European).

Age Category	18-25	26-34	35-44	45-54	55-59	60-64	65-74	75-84
Male	*9*	4	-	-	1	4	6	3
Female	11	2	-	-	1	5	5	2
Total	20	6	-	-	2	9	11	5
Summary	Group 1 (Students under 35)				Group 2 (Over 55 years)			
Male	13		-	-	14			
Female	13		-	-	13			
Mean age	**23**		**-**	**-**	**68**			
Median age	24		-	-	70			

Table 3.4. Participant details.

3.5. Ethical considerations

The main ethical issue was in asking participants to take photographs on streets where they felt confident (or not) to walk alone at night. This issue was mitigated by giving participants the option to take photos during the day, or not take photographs at all, in which case the author went to the locations they described to complete the task. 5 out of 53 participants (all in the older group), opted out of taking photographs. 10 participants took photographs at night, including three who mixed day and night time photographs. Out of the seven who only took photographs at night, six of these were in the younger group. This shows that the option for participants to take photographs during the day was a good idea.

Participants were also given the option to be interviewed in their own home for convenience. Nine participants (all in the older group) requested this. The full ethics application can be found in Appendix A.2.

3.6. Pilot studies

Two pilot studies which informed the procedure were completed. Pilot studies are useful because they test a participant's interpretation of the task and identify areas for improvement. The aim of pilot study 1 was to test how participants responded to the task of taking photographs and to explore how best to use preselected images in the experiment design. The purpose of pilot study 2 was to practice asking questions.

3.6.1. Pilot study 1
Procedure

In summer 2011, 9 people were asked to photograph streets where they would & would not be happy to walk alone at night and invited to follow up interviews in which they were also presented with preselected scenes and asked, whether or not they would walk down a street like that in an unfamiliar area, giving reasons for their answers. Interviews were transcribed and analysed. Participants were asked to complete three personality surveys at the end of the interview, which are included in Appendix A.3: (1) A scenario-based survey in which participants were asked to imagine situations and rate how they would feel and (2) a survey which tested participants feelings of power, perceived attractiveness in relation to others, and their feelings towards other people in the environment and the extent to which space is criminalisable both after Wurff (Wurff, Staalduinen et al. 1989). They also completed (3) The Penn State Worry Questionnaire as this is a standard questionnaire used to gauge anxiety levels (Meyer, Miller et al. 1990). Two participants completed an additional survey, the Intolerance of Uncertainty survey (Sexton and Dugas 2009).

Learning outcome

The learning outcomes of pilot study 1 are summarised as follows:

Photo task

- The number of places which participants are asked to photograph should be specified otherwise the response ranges from the selection of 2 to 20 places. An inconsistent number of places between participants makes it more difficult to make systematic comparisons.

- It is necessary to limit the number of photographs per street so that the dataset is more manageable and so that participants think about what they want to show on the photographs, rather than photographing everything they see on the street.

Preselected images

- When using preselected images, it is important that the manner in which they are shown to participants is controlled. Otherwise participants are easily confused about which image they are discussing.

- Images should be printed at A4 so that they are clear enough for features in the photograph to be identified, as some participants could not see the scenes clearly when printed at A6.

- Participants found the open-ended interview structure tedious when referring to preselected scenes, as they had to repeat themselves. It may not be necessary to use the open ended interview structure when using preselected images as information regarding what matters to them in familiar and unfamiliar environments is gleaned earlier on in the interviews. When using preselected images a tick box sheet method would test another procedure and may also be a more efficient means of identifying the main concerns of participants and result in less verbal repetition.

Personality surveys

- Some participants found the scenarios survey entertaining, therefore it was not selected. The purpose of this survey is to ascertain if personality can have an overriding effect on perceptions of the environment. The survey which asked participants for their responses to environmental situations was the most relevant, as this study is concerned with the environment, therefore this was used. This was the shortest survey therefore it also met the time constraint of the experiment.

3.6.2. Pilot study 2

Procedure

In Autumn 2011, a further 6 people were interviewed with the purpose of focussing on the method of asking questions and exploring other aspects of the interview in more detail. A group interview was tried with two people. This pilot study tested a shortlist of 8 scenes for the fixed photograph part of the experiment. Participants completed discrimination tasks of forced choice of all possible pairs and ranking of all images. Preselected photographs were shown to participants one by one and they were asked whether or not they would be happy to walk at alone after dark and asked to list three reasons for their decision. The IOU worries survey was tested on two participants.

Learning outcome

The learning outcomes of Pilot Study 2 are listed below:

Methods of questioning

- Questions should be clear and not create overcomplicated scenarios. For example confusion was created when participants were asked if there are any circumstances in which they would feel different to the way they had described.

- The wording of the question is important. For example the wording of the instruction sheet was amended from "happy to walk alone at night" to "confident to walk alone at night", because this addresses the issue of reassurance more closely, and does not imply an emotion which may not be present.

- Participants requested that the format of the interview be described to them beforehand so that they know what to expect and roughly how long it will take. This was adopted in the main test.

- That setting the scene of the questioning is important. For example, some participants used day and night interchangeably therefore it was important to make it clear that all questions refer to after dark unless otherwise stated.

- Asking participants about their feelings and what emotions an environment may evoke leads to more deep reasons about what concerns them. However not all participants were talkative. Therefore, in order to obtain environment specific information and make the question easier to answer, asking them to give three reasons for their feelings (if they could) was an effective way of obtaining information.

- Asking participants for reasons for their choices in the forced choice of all possible pairs part of the test, resulted in repetition which they found tedious. Therefore this approach was not used in the main test.

- The personality tests were confusing and resulted in lots of "it depends" scenarios. The IOU scale, also used as a means of measuring worry (Freeston, Rhéaume et al. 1994, Buhr and Dugas 2002) was tested on two participants, however non-native speakers of English had trouble understanding the captions therefore this was not used in the main test. Any personality test used should be simple and clear.

- Adding a "any other comments" section to the predefined reasons enables participants to mention any topics which they felt were not covered by the options given.

  Image choice
- The eight photographs used for the pilot study means that twenty-eight paired comparisons would be required when checking all possible pair comparisons for consistency. The limitation on photographs (five) means that the most important variable which is light should be prioritised. Two pairs comparing light and dark of the same scene were chosen because they test the most important variable.

- The number of preselected images should be restricted to no more than five or six otherwise participants found the repetition of comparing all possible pairs (28) of eight images tedious.

- The camera flash was not used in selected images because two participants asked if and how the light had been added to the scene.

- The scene should be exactly the same in the photographs which test whether a change in the light level has any effect. This is because participant photo choice was sometimes influenced by a slight change in camera angle.

    Wording of preselected image tick boxes
- Following the pilot study, the wording of the 'light' part of the predefined reasons, was amended to read "it is light", it is dark", because "light" could be seen to mean the presence of a street luminaire rather than an adequately lit environment.

3.6.3. Pilot study 1 analysis

Testing the analysis process checks that the data collected is useful. The nine interviews of pilot study one were recorded and transcribed (Appendix A.4). The transcripts were used to test two methods of analysis; hierarchical cluster analysis (Zhang and Julian 2011) and reason counting (Loewen, Steel et al. 1993), after previous research. Two places identified by a participant were visited for the purpose of testing the feasibility of taking photometric measurements in places chosen by participants. Measurements and photographs taken by the author at these two sites, were tested in luminance mapping software. Data from the different personality surveys was compared, to understand whether this would be useful for further analysis. Only the results of the reason counting exercise are included here, the rest are described in Appendix A.5. To summarise, (1) no meaningful quantitative analysis could be derived from interview transcripts using hierarchical cluster analysis, (2) photometric measurements at each site identified by participants would have taken too long in the main test and (3) personality surveys completed by participants yielded inconsistent results when compared to each other.

Reason counting
Aim

The rich vocabulary of the English language means that there are many ways of expressing the same fundamental concerns. Forming categories into which clusters of reasons can be placed, enables the underlying concerns to be identified and the frequency by which it occurs to be counted. This approach was used in previous research (Loewen, Steel et al. 1993, Okuda, Ishii et al. 2007). The success of the method of using interview transcripts from which to sort reasons given for the presence or absence of reassurance depends on the categorisation process. Therefore this was tested.

Procedure

The first six interviews were transcribed fully, whereas the last three interviews were partially transcribed. When compared, there was no difference in results between full interview transcriptions of interviews and shorter transcriptions of relevant parts of the interviews. Therefore the use of shorter transcriptions which did not record unrelated anecdotes when a

participant ventured off the topic, for example to talk about their dog's ill-health, is appropriate and also saves time.

The reasons that participants gave for the presence or absence of feelings of reassurance were divided into two sets of categories, the first defined by Loewen (access to help, open space and lighting) and the second defined by the author (presence of others; familiarity; spatial features; lighting). Coding the reasons into categories requires the subjective interpretation of the author. For example, "big streets, they are wide" was included in the Spatial Features category. At this stage it was deemed adequate that the author was consistent across transcripts.

Results

Using Loewen's set of categories it can be seen that 28% of the reasons given for being happy or not happy to walk on a particular street were in the category spatial features; 19% of reasons given indicated the presence or absence of light and 9% of reasons were related to familiarity (Figure 3.10). When dividing the reason by the authors categories (Figure 3.10, second column), what mattered most (44% of reasons given) was the presence of others, which included positive aspects such as perceived access to help through occupancy and judgements about the 'type' of area based on direct and indirect experience (personal and media) and signs of incivilities. When the categories were changed, so did the results. For example presence of other people was mentioned by 44% of people, spatial features by 28%, light by 19% and familiarity by 9%. This demonstrates the importance of the categorisation process because different ways of categorising yield different results. In these examples the "lighting" category was not affected.

Loewen's categories

- 🟢 Open Space
- 🟠 Light
- 🔵 Access to help

Alternative categories

- 🔵 Presence of others
- 🟢 Familiarity
- 🟠 Light
- 🔴 Spatial features

Influencing factors given for street choice
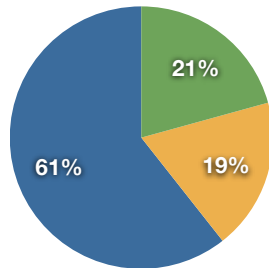
21% | 19% | 61%

Influencing factors given for street choice

44% | 9% | 19% | 28%

No visual stimuli

12 | 8 | 25

No visual stimuli

19 | 4 | 8 | 15

Photographs provided by participants

26 | 22 | 88

Photographs provided by participants

59 | 14 | 22 | 42

Fixed set of photographs

3 | 7 | 7

Fixed set of photographs

6 | 7 | 4
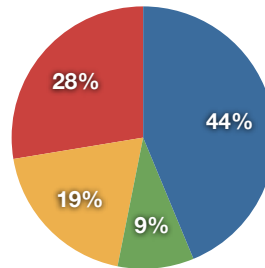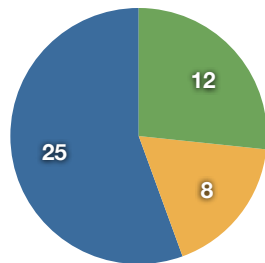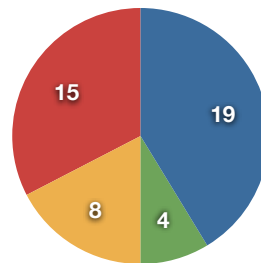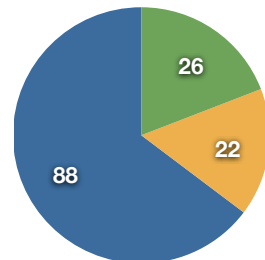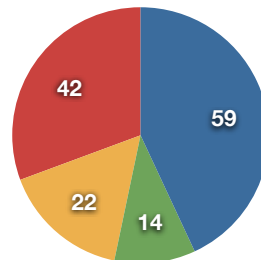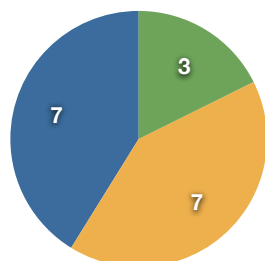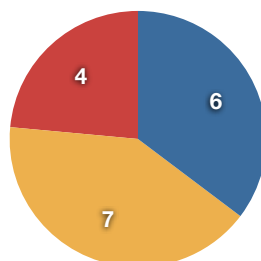
Figure 3.10. Categorisation using Loewen's and author's categories.

The advantage of this method is that by the process of counting reasons the relative importance of light can be quantified. The disadvantage is that it relies on the subjective interpretation of the interview and does not take into account the emphasis that the interviewee may have given to their reasons or the relationships between reasons. For example, when the reasons were categorised according to Loewen, assumptions were made such as "dodgy people" implies "no access to help" however participants may have been referring to the presence of a possible threat, rather than people being incapable of helping them should something happen. This would result in a further category "threatening others", which was added in the study 1 main test. It is interesting to note that in unfamiliar areas (pre selected images), lighting was a more important factor to this small sample size of nine people. This may be due to the fact that lighting is an easily identifiable difference between images, whereas other more subtle differences related to nuances on the street are not discernible in an image. For example an occupant shouting may indicate a potential source of trouble which a participant could recall from memory however this would not be addressed in an image of an unfamiliar street.

Learning outcome

The conclusion of the pilot study 1 analysis using categories is that sorting reasons given into categories, works as a method of identifying what matters to pedestrians.

3.7. Summary

Interviews were chosen as a means of allowing participants to talk in their own language about what matters to their reassurance. Open ended questions enable a full range of responses which can be categorised afterwards. The fact that participants were asked to identify places prior to interview enabled the topic of reassurance in their every day lives to be broached. By the use of a supporting image study, quantitative data can be collected to support the qualitative data. A short personality survey was included in case any trends could be found between personality and survey responses. Attention was given to the way questions were asked in the interviews, and how the overall study was planned, to avoid leading participants towards the over emphasis of the importance of lighting, a criticism that can be levied at most existing research in the field. The aim of this experiment is to take one step towards a less biased approach which may lead to more convincing conclusions regarding whether participants think lighting matters to their reassurance.

4. Three Stage Interviews Results and Analysis

4.1. Introduction

Fifty three participants were invited to interview to discuss reassurance when walking alone at night in areas which they had identified in a task which required them to provide the author with photographs beforehand. This was supplemented by questions with no reference to place, by ranking and forced choice discrimination tasks and preselected reasons based on images of street scenes chosen beforehand.

A review of literature identified a methodological gap in existing research, which often uses words such as safety and security in the questions asked. This may lead participants to emphasise aspects of the environment that they think should matter to their reassurance, which may not influence their behaviour in reality. A method was developed in which participants were asked to complete a pre-interview task of taking photographs on streets where they were reassured and not reassured when walking alone at night and then attend a semi structured interview using open-ended questioning and their own photographs as prompts. The part of the interview in which participants were asked to assess preselected photographs in which variations in lighting could have been detected, was conducted at the end of the interview so that this could not influence earlier proceedings. This chapter describes the results of the experiment (Study 1).

4.2. Categorisation

The interview transcripts were rich sources of data which recorded how participants communicated what mattered to them. Interview transcripts can be found in Appendix B.1. In order to summarise the findings, it is necessary to divide and sort reasons given by participants in order to obtain an overall impression of what matters.

Previous research has used the method of asking participants what matters to them and then sorting out the results accordingly (Nasar, Fisher et al. 1993, Okuda, Ishii et al. 2007). For example, when participants were asked to list features of the environment which they believed could make it safe from personal crime (Loewen, Steel et al. 1993), they most commonly listed refuge (44%), light (76%) and open spaces/prospect (55%). Refuge and prospect were also identified by others (Appleton 1975). Another study asked participants to identify environmental changes which would encourage greater physical activity (Lees, Taylor et al. 2007). The physical environment (gyms, parks, bicycle lanes); safety (presence of gangs and pitbull dogs) and social support, for example group activities such as dancing were identified.

The categorisation process was driven by the interview transcripts. The author read them and highlighted reasons given by participants, sorting them into clusters of the same fundamental concerns. The following categories were identified as being the key issues around which reasons given by participants could be clustered: Access to help; lighting; spatial features; presence of threatening others; familiarity; mobility and presence of CCTV. Examples of reasons and the categories into which they were sorted are given in Table 4.1. Most of these categories coincided with previous research. Only mobility and presence of CCTV formed new categories.

Table 4.1 gives examples of the range of answers within a category. For example "it's so dark I can't see anything" would be placed in the same category (lighting) as "there's not enough street lighting", as it addresses the same underlying concern. The categories chosen were validated by others to ensure that the selected categories were not a result of the author's bias.

Category	Reason given by participant
Access to help	**Positive effect on reassurance:** The presence of houses; occupied buildings; indications that buildings are occupied for example parked cars and lighting in the buildings; a busy area. **Negative effect on reassurance:** Isolated areas with few people around.
Lighting	**Positive effect on reassurance:** The presence of road lighting or a bright environment using words such as lit up, illuminated, well lit, light enough. **Negative effect on reassurance:** Darkness or absence of adequate road lighting; not enough lamp posts or the environment does not seem light enough despite the presence of street lights.
Spatial features	**Positive effect on reassurance:** Openess; wide streets, trees. **Negative effect on reassurance:** High walls; narrow environments; woodlands; open expanses; big trees; places where a potential offender could hide; blocked escape routes.
Presence of threatening others	**Negative effect on reassurance:** The presence of people who may pose threat; participant's own or their friend's negative experiences; the poor reputation of the occupants of an area portrayed by the media.
Familiarity	**Positive effect on reassurance:** The street on which they live; roads that form routes that they use often, on which they have never encountered any problems. **Negative effect on reassurance:** Not being familiar with an area and therefore not being confident in knowing what to expect when walking through that area.
Mobility	**Positive effect on reassurance:** The presence of well maintained footpaths; seats at bus stops to rest. **Negative effect on reassurance:** A rough or slippery pavement surface; roads with fast cars and no crossing points; streets with no pavements where pedestrians feel threatened by oncoming cars.
Presence of CCTV	**Positive effect on reassurance:** Presence of CCTV

Table 4.1. Examples of reasons and categories.

4.2.1. Categorisation validation

The identification and sorting of reasons given by participants from an interview transcript is a subjective process which may be biased by the author's subconscious. Therefore two interview transcript validation tasks were completed by nine people from a broad range of backgrounds. Only two of the nine people were involved in lighting research.

Task 1

The first task was to read a short interview extract (Figure 4.1) and use that to define categories into which the reasons that the interviewee gave for their feelings, could be slotted.

Figure 4.1. Example of participant response to validation task 1.

The results are summarised in Table 4.2, which lists categories given by each participant. The left-hand column shows the author's categories. As *surveillance* in this case meant close proximity to passing vehicles or people, it was interpreted as meaning the presence of potential help should anything happen. Therefore all validators gave categories similar in meaning to *presence or absence of access to help*. Eight out of nine validators defined categories which meant *lighting, familiarity and presence of threatening others*. Two categories were given which did not match the author's categories. These were *quiet*, which was mentioned in the context of the familiar area where it was known that there was not much trouble, therefore this could be included in the *familiarity* category. One validator gave *psychological context/safety* as a category. This category encompasses all reasons given by interviewees. Overall there was good agreement between the categories identified by the author and those by the nine validators using the same transcript.

Categories	Validator								
	1	2	3	4	5	6	7	8	9
Access to Help (presence or absence of other people)	Main road ="busy street"	Surveillance by others	Safer route because it's a main thoroughfare	Other people (including cars around).	Availability of surveillance.	Busy, lively road.	Volume of pedestrians/ traffic.	No proximity to people.	Types of people.
	-	-	Regular vehicular usage.	-	-				
Lighting (presence / absence of)	Well lit.	-	Inadequate illumination for people to feel safe and secure.	Dark/lack of street lighting.	Well-lit or not.	Brightness	Lighting levels.	Bright light; better than darkness.	Street lighting.
	-	-	Good level of illumination.	-	-	-	-	-	Time of day.
Threatening others (presence of) 2no.	Attack against people. Expose themselves to dangerous situations.	-	Area has a reputation for people being threatened.	Fear of criminal act.	Possibility of being mugged (or victim).	With dangerous people around.	Perception of crime.	Close proximity to unfriendly people.	-
	Strange or dangerous people.	-	Unsavory (possibly inebriated/ aggressive) people in the area.	Fear of unsavory characters.	Threatening people.	-	Social/ demographic profile of the area.	-	Activities taking place.
Familiarity	Close to a familiar place.	Proximity (to home)/ efficiency	Not a 'suspect' area - not known for muggings etc...	Familiarity	Familiarity of the area.	Familiarity.	-	Familiar and close to home- access to help.	Location.
	-	-	Familiarity.	-	-				
	-	-	No problem but only in certain circumstances.	-	-				
Won't fit into category:	Quiet. (1no.)	Psychological context/safety. (6no.)							

Table 4.2. Summary of response to interview validation task 1, from the nine validators.

Task 2

The second task (Figure 4.2) asked validators to identify reasons in a short excerpt from a transcript, and slot them into predefined categories.

Task 2

2.a. Please read the below paragraph and highlight (by underlining and numbering), the reasons that the interviewee gives for their feelings.

Tell me something about the streets where you do walk alone after dark? Their characteristics.

Probably would be going to another friend's flat, sometimes I go to English......which is about five minutes walk, it's quite illuminated when you get to Ranmoor

Tell me something about the streets where you don't walk after dark

Enclosed alleyways and streets without street lights. If cars going by I wouldn't be as nervous.

When you choose your routes, do you plan it in advance?

I am trying to stick to main roads,

3 main characteristics where you do walk alone after dark

street lights mainly; open shops; 24hour shops; people around;

What about streets where you wouldn't feel confident walking alone in the dark?

country lanes, no buildings; no street lights; just very quiet; no cars

2.b. Please list which reasons you would place into each category listed below (by placing the number identified above, adjacent to the reason). If no reasons apply to that category, please leave blank.

Access to Help (presence of other people)	8
Lighting (presence of absence of)	3 8
Spatial features	2 4 6 7 10 5
Threatening others (presence of)	
Familiarity	1 9
Mobility (ease of movement)	
CCTV (presence of)	

Figure 4.2. Example of participant response to validation task 2.

All participants identified *Access to Help (presence of other people)* & *Lighting (presence or absence of)* and all except one identified *Spatial features*. Two identified *Threatening others (presence of)*, however as "people around" was mentioned in the part of the interview where the participant was discussing a place where they felt reassured, then this could be interpreted as being a misunderstanding of the task. Three of nine validators did not identify *Familiarity* as a category. Two people classed "five-minute walk" as *Mobility (ease of movement)*, rather than *Familiarity* due to close proximity to the participant's home. One validator mentioned *Presence of CCTV* as a reason however this is not mentioned in the text. As five of the nine validators spoke English as a second language, then the anomalies could be attributed to lack of comprehension of the text.

Table 4.3 summarises the results of task two of the interview validation exercise, and found 86% agreement with the author's categorisation.

		Identified by Validator:										
Identified by author:		1	2	3	4	5	6	7	8	9	Agree	Disagree
Access to Help (presence of other people)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9	0
Lighting (presence or absence of)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9	0
Spatial features	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	8	1
Threatening others (presence of)	No	No	No	Yes	No	No	No	No	No	Yes	7	2
Familiarity	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	6	3
Mobility (ease of movement)	No	No	No	No	No	Yes	No	No	No	Yes	7	2
CCTV (presence of)	No	No	No	No	No	No	No	No	No	Yes	8	1
										Total	**54**	**9**

Table 4.3. Response to interview validation task 2. Examples of categories identified in excerpt of transcript by author and validators.

Following the validation tasks, it was decided that the categories identified by the author were appropriate. In the first task, the vast majority of validators identified the same categories as the author, although sometimes the category was given a slightly different name. In the second task, when presented with the same categories that the author used, the majority of validators identified the same categories from the same transcript.

4.3. Stage 1 - No visual prompts

The aim of this section is to use the reasons given by participants in stage one of the interview to identify what matters to their reassurance. How the reasons were counted is shown in Figure 4.3.
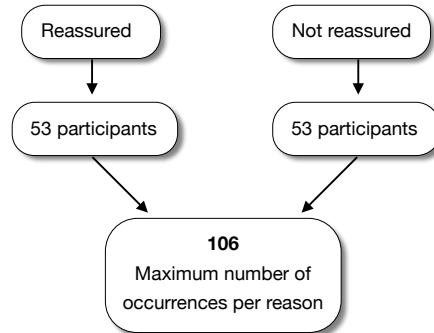
Figure 4.3. Stage 1 reason counting.

The results of this exercise are shown in Figure 4.4 which demonstrates that when participants are asked to discuss what matters to them with no visual prompts, similar emphasis is given to the importance of access to help and lighting, with spatial features not far behind, in both reassuring and non-reassuring areas. The presence of other people who could be perceived to present a threat, was given as a reason for not feeling reassured by all 53 people. Familiarity was a reason to be reassured, more often than a reason not to be reassured, in the case of a participant knowing an area was not safe, based on their own or their acquaintances experiences. It could be argued that knowledge of threatening others is a form of familiarity, however this was counted separately as the possibility of harm is not encompassed by the word "unfamiliar". Four people gave mobility as a reason for a lack of reassurance, and one person gave the presence of CCTV as a reason for reassurance.
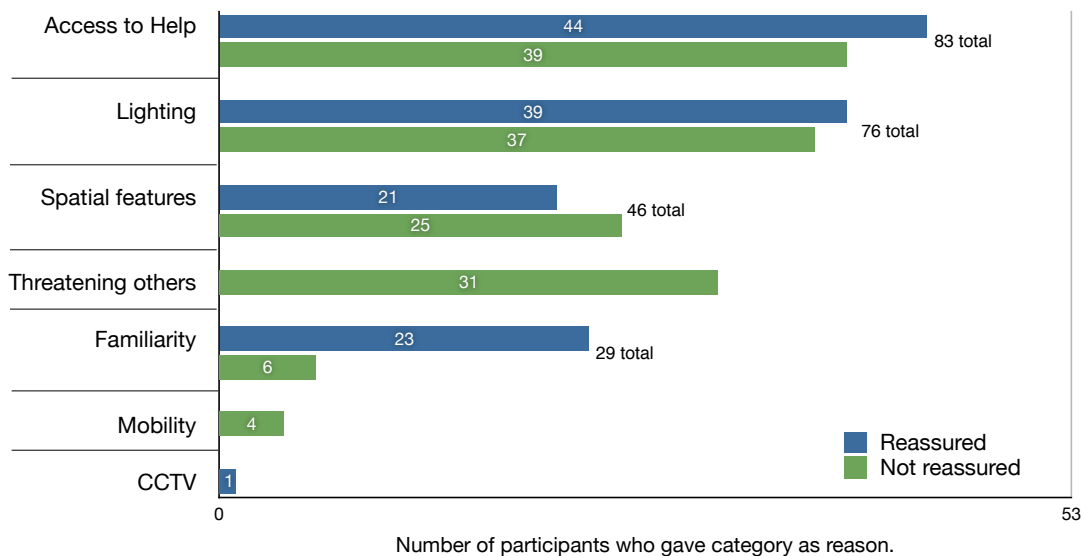
Figure 4.4. Number of times the reason was given in Stage 1.

Effect of age

Figure 4.5 shows little difference in the concerns identified by both the older and younger groups. A Pearson Chi Squared test (2 by 2 older/younger and reason identified/not identified) was used to test whether any evidence existed to reject the null hypothesis that age makes no difference to the response. A Fisher's Exact test was used when the assumptions of the Pearson Chi Squared test were violated. Only in the category "Access to Help" in reassured areas did significant evidence (p=0.024) exist to reject the null hypothesis. 25 younger people and 19 older people gave lack of access to help as a reason for feeling reassured. The findings of the statistical tests are listed in Appendix B.3.
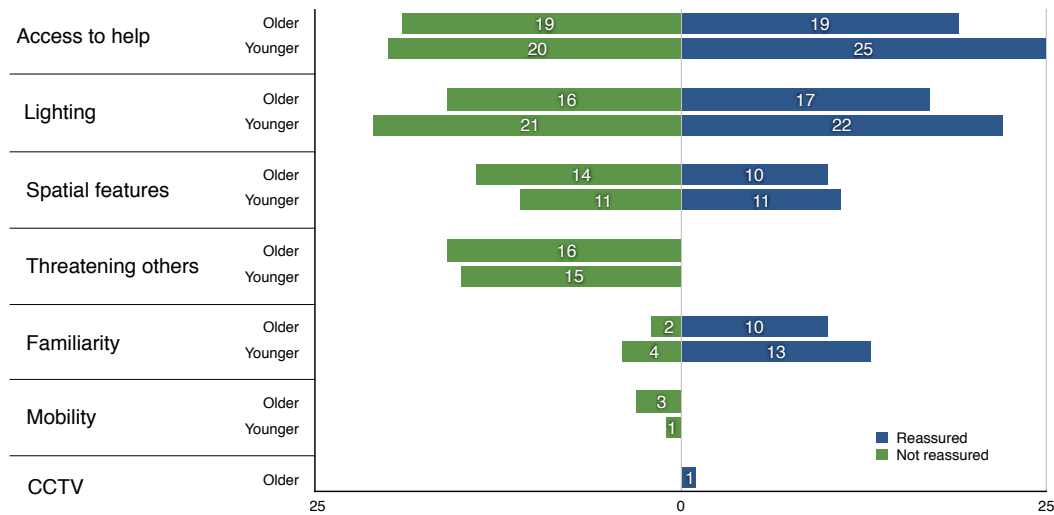
Figure 4.5. Number of times the reason was given in Stage 1, identifying the difference between older and younger age groups.

4.4. Stage 2 - Visual prompts using own photographs
4.4.1. Photograph task

Before being invited to interview participants were asked to take photographs of streets where they did and did not feel confident to walk alone at night-time. They either e-mailed the photographs or were issued with disposable cameras which were collected and developed prior to the interview. These photographs were then used as discussion aids during the follow-up interview. Table 4.6 shows a sample of images received from the participants, showing areas in which they felt reassured or not reassured to walk alone at night-time.

Participant	Streets on which participants felt confident to walk alone at night		Streets on which participants did not feel confident to walk alone at night	
Elderly 1				
Elderly 2				
Elderly 3				
Elderly 4				
Student 1				
Student 2				
Student 3				
Student 4				

Table 4.4. Examples of photographs provided by participants.

Figure 4.6 shows how the reasons were Stage 2 a reason was mentioned for both or either location of the participants own choice, it was counted once.

| Reassured Place 1 | Reassured Place 2 | | Not reassured Place 1 | Not reassured Place 2 |

Reason given for either place (max. occurrence of each reason is **53**)

Reason given for either place (max. occurrence of each reason is **53**)

106
Maximum number of
occurrences per reason
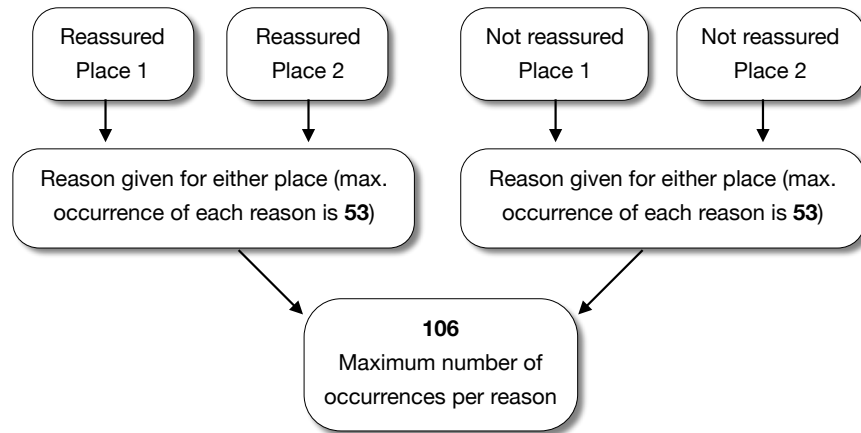
Figure 4.6. Stage 2 reason counting showing that a reason was counted once, even if it was mentioned twice.

Using this method of counting, Figure 4.7 presents the number of reasons identified by each participant as reasons for the absence or presence of feelings of reassurance. As there were 53 participants, the total is 106 reasons, 53 reasons of each for places where they did and did not feel reassured. With specific reference to place, spatial features increase in relative importance as a reason not to feel reassured compared to the results from Stage 1, almost equalling that of access to help and lighting. Familiarity increases in importance as a reason for reassurance. An increased number of participants mention difficulty in mobility as a reason not to feel reassured. The importance of the presence/absence of access to help or adequate/adequate lighting remains roughly equally important as the reason for the presence or absence of reassurance when compared to the results of Stage 1. It is interesting that CCTV is given as a reason for reassurance, rather than being seen as a sign the area needs surveillance, which contradicts earlier suggestions (Postlethwaite 2003).

3   Unique
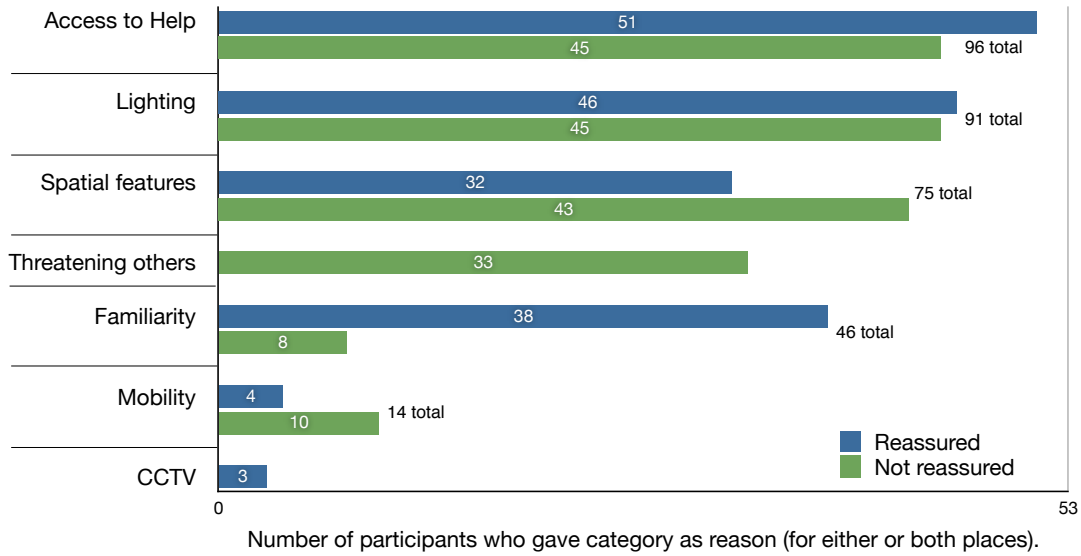
Figure 4.7. Summary of reasons for presence of or lack of reassurance amongst participants.

4   Unique

Effect of age

Figure 4.8 shows little difference between the older and younger groups except for an increased mention of mobility amongst the older group. Using Pearson Chi Squared and Fisher's Exact tests no evidence could be found to reject the null hypothesis that age makes no difference to the reasons given by participant's. The findings of the tests are listed in Appendix B.3.
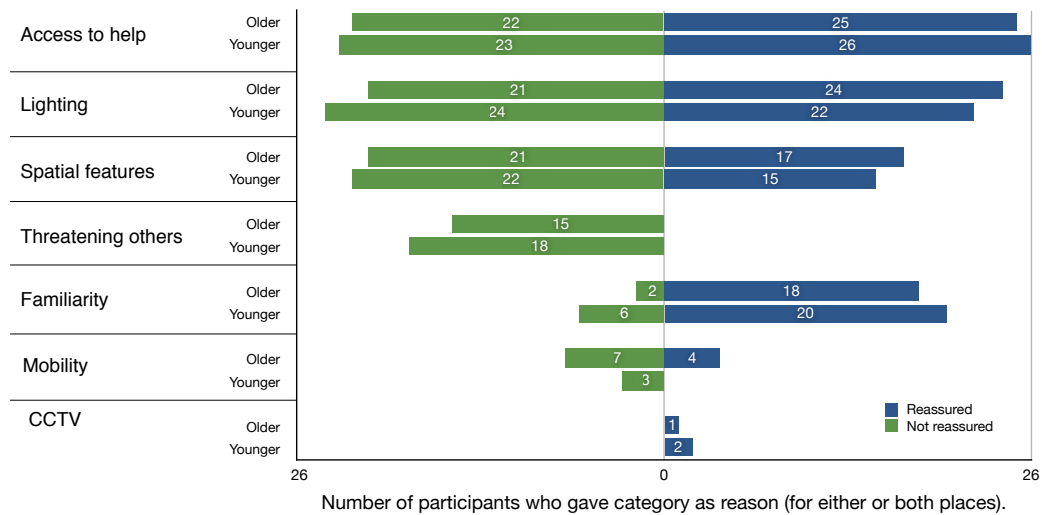
Figure 4.8. Summary of reasons for presence or lack of reassurance amongst participants, according to age.

6   Unique Reassured and not reassured Old/young

4.4.2. Visual prompts using own photographs - all places

The reason to also present the results on a place-by-place basis is because the previous counting method could be seen as biased. If a participant gave spatial features as the reason to not feel reassured in two locations, and in one of these locations lighting was also perceived to be part of the problem, then each reason received one count, resulting in the over emphasis of the importance of lighting. Therefore, the results were also sorted in a manner which counts a reason twice if it was mentioned for both places (Figure 4.9).
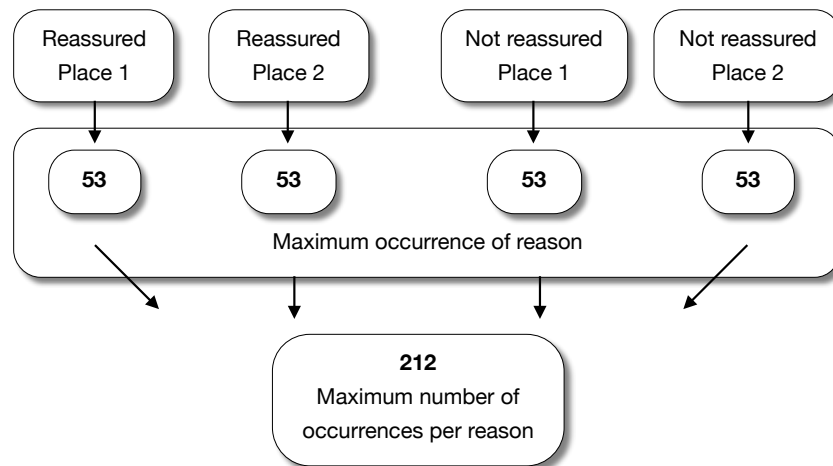
Figure 4.9. Alternative way of counting reasons for Stage 2.

Figure 4.10 shows that when counted on the basis of place the results are similar to participant responses when a distinction was not made between places (Figure 4.8 and Figure 4.9), which validates the first counting method. The total possible number of reasons is 210 (instead of 212) because one participant said he was always reassured therefore did not submit photographs of locations where he did not feel reassured.

Eight younger people and two older people gave familiarity as a reason for not feeling reassured resulting in the Pearson Chi Squared test finding significant evidence (p=0.046) to reject the null hypothesis that age makes no difference to the response. Otherwise no evidence was found to reject the null hypothesis (Appendix B.3).
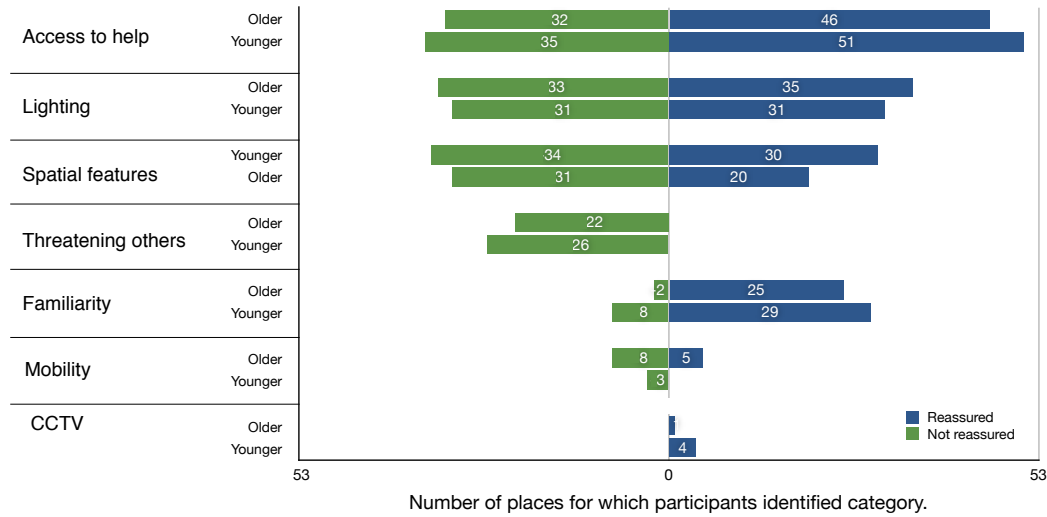
Figure 4.10. Division of reasons when counted place by place.

4.4.3. Comparison of counting methods used so far

Using the methods described so far to count reasons, Figure 4.11 shows little difference between the reasons for the presence or absence of reassurance in Stage 1 and Stage 2. In reassured areas, perceived access to help is the most mentioned reason, followed closely by lighting, spatial features and familiarity. In unreassuring areas, lack of perceived access to help, poor lighting and spatial features matter most, followed closely by the presence of threatening others. The close agreement of the findings of Stage 1 and 2 contributes to validating the findings. This approach gives equal weighting to reasons and does not consider combinations of reasons.
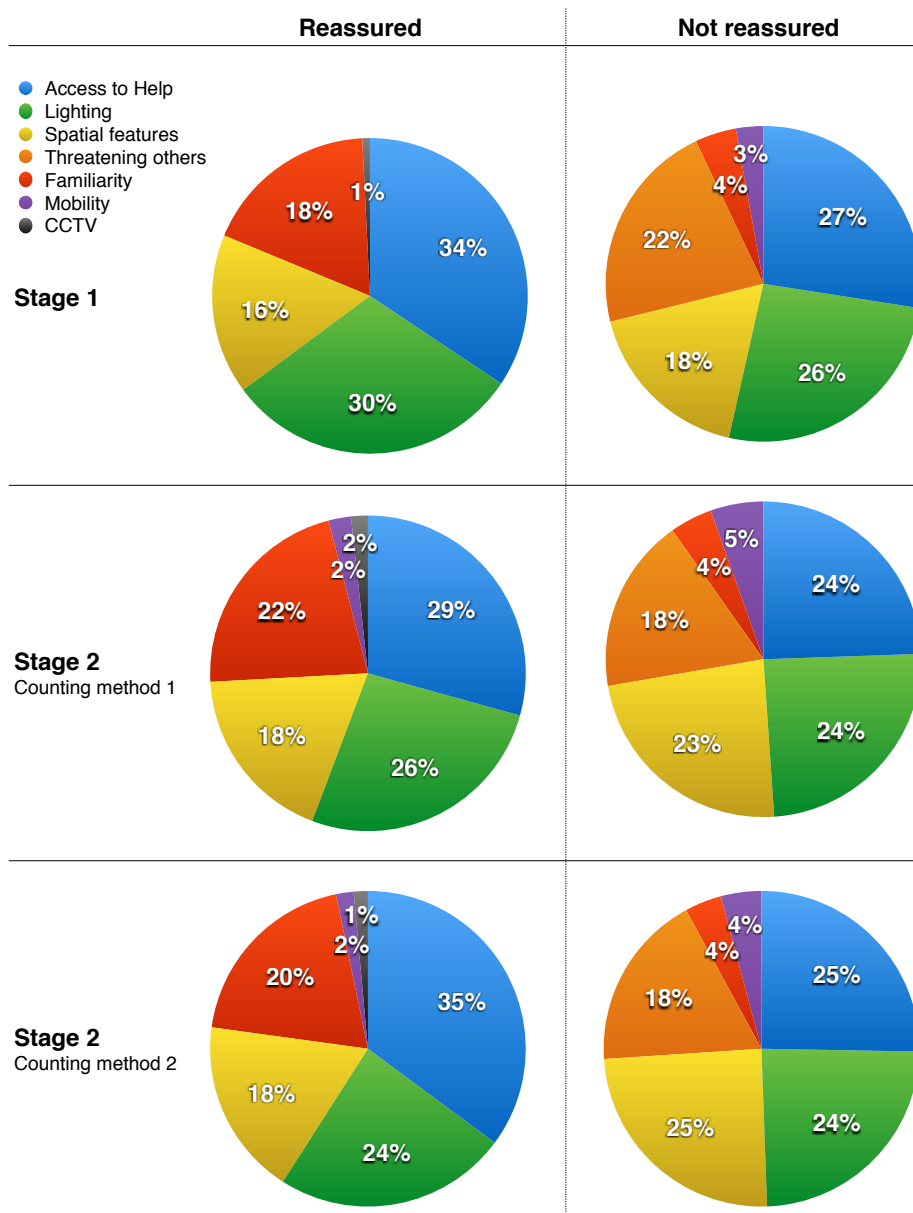
Figure 4.11. Comparison of methods used to count reasons so far for Stage 1 and Stage 2.

4.4.4. Combinations of reasons

The results described so far do not acknowledge combinations of reasons given by participants. Figure 4.12 and Figure 4.13 identify the combination of reasons given by participants for all locations. It can be seen that reasons are rarely given in isolation of others. The most common combination of reasons given by 17% of participant's is access to help; lighting and spatial features, for both reassuring and unreassuring areas.

The top three combinations of reason for reassurance in an environment were access to help, light and spatial features; access to help, familiarity and lighting followed by access to help and lighting. Each of these combinations contains lighting. The top three combinations of reasons for a lack of reassurance are access to help, lighting and spatial features; access to help, lighting, spatial features and threatening others followed by threatening others only. This supports previous research which suggests that lighting may not have an effect on an area which is perceived to be unsafe because of the presence of other people who may present a threat.
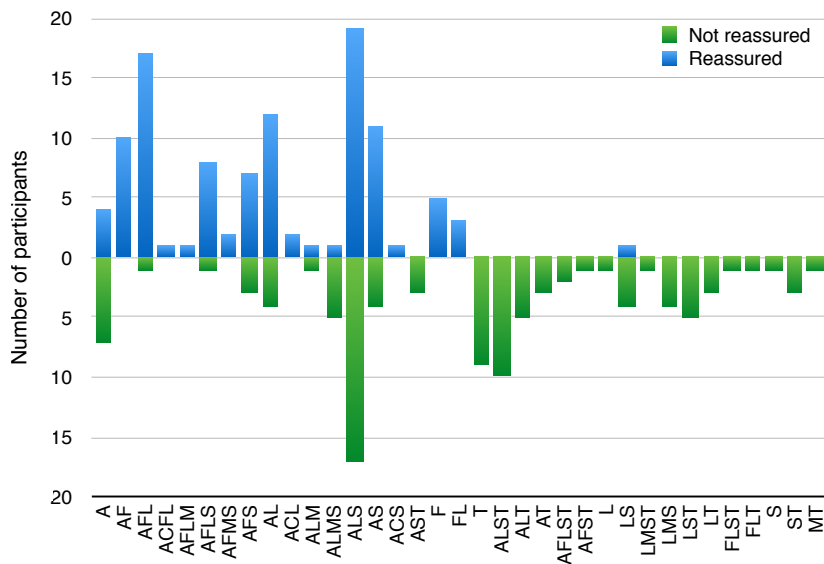
Figure 4.12. Combinations of reasons given for the presence or absence of reassurance in all places identified by participants.
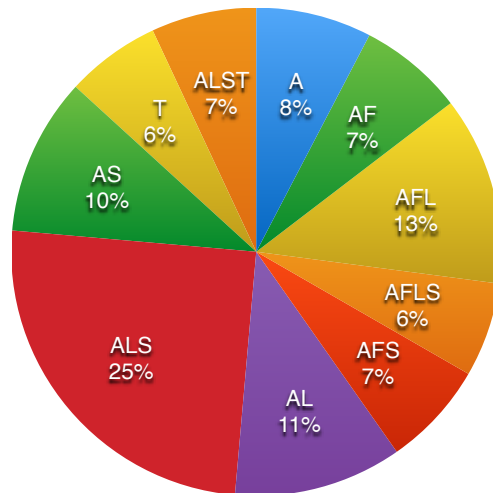
Figure 4.13. All combinations of reasons given by more than 6 people for both reassured and not reassured locations, using the same key as in Figure 4.12.

The charts (Figures 4.12 and 4.13) show that occasionally one reason alone was given the presence or absence of reassurance. For reassured areas access to help was given as the sole reason by 4 people and familiarity by 5 people. In unreassuring areas access to help was given as a reason by 7 people, presence of threatening others by 9 people and lighting and spatial features by one person each. This implies that environmental features such as lighting and spatial features depend more on other factors also being present, when compared to access to help and the presence of threatening others. The selection of 6 people as the cut off in Figure 4.13 is arbitrary. In all combinations access to help is mentioned except for one, which is the presence of threatening others in unreassuring areas. This supports previous work which identified that lighting may have less effect if an area is already perceived to be unsafe (Mansfield and Raynham 2005).

4.4.5. First mention of reason on a place by place basis

The method of counting reasons given by participants for being reassured or not gives equal weighting to each reason, which may not reflect an equal weighting of participant's concern. When examining the transcripts, it is difficult to detect which reason may be more important than others. One way of exploring the issue is to assume that the first reason mentioned by participants is the most important, simply because it is mentioned first. Figure 4.14 shows only the first reasons given by participants. The effect of this on Stage 1 is minimal, however in Stage 2, there is a markedly increased emphasis on perceived access to help. Therefore, if the first mention is taken to be the most important reason given by a participant then the relative importance of access to help is higher than using the previous methods of counting.

6
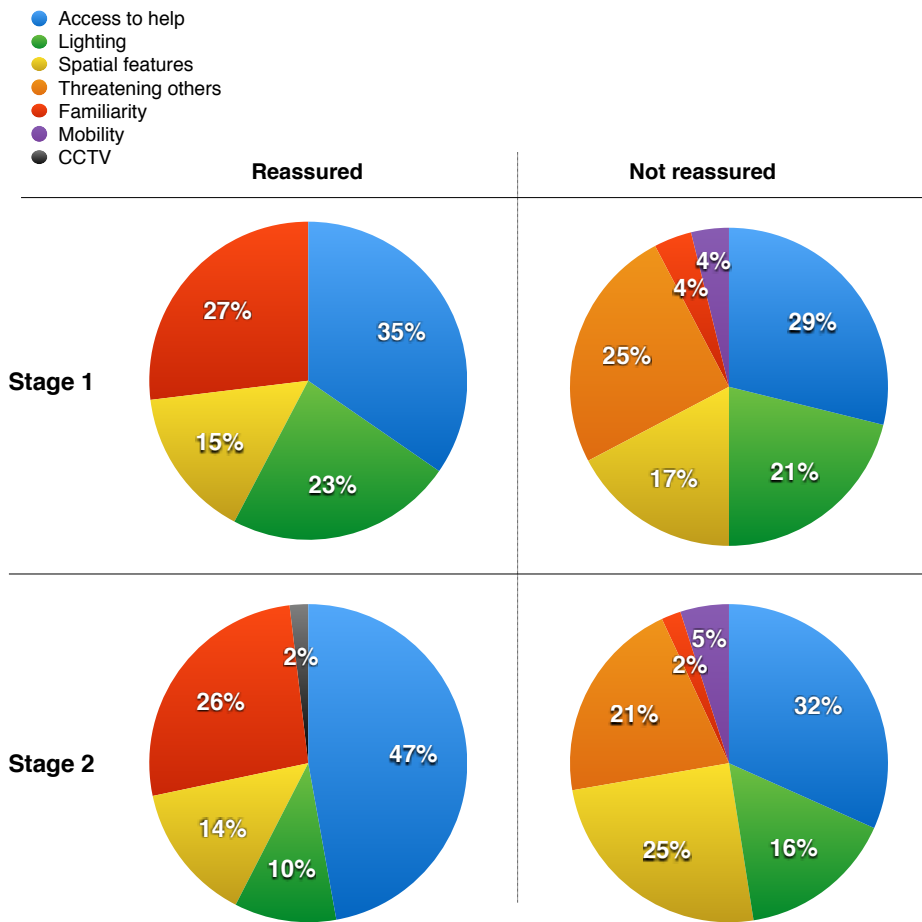
Figure 4.14. First reasons given by participants for Stages 1 and 2.

4.5 Stage 3 - Discrimination of streets in preselected photographs

4.5.1. Presentation in all possible pairs (two-alternative forced choice) (Stage 3a).

Participants identified the preferred image in each pair when all possible pairs were presented in random order. Analysis is shown in Table 4.5. The preferred scene scored one point and the less preferred scored zero. For each image in each pair, the maximum possible score was the sample size of 53 and the minimum score possible was zero.

Row 1	Scene no.	1	1	1	1	2	2	2	3	3	4
Row 2	Scene no.	2	3	4	5	3	4	5	4	5	5
Vote for scene in row 1	Number of participants	**53**	**52**	**53**	**53**	**47**	**52**	**53**	**52**	**27**	**15**
	% of participants	100	98	100	100	89	98	100	98	51	28
Vote for scene in row 2	Number of participants	**0**	**1**	**0**	**0**	**6**	**1**	**0**	**1**	**26**	**38**
	% of participants	0	2	0	0	11	2	0	2	49	72

Table 4.5. Participant's response to all possible pairs task.

The Dunn-Rankin variance stable rank sums test, a non parametric scaling method, was used to examine statistical significance of preference for either image after previous research (Quellman and Boyce 2002, Houser, Fotios et al. 2009). Table 4.6 shows that there is a significant difference between all pairs of images except scenes 3 and 5. The significance level was $p<0.001$ for all pairs except scenes 3/4, 3/2, 1/2 where it was $p<0.01$ and 4/5 where it was $p<0.05$.

Scene		5	4	3	2	1
	Rank value	64	16	87	152	211
5	64	-				
4	16	48 p<0.05	-			
3	87	23 n.s.	71 p<0.01	-		
2	152	88 p<0.001	136 p<0.001	65 p<0.01	-	
1	211	147 p<0.001	195 p<0.001	124 p<0.001	59 p<0.01	-

Table 4.6. Matrix of rank differences showing statistical significance of participant's response to all possible pairs task using the Dunn-Rankin VSRS test. The critical ranges are 44 for p<0.05, 53 for p<0.01 and 63 for p<0.001.

Table 4.7 scales the values in order to place them in rank order of preference. Figure 4.15 shows the scaled value of the summed score for each image. These both demonstrate that preference for scenes 1 and 2 are well above the others, and that preference for scene 4 is well below. The first discrimination task revealed that most people preferred the lighter residential street (scene 1) over a less light residential street (scene 2); a gunnel showing a street light (scene 3), over a gunnel where the streetlight has been removed (scene 4) and an open dark woodland with a lit path (scene 5) over a gunnel with high entrapment and no street light at the end (scene 4). These findings were supported by the second discrimination task, demonstrating that people see more light rather than less light as a positive environmental attribute. Spatial features also have an effect, as a wider environment is preferred to a narrower one.

Scene 1	Scene 2	Scene 3	Scene 5	Scene 4
4.00	2.87	1.64	1.21	0.30

Table 4.7. Ranking of images from all possible pairs task (Stage 3a) using scale values of VSRS analysis.
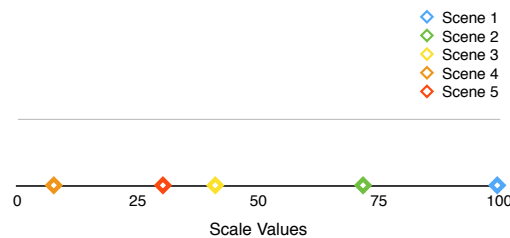
Figure 4.15. Scaled values of images from all possible pairs discrimination task using VSRS analysis.

Analysis of null conditions

Null condition 1 and 2 - Test for position bias
An equal number of participants chose images on the left and right when presented with null condition 1 and 2 which showed the same images (scenes 2 and 3) in left and right positions. Therefore, no evidence of left or right bias was found. A binomial test was used after previous research (Field 2005). It failed to find evidence to reject the null hypothesis that no bias between left and right existed.

Null condition 3 - Test for effect of position bias
The absence of evidence of left or right bias means there should be no effect on null condition 3. A binomial test found highly significant (p<0.01) evidence to reject the hypothesis that an equal number of participants would be consistent/ not be consistent when presented with the

same pair twice however with the order inverted. This means that the strength of differences between the scenes was strong enough for participants to repeat their selection. Only three participants, (one elderly and two students) were not consistent in their selection of image when the left/right position was inverted. One reported that "as I chose the other one last time, I'll pick this one this time".

Null condition 4 - Internal consistency

29 out of 53 participants changed their mind when presented with scenes 4 and 5 with no change of position for the second time. This shows that when presented with the most difficult pair for a second time, 55% of participants were inconsistent in their choice. The binomial test failed to find evidence to reject the null hypothesis that half the participants would be consistent, and the other half would not.

4.5.2 Rank ordering of all five scenes (Stage 3b)

All participants were asked to place the five images in rank order of preference, from most to least preferred. Figure 4.16 shows the orders into which the images were sorted, identifying how many people selected that order and group breakdown. The small difference between the older and student groups showed little effect of age on this task.
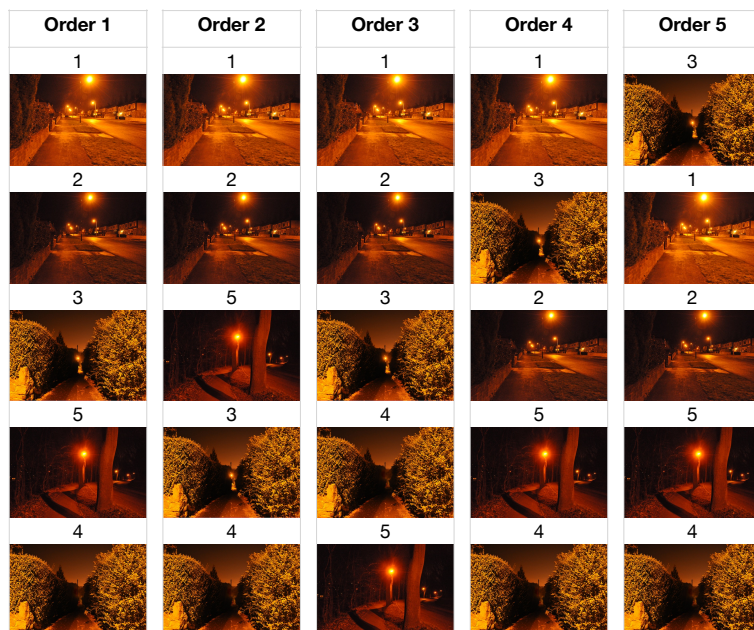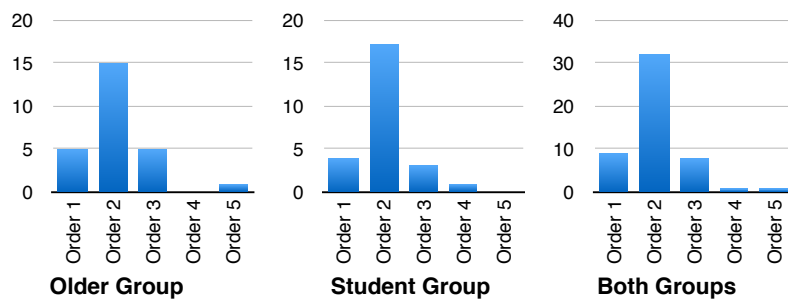
Figure 4.16. Ranking task preferred order of images.

5

The position of the scene in the rank order (1 for most preferred place,and 5 for least preferred place) were summated and a mean value calculated. The mean rank values for the ranking task are summarised in Table 4.8 and show the same order as the discrimination task for possible pairs showed the same rank order as the forced ranking of all pairs of images (Stage 3a).

Scene 1	Scene 2	Scene 3	Scene 5	Scene 4
1.02	2.04	3.58	3.51	4.85

Table 4.8. Mean ranking of images from ranking task (Stage 3b) in order of descending preference.

4.5.3. Comparison of Stages 3a and 3b

The results show good agreement between the discrimination tests of ranking and forced choice of all possible pairs. The results of both methods confirmed the hypothesis tested by the key pairs (Table 4.9).

Key pairs		Hypothesis	Confirm or reject?
1	2	Lighter is preferable and perceived as being safer.	Confirm
3	4	Lighter is preferable and perceived as being safer.	Confirm
5	3	More prospect is better than less prospect.	Confirm
2	3	Access to refuge is preferable to no access to refuge.	Confirm

Table 4.9. Hypothesis tested in preference by pair.

4.5.4. Preselected reasons (Stage 3c)

Participants were asked whether they would or would not walk down a street similar to that shown in the image alone after dark, and were then asked to select reasons for their decision from a list. Results of a binomial test on responses to the first question show a significant number of people ($p = <0.01$) would use streets such as those depicted in scenes 1 and 2, and would not use streets such as that depicted by image 4. (Figure 4.16 and Table 4.10). No difference was found between scenes 3 and 5. This shows that the presence of houses has a significant impact on pedestrian reassurance, which supports the findings of stages 1 and 2.

The presence of lighting such as in scene 3 can contribute to making areas with less desirable spatial characteristics, more acceptable, when compared to the same scene without lighting. This suggests that a lowering of illuminance levels in residential areas may not affect a pedestrian's decision to walk on a street as the result for both scenes 1 and 2 was significantly in favour of the decision to walk down the street. The effect of an enclosed environment was not significant with a light source at the end of the path, however when this was removed a significant number of people would not choose to take that path. This shows that less light in

an environment with high entrapment may significantly affect a pedestrian's decision not to use that path.
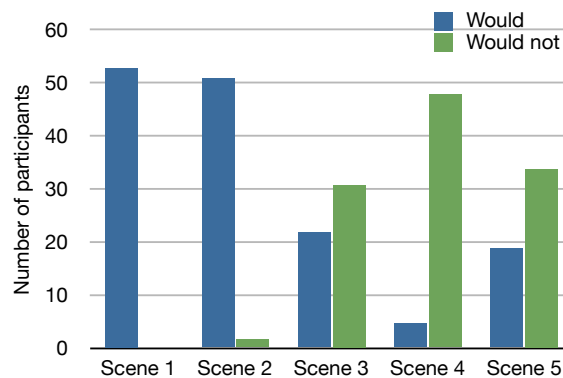
Figure 4.17. Bar chart showing frequency of answers to the question "Would you or would you not walk down a street similar to this in an unfamiliar residential area alone after dark?"

Photo	Participant's decision to use the street:		Binomial test result	p
	Would	Would not		
1	**53**	**0**	**0**	**< 0.01**
2	**51**	**2**	**0**	**< 0.01**
3	22	31	0.272	n.s.
4	**5**	**48**	**0**	**< 0.01**
5	19	34	0.053	n.s.

Table 4.10. Responses to the question "Would you or would you not walk down a street like this in an unfamiliar area after dark?"

Figure 4.18 shows the results of Stage 3c, listing how participants answered the question "would you or would you not walk down a street similar to this in an unfamiliar residential area alone after dark?" and the preselected reasons they gave for their choice. Table 4.11 identifies the significance levels obtained by participants' responses to preselected reasons, using the binomial test. Full binomial test results can be found in Appendix B.2.
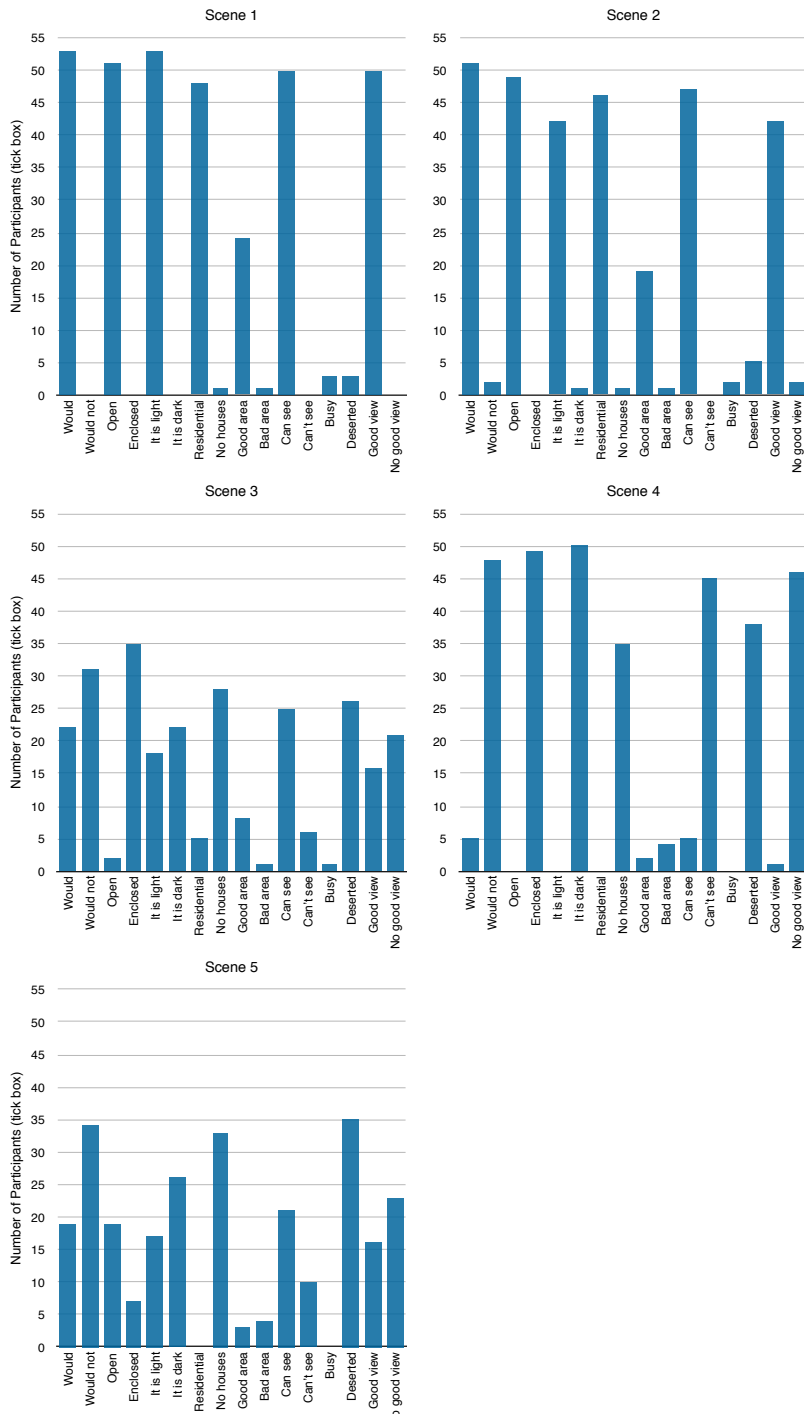
Figure 4.18. Number of reasons identified for participant answer to the question "would you or would you not walk down a street similar to this in an unfamiliar residential area alone after dark?"

	Scene	1	2	3	4	5
Spaciousness	Open	**< 0.01**	**< 0.01**	n.s.	n.s.	n.s.
	Enclosed	n.s.	n.s.	**< 0.01**	n.s.	**<0.05**
Light Levels	It is light	**< 0.01**	**< 0.01**	n.s.	n.s.	n.s.
	It is dark	n.s.	n.s.	n.s.	**< 0.01**	n.s.
The presence of houses	Residential	**< 0.01**	**< 0.01**	n.s.	n.s.	n.s.
	No houses	n.s.	n.s.	**< 0.01**	**< 0.01**	**< 0.01**
The type of area it is	Good area	**< 0.01**	**< 0.01**	**< 0.05**	n.s.	n.s.
	Bad area	n.s.	n.s.	n.s.	n.s.	n.s.
I can see the path ahead	Can see where I'm going	**< 0.01**	**< 0.01**	**< 0.01**	n.s.	n.s.
	Can't see where I'm going	n.s.	n.s.	n.s.	**< 0.01**	n.s.
Presence of other people	It looks busy	n.s.	n.s.	n.s.	n.s.	n.s.
	It looks deserted	n.s.	n.s.	**< 0.01**	**< 0.01**	**< 0.01**
View of my surroundings	I have a good view	**< 0.01**	**< 0.01**	n.s.	n.s.	n.s.
	I don't have a good view	n.s.	n.s.	n.s.	**< 0.01**	n.s.

Table 4.11. Summary of binomial test results of pre selected reasons for the decision to use the street in a unfamiliar area after dark.

Reasons given for willingness to use streets such as those presented by scenes 1 and 2 were *open, it is light, residential, can see where I'm going,* and *I have a good view*. Reasons given not to use a place such as the gunnel presented by images 3 and 4 were *enclosed, no houses*, and *it looks deserted*. Additional reasons given for scene 4 only were *it is dark, can't see where I'm going*, and *I don't have a good view*. It is interesting to note that a significant number of people said that scene 3 was a *good area*, showing that the presence of light might imply an area is cared for. There were no significant scores for scene 5 except *no houses* and *it looks deserted*. It is interesting to note that "good area" is implied by scenes 1, 2 and 3 and that scenes 3, 4 and 5 are seen to be "deserted". This demonstrates that participants may assume social circumstances from an image revealing land use (for example the presence of houses) and also use spatial features to obtain affective impressions.

4.5.5. Personality survey (Stage 3d)

A personality survey was tested as a means of gauging undeniable differences between individuals. The results were inconclusive. A weak correlation (R^2=0.06) was found between the reassurance score for each participant based on their answers to the eight personality questions and the number of streets that they would walk down in an unfamiliar area after dark. A participant's response to the personality question was given either one (reassured) or zero (not reassured) and the mean response rescaled from 0,8 to 0,5 using a formula so that the value could be compared to the number of streets that they were willing to use. Figure 4.19 plots the frequency of response to the number of scenes participants were confident to use and the frequency of reassurance score. The different frequency patterns partially explain the weak correlation. This may be because the photographs presented extreme conditions however the personality test probed for more subtle differences between people therefore the scales were incompatible. Also personality may not be easily expressed in a numeric value based on answers to questions. Therefore this was not examined further in this thesis.
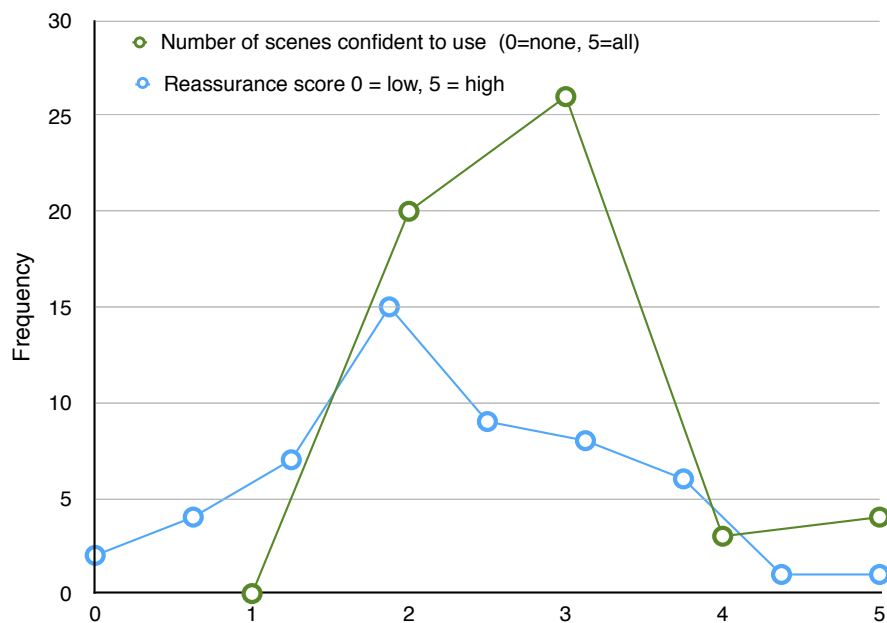
Figure 4.19. Frequency of reassurance score obtained from answers to personality questions, for example "yes" to the question "Do you think that you're capable of chasing off a possible assailant?", plotted against frequency of the number of streets down which participant's would walk alone in an unfamiliar residential area after dark.

4.6. Findings

Pedestrians want to know what type of place they are in and how people behave there as this knowledge contributes to their ability to control the situation should anything happen. Therefore, the purpose of the lighting is to convey information about the environment. This can be achieved by recognising whether the environment is likely to produce a threat or not and identifying whether anything on the street could hinder decision and action. The findings of Study 1 -Three Stage Interview are listed below.

Finding 1 - What matters to reassurance?

The following categories identified as being the key issues around which reasons given by participants could be clustered: Access to help; lighting; spatial features; presence of threatening others; familiarity; mobility and presence of CCTV. These categories were formed in response to interviews in which the words safety or lighting were not use beforehand. This means that participants think lighting has an effect on their reassurance without the questioning method having led them in this direction.

Finding 2 - The combination of different factors which matter to reassurance

In areas which participants found reassuring, access to help was identified by 83% of participants, lighting by 74%, spatial features by 40% and familiarity by 43%. In unreassuring areas 74% of people mentioned absence of perceived access to help, 70% mentioned lighting 47% mentioned spatial features and 51% mentioned the presence of threatening others. This gives an indication that the factors which matter most to pedestrians are perceived access to help, lighting, spatial features, familiarity and whether people in the environment could harm them. Previous research has identified similar reasons (Appleton 1975, Fisher and Nasar 1992, Loewen, Steel et al. 1993, Okuda, Ishii et al. 2007) however study one found the presence of threatening others to be an additional important factor in unreassuring areas. This supports previous research which recognises that the ability to see people in the environment is important for pedestrian reassurance (van Bommel and Caminada 1982, Rombauts, Vandewyngaerde et al. 1988). The results were similar when participants discussed locations of their own choosing.

Combinations of reasons rather than isolated reasons matter to reassurance. The most common combination of reasons given by 17% of participants is (1) access to help; lighting and spatial features, for both reassured and not reassured areas. This combination was followed closely by (2) access to help, familiarity and lighting and (3) access to help and lighting, and (4) access to help and spatial features. The most frequent combination of reasons for participants not feeling reassured was (1) access to help, lighting and spatial features followed by (2) access to help, lighting, spatial features and presence of threatening others, followed closely by (3) threatening others only. This means that lighting is part of interlocking web of factors which affect reassurance.

Finding 3 Perceived access to help (busy area and/or presence of people perceived to be helpful) may be more important than lighting

If more weighting is given to a reason on the basis that it is mentioned first, then the most important factor to reassurance is perceived access to help. This was supported by Stage 3 in

which almost all participants opted to walk down the residential streets regardless of a variation in lightness of the scene. This suggests that a lowering of illuminance levels in residential areas may not effect a pedestrian's decision to walk on a street. Further work could investigate why busy areas are perceived to need more light in the P class system, as busyness tends to lead to more light (lights on in windows and passing cars etc.), and the presence of other people seems to increase reassurance.

Finding 4 Using discrimination tasks the preference for brighter environments is significant

Regardless of whether lighting effects behaviour, the discrimination tasks revealed that most people prefer a lighter residential street over a less light residential street; a gunnel showing a street light, over a gunnel where the streetlight has been removed and an open dark woodland with a lit path over a gunnel with high entrapment. This shows that people see more light rather than less light as a positive environmental attribute, and that spatial features also have an effect, as a wider environment is preferred to a narrower one. The increased importance of lighting in Stage 3 may be because the ability to see different layers of detail is more important in an environment people do not know.

Finding 5 Lighting has meaning beyond visibility

The findings of stage three indicate that the presence of lighting may have other meanings for example, implying that an area is cared for. It is interesting to note that "good area" was implied by scenes 1, 2 and 3 and that scenes 3, 4 and 5 were seen to be "deserted". This demonstrates that participants may assume social circumstances from an image revealing land use (for example presence of houses) and spatial features to obtain an affective impression.

Other outcomes of study 1

It is interesting to note that participants did not mention details such as well-kept neat gardens, litter and graffiti as contributors to reassurance, which supports previous work stating that the environment itself does not pose a threat (Acuña-Rivera, Uzzell et al. 2011).

It is interesting to note that 17% of participants used the word "bright" or "brightness" during the course of the interview. This could indicate that most people do not expect or desire an environment which is perceived to be bright at night and the aim of street lighting should not necessarily equate to an environment which is perceived to be bright.

Limitations of the study

It was made clear that all questions referred to walking alone after dark. Use of the work "dark" could have caused participants to think of the opposite, "light". The act of asking participants to choose places before the interview could have made them inadvertently think of those places during Stage 1 of the interview which could be one explanation for this similarity of results between Stage 1 and Stage 2.

4.7. Summary

An experiment which took care to be as unleading as possible found that street lighting matters to pedestrian reassurance in residential areas using all methods tested. The controlled experiments of Stage 3 had the most resounding results supporting the hypothesis that light matters. Stage 1 and Stage 2, used two different methods of questioning, one which required participants to talk spontaneously with no visual prompts, and another which was prompted by places identified beforehand. About a quarter of the reasons given for the presence or absence of reassurance were related to lighting. However, access to help tended to be mentioned before lighting, suggesting that this factor could be more important than others. Lighting was almost always mentioned with other factors. The most common combination of reasons for reassurance was perceived access to help, light and spatial features. The most common combinations of reasons for a lack of reassurance were lack of perceived access to help, inadequate lighting and undesirable spatial features. Discrimination tasks also pointed to a preference for more street lighting over less in residential areas. However more or less light in an image did not affect their behaviour when asked whether they would use a street similar to that shown in an unfamiliar area after dark.

The contribution of Study 1 is that lighting matters to pedestrian reassurance in interaction with other factors even though the methods of Stage 1 and 2 did not mention "light" or "safety". The results of Stage 3 suggest that participants think lighting matters however the extent to which it is a behaviour influencing factor is less clear.

5. Residential Street Surveys

5.1. Introduction

The aim of study one was to find out if pedestrians think lighting is important to reassurance using as unleading an approach as possible. The first part of the interview, which asked them what mattered when walking alone after dark found that participants certainly think lighting matters. When asked the same questions about familiar places which they identified and photographed prior to interview, the importance of lighting decreased slightly. When presented with images in which the only variable which was manipulated was lighting, then the importance of lighting increased. Study 1 has shown that perceived access to help, spatial features and the presence of threatening others are also factors important to reassurance. One criticism of Study 1 is that spatial features and lighting are identified separately, whereas in real environments they are two sides of the same coin. Lampposts are a separate feature to houses, roads and pavements, however how that environment is revealed by light cannot be differentiated from the light source. Therefore Study 2 explores how lighting is perceived within a real environment. Study 2 was planned to ascertain how these other factors interact with lighting to inform pedestrian reassurance in residential environments in Sheffield.

The second study described in this chapter took participants into real environments and asked for their judgements of streets during the day and at night and plotted the resultant day minus night value against relevant lighting metrics with the aim of finding out which lighting characteristics matter to pedestrian reassurance. Despite difficulty of variable control in real environments, this approach may give a more realistic indication of what matters to pedestrians, because it is closer to conditions in which they find themselves in everyday life and is not require them to imagine themselves in a scenario. Therefore, in late winter and early spring of 2013, 46 participants made 10 daytime and 11 night time visits to nine streets in Sheffield to complete surveys. The surveys asked questions about lighting along with other social and environmental factors raised in previous research, with the aim of getting to the root of what matters to reassurance. The experiment was repeated in summer with 31 people, with the aim of testing the effect of seasonal changes.

5.2. Method

The advantage of using on street surveys is that real environments are used to assess perceptions of reassurance, which may give results which are closer to the reality when compared to highly controlled experiments which unavoidably take the situation out of a context with which participants can identify themselves in their everyday lives. One problem is that it is difficult to compare the effect of lighting on streets which have a range of different social and physical characteristics. This was addressed by Boyce et al. (Boyce, Eklund et al. 2000) by the use of a day minus night safety rating, where the day rating acted as a control of the night rating, resulting in values which took the range of perceived safety of the daytime environments into account. By comparing a street to itself in different lighting conditions (daylight and electric street lighting), the effect of variables such as street geometry are eliminated because there is no difference in spatial features between night and day. In this example, only the effect of the spatial features as revealed by the street lighting conditions remains. As Study 2 is concerned with the change in perceptions of an environment due to

street lighting, the method of deducting the night time safety rating from the day time rating is repeated in this study.

Perceptions of safety in car parks

A field study by Boyce et al. (Boyce, Eklund et al. 2000) took 18 participants to 24 car parks, by day and by night and used the resultant day minus night safety rating to suggest illuminance levels over which lighting had little effect on perceived safety. The reported method was followed as closely as possible so that the results can be reliably compared thereby adding to the body of research in the field. As a residential street is a different environment to a car park, the results will contribute to understanding the role of lighting in a different context. Some variations of Boyce et al.'s experiment were designed into the procedure, for example additional experiments were added at a different time of year and the surveys were amended. These changes are discussed below.

5.2.1. Time of year of the tests

The method of previous work exploring pedestrian perceptions by the use of on street surveys, was extended to include the effect of the time of year which has not to the author's knowledge been done before. This is important because light, weather and environmental features such as trees vary between seasons. For example, trees block out more street lighting in summer due to increased foliage. The effect of changed lighting conditions over seasons was tested along with comparable lighting conditions (street lights on) at a different time of day.

Street lighting varies with location, direction of view and time. Therefore these three factors were kept constant in the winter experiments, by the selection of streets, orientation of survey filling in point and time of day. In the summer experiments the same factors were kept constant, except that one group varied the lighting condition (as 19.30 hours in summer is daylight), and the other group varied the time, however kept the street lighting condition remained constant, as 22.30 hours in summer is after sunset. Increased foliage on some of the streets in summer may have affected the lighting conditions. Figure 5.1 plots the time of day and year of the experiments, showing how the seasons presented an opportunity to test the effect of other variables. The hypotheses tested by the two summer groups are firstly, that if light matters there will be no difference between the behaviour of group 4 and the winter groups, as the dark condition is comparable, and secondly if light matters group 5 will report lower D-N safety ratings than all other groups, despite the constant time of day.
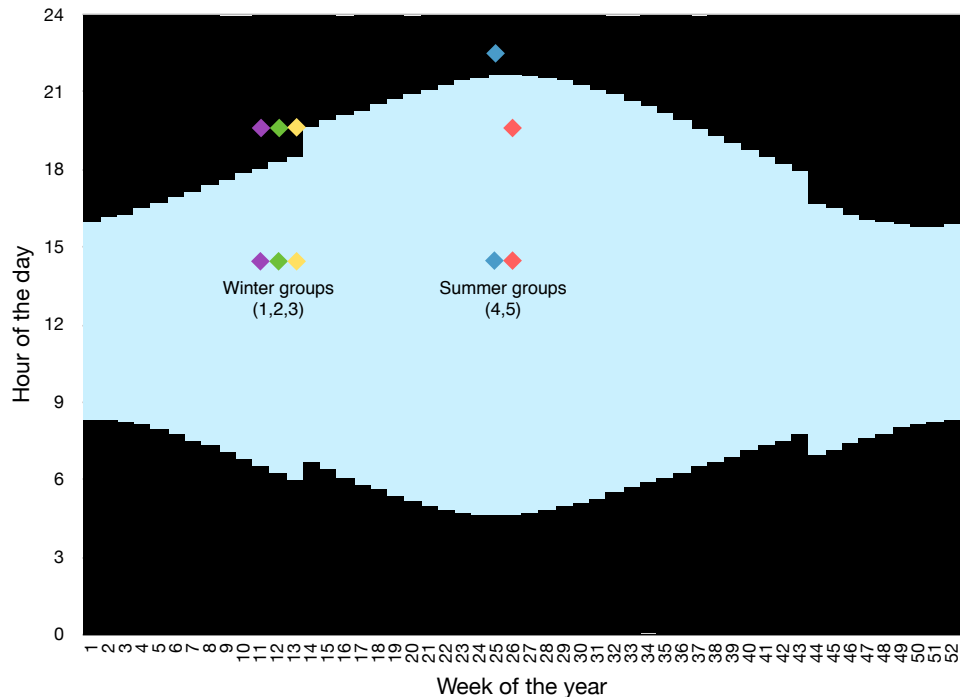
Figure 5.1. Time of year and day of street visits.

5.2.2. Surveys

The surveys, adapted from Boyce et al's field study 3 as closely as possible, were designed to be clear, easy to understand and to fit onto one A4 sheet of paper for convenience (one sheet per street). The key questions associated with reassurance are "How safe do you feel this area is?", and "How risky do you think it would be to walk alone here at night?" Three questions were added to address (1) presence of hiding places; (2) ease of avoiding people relating to openness and low entrapment and (3) access to help, because previous research, including Study 1, identified these being relevant issues (Jacobs 1969, Fisher and Nasar 1992). These questions were:

(1)   Are there places on this street where people who are up to no good could hide?
(2)   If you saw some other people you wanted to avoid, do you think you could do so easily on this street?
(3)   Do you think there are other people who could come to your assistance should you encounter trouble on this street?

Questions specifically relating to street lighting were omitted from the daytime surveys. The 7 point scale used by Boyce et al. was changed to a 6 point scale because a scale with an even number of points disallows an exact middle rating, a 'neutral' response, and so reduces the possibility/strength of the response contraction bias (Poulton 1982). Participants were also asked whether they had visited the streets before, as a means of gauging familiarity, as Study 1 found that this may influence their reassurance.

An extra sheet after each experiment asked participants to identify streets which they thought to be the most and least safe and also their age, country of origin, and how long they had been in Sheffield. The full surveys are shown in Figures 5.2 and 5.3. Note that not all questions were analysed within the timeframe of this thesis.

Street number (write in box):

I can see clearly around me. **(**Please circle as appropriate).

Strongly disagree	1	2	3	4	5	6	Strongly agree

This is a good example of street lighting.

Strongly disagree	1	2	3	4	5	6	Strongly agree

I can see far enough ahead.

Strongly disagree	1	2	3	4	5	6	Strongly agree

The lighting here is:

good	1	2	3	4	5	6	bad
bright	1	2	3	4	5	6	dark
comfortable	1	2	3	4	5	6	uncomfortable
even	1	2	3	4	5	6	uneven
not glaring	1	2	3	4	5	6	glaring
right for this place	1	2	3	4	5	6	wrong for this place

How would you rate the appearance of people under this lighting?

good	1	2	3	4	5	6	bad
natural	1	2	3	4	5	6	unnatural

How safe do you feel this area is?

very dangerous	1	2	3	4	5	6	very safe

How risky do you think it would be to walk alone here at night?

not at all risky	1	2	3	4	5	6	very risky

Do you have any comments about the lighting on this street?

Are there places on this street where people who are up to no good could hide?	Yes ☐	No ☐
If you saw some other people you wanted to avoid, do you think you could do so easily on this street?	Yes ☐	No ☐
Do you think there are other people who could come to your assistance should you encounter trouble on this street?	Yes ☐	No ☐
Have you visited this street before?	Yes ☐	No ☐
If so, has that affected how you have answered the survey?	Yes ☐	No ☐
If 'yes' please give details:		
Did you use your reading light to fill in this sheet?	Yes ☐	No ☐
Did you wear sunglasses on this street?	Yes ☐	No ☐

Figure 5.2. Night time survey.

Street number (write in box):

Please circle as appropriate:

I can see clearly around me.

| Strongly disagree | 1 | 2 | 3 | 4 | 5 | 6 | Strongly agree |

This street is well kept.

| Strongly disagree | 1 | 2 | 3 | 4 | 5 | 6 | Strongly agree |

I can see far enough ahead.

| Strongly disagree | 1 | 2 | 3 | 4 | 5 | 6 | Strongly agree |

Are there places on this street where people who are up to no good could hide?   Yes ☐   No ☐

If you saw some other people you wanted to avoid, do you think you could do so easily on this street?   Yes ☐   No ☐

Do you think there are other people who could come to your assistance should you encounter trouble on this street?   Yes ☐   No ☐

How safe do you feel this street is?

| very dangerous | 1 | 2 | 3 | 4 | 5 | 6 | very safe |

How risky do you think it would be to walk alone here at night?

| not at all risky | 1 | 2 | 3 | 4 | 5 | 6 | very risky |

Have you visited this street before?   Yes ☐   No ☐

If so, has that affected how you have answered the survey?   Yes ☐   No ☐

If 'yes' please give details:

Did you wear sunglasses on this street?   Yes ☐   No ☐

Figure 5.3. Day time survey.

5.2.3. Pilot studies

The purpose of a pilot study is to recognise and address the practical challenges presented by the proposed experiment. This is achieved by testing the planned procedure to ensure that the process is feasible. It enables the proposed method to be refined through experience of the process. It also ensures that the format in which the data are collected is manageable and useful. The main aim of the pilot studies was to determine whether it was possible for the author to repeat the Boyce et al. method in Sheffield on residential streets.

Three pilot studies were completed. The first addressed the feasibility of completing routes in the timeframe, the second took a group of participants along a test route asking them to fill in surveys on specific streets, and the third tested the process and time required to record measurements. Each of these pilot studies is described briefly below, along with the key learning outcomes.

Pilot Study 1. Feasibility of routes in the time frame

The author drove around Sheffield at night on eight occasions, scouting the streets for suitable test sites which had a range of lighting conditions, were clearly residential, were wide enough to manoeuvre a vehicle, had readily available parking and were not too far from the University so that they could be easily reached from the starting point. The main learning outcome from this exercise was the importance of knowledge of the local traffic conditions. The experiment must be timed to be out of or against the flow of rush-hour traffic, to avoid wasting time sitting in traffic jams. Ideally experiments should not take place in rush-hour. It was found that how accessible areas were in relation to each other was important, for example the closer the streets are to each other, the more that can be visited in a given timeframe. This process resulted in the route which was tested with participants for pilot study 2. The route (Figure 5.4) also included two suburban areas outside the city centre and was partly influenced by dropping participants off at their homes, as they were unpaid therefore the author did not want to impose transportation costs on them.
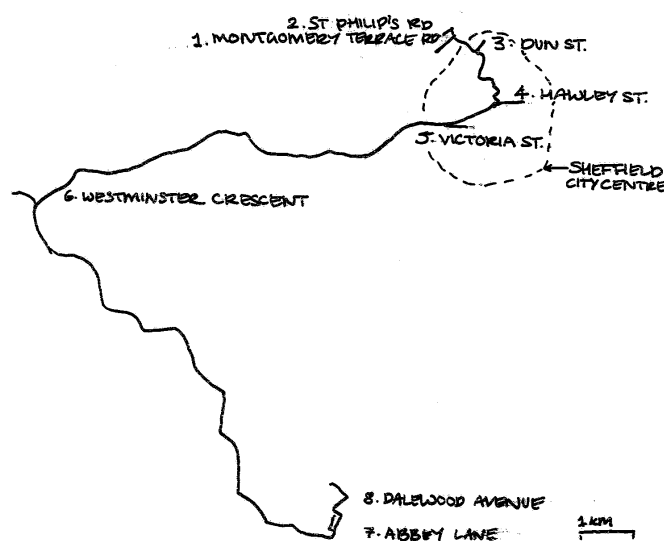
Figure 5.4. Pilot Study 2 route and street order, determined by Pilot Study 1.

Pilot Study 2. Feasibility of street visits with a group

The author drove seven participants to eight streets in Sheffield in a people carrier where they filled in surveys after dark in winter 2012. The participants were given the option to leave the experiment after two hours due to torrential rain and wind. Therefore three participants dropped out after two hours having visited five streets, one participant left experiment after six streets and two participants stayed for the duration of eight street visits which took four hours.

Pilot study 2 demonstrated that after three hours participants showed fatigue expressed in complaining about being cold and tired. Therefore the time limitation of the experiment was set at three hours, including the trial run in the Arts Tower car park which gave participants the opportunity to ask questions about the surveys. The time taken to park, and for everybody to alight the people carrier, find the correct survey sheet and be briefed about the route to walk, took about five minutes. Therefore this was planned in addition to the time taken to walk the routes, reiterating that the streets must be close to each other in order to assess as many streets as possible within the three hour time frame. Another learning outcome was that pencils should be provided in case of rainy weather as most of the biro pens stopped working on wet paper.

Pilot study 3. Feasibility of taking photometric measurements on a street

The purpose of pilot study 3 was to time how long it took to take photometric measurements, and how many helpers would be required. Measurements were taken on Montgomery Terrace Road (a street that had been used in pilot study 2) underneath and in between lampposts at a central location on the pavement, in order to test the amount of time this took. It was decided that four vertical semi cylindrical illuminance readings would be taken at 1.5 metres at each location, and one horizontal illuminance measurement on the pavement.

Due to an assault on the author by two street residents (described in Appendix C.1), the measurements were not finished and Montgomery Terrace Road was not selected for the final experiment. The first important learning outcome was to inform the police of the routes to be taken before the experiments took place, so that they are aware of the activity and are readily available if needed. The second learning outcome was that as measurements took two people familiar with the lighting equipment over two hours at sixteen measurement locations, full measurements prior to street selection would not be feasible unless the start of the experiment was significantly delayed. Therefore the author selected streets to be used in this study, by making a subjective visual appraisal of a variation of lighting conditions on comparable streets taking into consideration other factors such as perceived access to help, described in the next section.

5.3. Choice of areas and streets

Selection of areas

Previous research has found that lighting has no effect on the perceptions of safety in some areas (Mansfield and Raynham 2005). Therefore clusters of streets were targeted in different areas to see if the type of area would influence pedestrian reassurance. Figure 5.5 shows two selected residential areas which are equal distances from the experiment start in the Arts Tower car park. The Arts Tower car park was selected as the experiment start because it is easy for participants to find, has plenty of space to manoeuvre a minibus and is near enough to the author's office space for the carrying of folders holding surveys, minibus hire paperwork, water and snacks not to present a problem. The residential areas were chosen based on the range of subjective perceived safety of the area, a range of lighting conditions (some darker than others), proximity to the Arts Tower, and the ease of driving to them in a minibus.
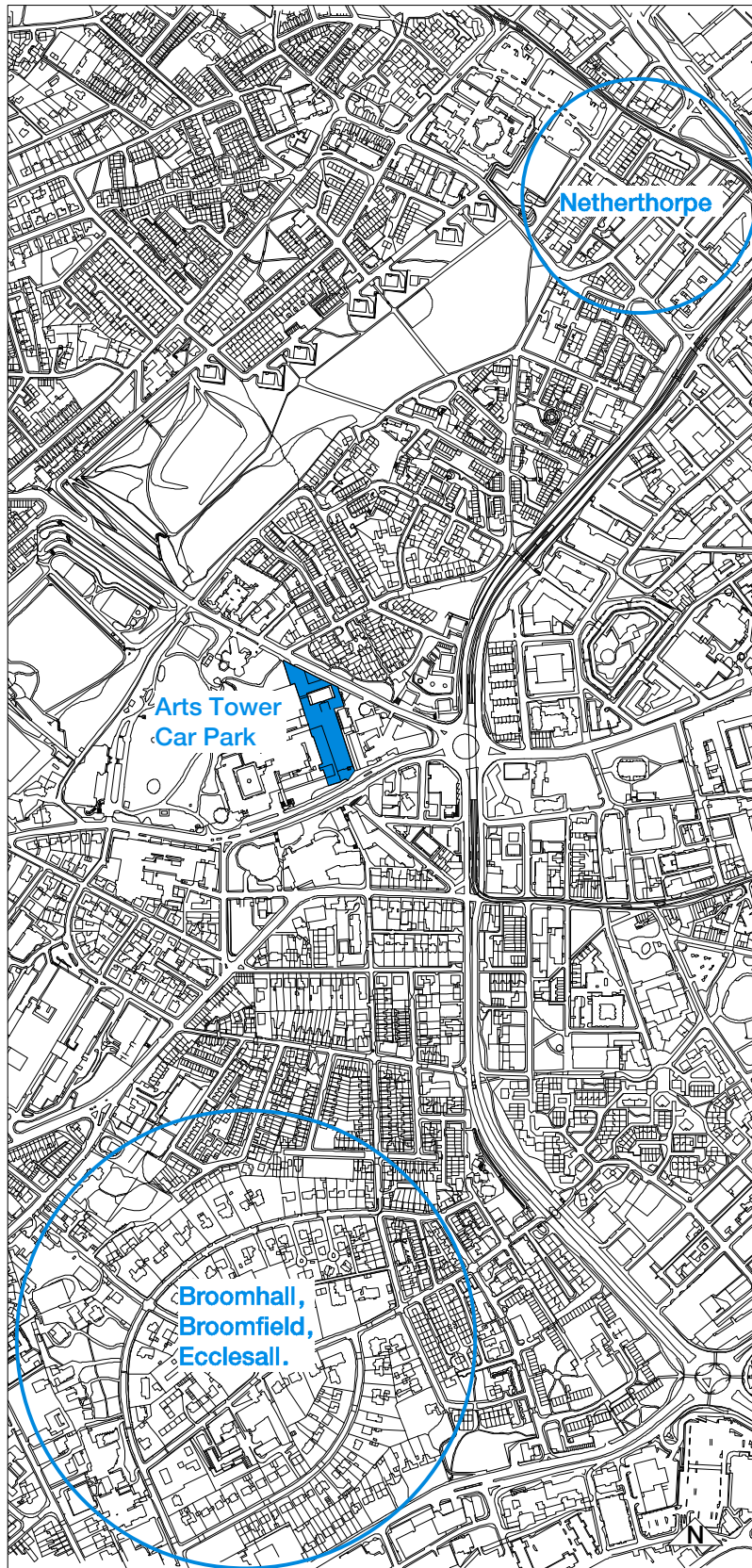
Figure 5.5. 1:10000 plan showing the two residential areas chosen for the study. The order of visits to each area was randomised between groups.

Netherthorpe falls within the Walkley Ward and Broomhall within the Central Ward, both of which encompass large areas of Sheffield. The subareas of Broomhall used in this study are named Ecclesall, Broomfield and Broomhall (Figure 5.6).
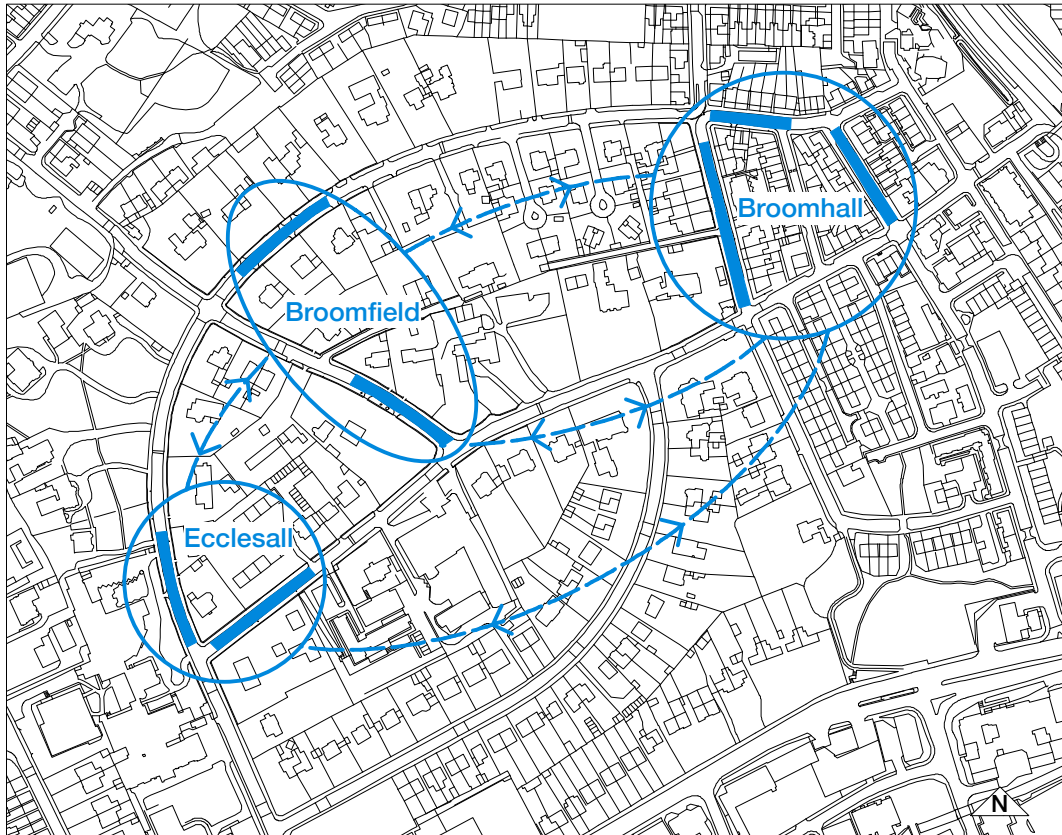
Figure 5.6. 1:5000 plan showing the three sub areas of Broomhall. The order of visits to each area were randomised between groups.

Based on experience of living in Sheffield and incidents which occurred whilst planning the study, the author would place the streets in the safety order described by Table 5.1. The range of perceived safety in the areas chosen is reinforced by interview participants' mixed feelings as some of the streets had been identified by interview participants in study 1. Broomhall (the whole area, not only Broomhall Street) was identified by two participants as an area where they did not feel reassured, however one student participant identified it as being an area where they felt reassured. St Philips Road was identified by a student as being a street where they did not feel reassured. Infirmary Road is adjacent to Roscoe Road and was recognised by one student is being an area where they felt reassured, and another student as an area where they did not. Otherwise the streets chosen were not mentioned by participants in the interview study. Throughout this thesis the streets numbered alphabetically are abbreviated as s1, s2, etc., "s" is an abbreviation of "street". In this chapter perceived "safety" is used as often as "reassurance" in order to repeat the language of the original study.

	Area of Sheffield	How ranking arrived at?	Street names	Street number	Safety rank
Most safe area	**Ecclesall (in Broomhall)**	Busy, leafy urban residential area.	Collegiate Crescent lower end	(s3)	1
			Broomhall Street	(s1)	2
	Broomfield (in Broomhall)	Leafy urban residential area.	Collegiate Crescent upper end	(s4)	3
			Park Lane	(s5)	4
	Broomhall	Urban residential area.	Wharncliffe Road	(s8)	5
			Clarke Street	(s2)	7
			William Street	(s9)	9
Least safe area	**Netherthorpe**	Incident in area (whilst taking measurements).	Roscoe Road	(s6)	6
			St Philip's Road	(s7)	8

Table 5.1. Author's perceived safety of areas chosen for study. Bold denotes where street rank order falls out of area order.

As can be seen in Table 5.1, on four occasions the rank safety order by street fell out of the area order. This was because of a congregation point on a corner opposite s9, and the proximity of s2 to this street may influence pedestrians more than the area as a whole. Although s6 is in Netherthorpe which was perceived by the author to be the least safe area, the fact that it housed a block of student residences which overlooked the street and is adjacent to a busy corner, raised it in the order of subjective perceived safety.

5.4. Low transmission glasses

A range of illuminance levels between streets enables the effect of illuminance to be analysed. If an environment which is much darker than another when other variables are controlled is perceived to be significantly less reassuring than in lighter conditions then it is likely that the change in perception is due to illuminance. In a street environment it is impossible to reduce illuminance levels without collaboration with the local council which would take an unpredictable amount of time to organise due to bureaucracy and is unlikely to be approved due to the increased perceived hazard. Therefore on two of the streets, participants were asked to wear low transmission glasses as a means of reducing illuminance at the eye to 10% of the natural street environment. Previous studies have used glasses to control the amount (Boyce, Eklund et al. 2000) and spectral transmittance (Figueiro 2009) of light received by the eye. The spectral response of the sunglasses filter were measured and recorded in Appendix C.2. It is possible that wearing low transmission glasses may have effects other than reducing the amount of illuminance received by the eye. The effect on illuminance at the eye is known, however the effect on other aspects of behaviour is unknown.

Participants were asked to wear the sunglasses before the minibus reached the selected street, so that they only viewed the street in the darkened condition. If they walked to the street, then they placed the sunglasses on before the destination street was in view. Each pair of glasses was given a code and each participant's glasses code was noted before they were distributed with the folders.

Low transmission glasses were used on two streets, William Street and Park Lane. William Street was visited twice during the day and twice at night, once with sunglasses (s10) and once without (s9). Park Lane was visited twice at night only, once with sunglasses (s11), and once without sunglasses (s5). The reason for this was so that the night time results could be compared with William Street, to test whether the method of using sunglasses was reliable. Due to limited parking on Park Lane during the day and increased traffic in the area, a daytime visit with sunglasses was not possible during the day within the three hour timeframe. This problem was not identified by the pilot studies which took place at night.

5.5. Selection of key pairs of streets

In order to make a prediction of the importance of lighting in relation to other characteristics of the streets, key pairs were selected. As the Arts Tower car park was a convenient and central drop-off point for the minibus, the experiment was restricted to residential streets in the vicinity that could be reached within the three hour timeframe. Within these practical constraints, pairs of streets that had similar characteristics in terms of spatial features and perceived levels of access to help were chosen for comparison. The key pairs are listed below:

Pair 1. William Street with (s10) and without sunglasses (s9)
The difference is in the amount of light received by the eye which reduced to about 10% when wearing low transmission glasses. If light matters participants will prefer s9.

Pair 2. Collegiate Crescent upper (s4) and Park Lane (s5)
Park Lane and the North Eastern part of Collegiate Crescent are similar because both are lined on both sides with large two-storey houses in walled gardens containing vegetation (Figure 5.7). The gardens range from being quite well kept to being full of overgrown bushes. The houses are approximately 17 by 11 metres (width and depth) and located between 9 and 20 metres from the pavement. Both streets are lined with old oak trees and have a slight incline. The survey filling in point was adjacent to a wall facing towards the downward incline on both streets.

Street 4 - Upper of Collegiate Crescent   Street 5 - Park Lane

Figure 5.7. Night and day photographs of pair 2.

The main difference between these two streets is in the illuminance level and distribution. Low pressure sodium luminaires are more widely spaced on Park Lane which means that the street appears darker than the upper end of Collegiate Crescent which is lit by newer luminaires fitted with high pressure sodium lamps. The variation is also partly due to the presence of un maintained trees which overhang the pavement and road on Park Lane, whereas on Collegiate Crescent the higher canopy trees look more well maintained. The proximity of the streets to each other are shown in Figure 5.8. If light matters to pedestrian reassurance participants will prefer the upper end of Collegiate Crescent. If not, participants will prefer Park Lane.

Figure 5.8. 1:2500 plan showing streets selected in Broomfield. Dashed line denotes area of street used in the experiment.

Pair 3. Clarke Street (s2) and William Street (s9)

The spatial features of both streets are similar because houses are 2 to 3.5 metres from the pavement edge (Figure 5.9 and 5.12). Therefore perceived access to help is likely to be similar on both streets. On both streets three covered passages divide houses however there are less hiding places on s9 due to less hedges. Both streets have similar dwelling sizes (ranging from depths of around 8 to 12 metres) and are busy residential streets due to their central location. Clark Street has one neatly kept garden adjacent to the survey filling in point) however also features high unkept hedges forming the border between front gardens and pavement. William Street has a better view of all front gardens because there are less hedges, and appears to be darker. The corner opposite William Street shown by a dashed circle on figure 5.12 is an occasional congregation point for teenagers. A pub at the bottom of Clark Street is the congregation point the older men. Neither of these congregation points were noticed during the street scouting sessions, they became evident during the course of the experiments. Both survey filling in points faced away from the congregation point.

If light matters more than the presence of places to hide then people will prefer Clarke Street despite the fact that it is slightly more secluded from the main road which joins and is perpendicular to William Street . If more light compensates for more hiding places participants will prefer Clark Street. If not, participants will prefer William Street.

Street 2 - Clark Street   Street 9 - William Street

Figure 5.9. Night and day photographs of pair 3.

Pair Four. Clarke Street (street 2) and Wharncliffe Road (street 8).

On Wharncliffe Road houses are located between 4 to 14.5 metres back from the pavement whereas on Clark Street they are closer at 2 to 3.5 metres from the pavement edge (Figure 5.10), however on both streets front doors are equally visible and accessible. Vegetation in the form of hedges is present on both streets, however there are more trees and other forms of foliage on the street and in gardens on Wharncliffe Road. Due to older, low pressure sodium luminaires, the spacing of these luminaires and the presence of trees, Wharncliffe Road is darker than Clark Street. On Wharncliffe Road the houses are larger on one side of the street, and on the other side of the street there are flats and terraces, therefore the housing types are more varied. The entrance lobby to the apartment block is lit. Wharncliffe Road is noisier during the day and night, due to noisy student house shares and the presence of a nursery. Wharncliffe Road is more of a pedestrian thoroughfare than Clark Street. If light matters participants will prefer Clark Street despite Wharncliffe Road being busier.

Street 2 -Clark Street   Street 8 - Wharncliffe Road

Figure 5.10. Night and day photographs of pair 4.

Pair Five. Wharncliffe Road (s8) and William Street (s9).

Wharncliffe Road is darker than William Street and also has more hiding places because of almost continuous planting along the street on both sides, whereas there is only one hedge on William Street (Figure 5.11). The placement of houses and walls on William Street is similar to Clark Street so spatial differences between streets are similar to pair 4. If light matters

participants will prefer William Street.

| Street 1 - Broomhall Road | Street 3 - Lower end of Collegiate Crescent |

Figure 5.13. Night and day photographs of pair 6.

The streets which make up pairs 3, 4 and 5 are shown in plan on Figure 5.12.
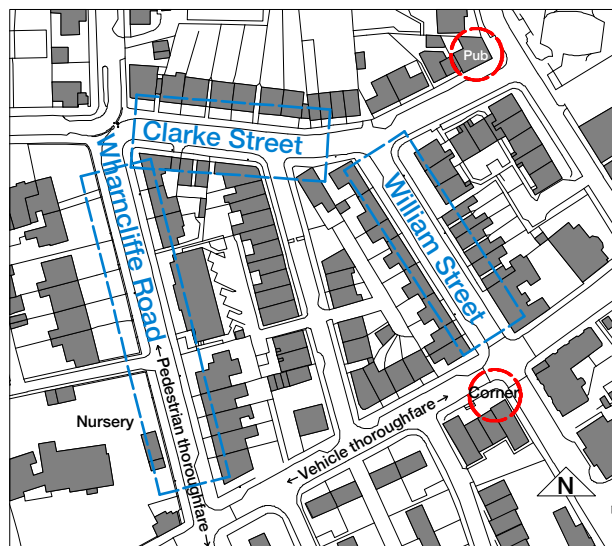
Figure 5.12. 1:2500 plans of Broomhall. Dashed line denotes area of street used in the experiment.

Pair Six. Broomhall Road (s1) and Collegiate Crescent lower end (s3).

On both sides of Broomhall Road houses are approximately 5 to 13.5 metres from the pavement edge and on this part of Collegiate Crescent residences range from 2 to 18 metres from the pavement edge on the eastern side and University buildings are located much further away on the western side (Figure 5.13). Each street has two residences directly accessible from the pavement shown by arrows on Figure 5.14. On both streets vegetation and walls partially block the view of the buildings. Half way through the research building work started on s3.

| Street 1 - Broomhall Road | Street 3 - Lower end of Collegiate Crescent |

Figure 5.13. Night and day photographs of pair 6.

Broomhall Road is a pedestrian thoroughfare due to high density residential blocks on the southern side, one of which houses NHS staff. The lower end of Collegiate Crescent is also a pedestrian thoroughfare because of the Sheffield Hallam University campus. Despite differences in spatial features and occupancy, the streets give a similar subjective impression because they are busy, old walls flank the pavements and vegetation partially obscures buildings from view.

This pair test whether less houses on a busy street with higher illuminance levels are preferable to more houses on a street with lower illuminance levels, especially if these houses are not accessible from the pavement. If the whole environment is more brightly lit then it might not matter if there are accessible houses around or not. On this stretch of Collegiate Crescent all buildings except one house feature some form of facade lighting. The university buildings appear to be unoccupied late at night, however the paths leading to the buildings are lit. On Broomhall Road the nurses accommodation is lit vertically, as is the residential block adjacent to the survey be filling in point, however no other buildings are lit. On both streets the survey was completed next to a wall, behind which was accessible housing on street three, and inaccessible housing on street one. Figure 5.14 shows the proximity of the two streets to each other.
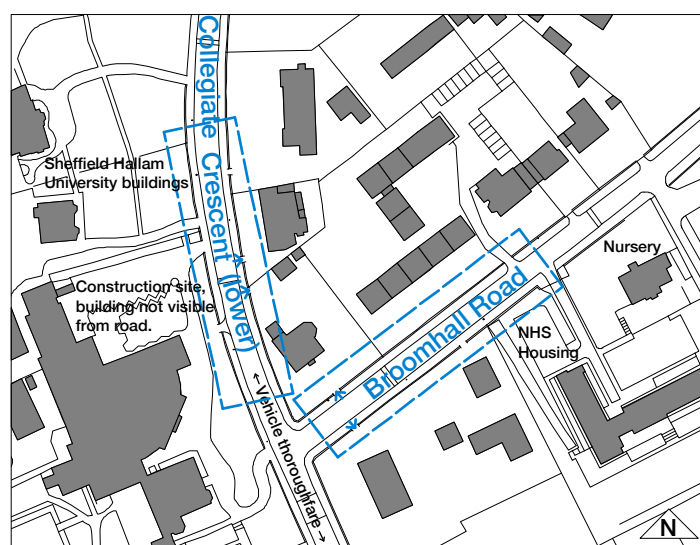
Figure 5.14. 1:2500 plan showing Ecclesall. Dashed line denotes area of street used in the experiment.

Pair 7. Roscoe Road (s6) and St Philips Road (s7)
Located in Netherthorpe, North West of the city centre, Roscoe Road is lit to higher illuminance levels than St Philips Road however due to spatial features and building type there is no potential for immediate access to help from building residents (Figure 5.15). One side of the road is lined with warehouses and on the other side metal railings protect the ground floor of student residences. Street 7 has semi-detached residences and a Legal Centre which is not used at night. Both streets are perpendicular to busy roads on one side, Penistone Road at the bottom of Roscoe Road and Upperthorpe Road which flanks St Philips Road. On each street the busy road is met by a dead-end, therefore neither street is a vehicular thoroughfare.

Students may be more familiar with Netherthorpe because of the presence of student residences. However, if participants are familiar with one of the streets, they are also more likely to be familiar with the other so the familiarity effect might be countered, unless they know one street to be less safe than the other from experience. Both survey completion points have a view of the Arts Tower and are facing up the incline of the hill. Figure 5.16 shows the relationship of the two streets to each other in plan. This was the only pair where participants were driven between sites, rather than walking. This pair test the question of whether light compensates for no access to help.

| Street 6 - Roscoe Road | Street 7 - St Philips Road |
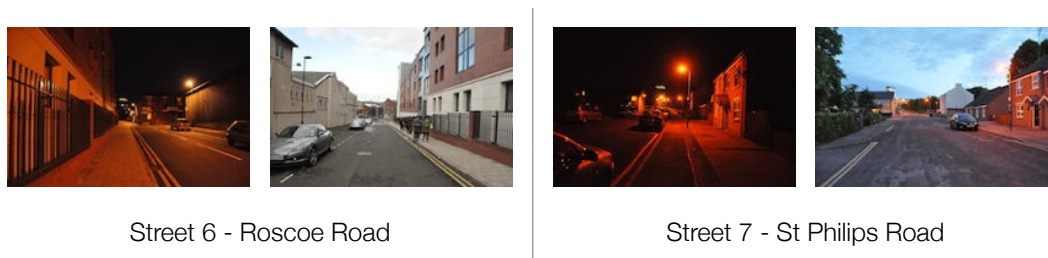
Figure 5.15. Night and day photographs of pair 7.
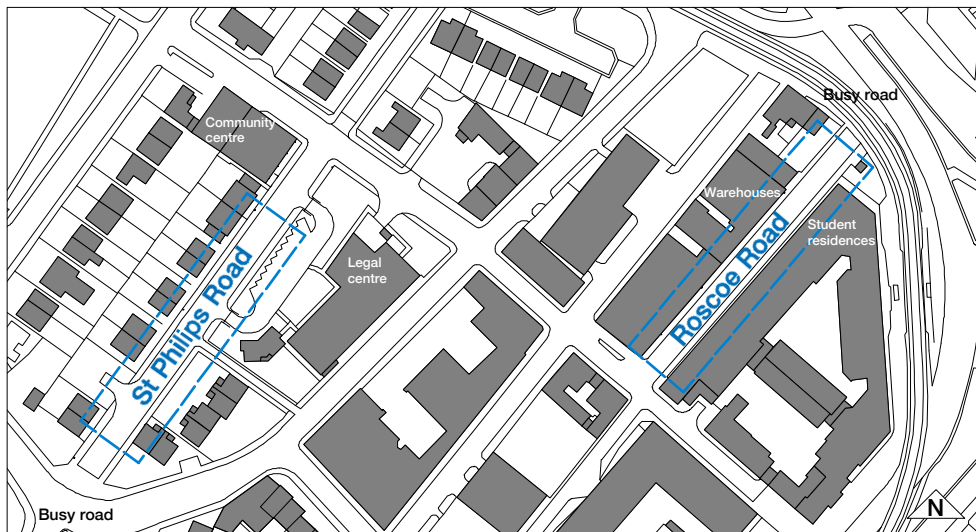
Figure 5.16. 1:2500 plan showing streets in Netherthorpe. Dashed line denotes area of street used in the experiment.

The hypotheses described within the descriptions of key pairs are summarised in Table 5.2.

Pair	Street	Street	Street choice if the following matter most (based on author's visual appraisal):				Hypothesis
			Illuminance levels - Horizontal	Activity levels on street	Presence of accessible residences	Absence of hiding places	
1	William Street (s9)	William Street with sunglasses (s10)	s9	Equal	Equal	Equal	If light matters (H1) s9 is significantly safer at night.
2	Collegiate Crescent top end (s4)	Park Lane (s5)	s4	s5	Equal	Equal	If light matters (H1) s4 is significantly safer at night.
3	Clarke Street (s2)	William Street (s9)	s2	Equal	Equal	s9	If light matters (H1) s2 is significantly safer at night.
4	Clarke Street (s2)	Wharncliffe Road (s8)	s2	Equal	Equal	Equal	If light matters (H1) s2 is significantly safer at night.
5	Wharncliffe Road (s8)	William Street (s9)	s9	Equal	Equal	s9	If light matters (H1) s9 is significantly safer at night.
6	Broomhall Road (s1)	Collegiate Crescent bottom end. (s3)	s3	s3	Equal	Equal	If light matters (H1) s3 is significantly safer at night.
7	Roscoe Road (s6)	St. Philip's Road (s7)	s6	Equal	s7	s6	If light matters (H1) s6 is significantly safer at night. If light compensates for no access to help participants will prefer s6 (H2).

Table 5.2. Street choice hypotheses.

5.6. Ethical considerations

Participants were provided with an information sheet which described the requirements of the study so that those who did not feel up to the task could withdraw their interest at an early stage. About five elderly participants withdrew after hearing details of the task. The main ethical consideration of the work was in the act of taking participants into residential areas of which they were most likely to be unfamiliar after dark. All participants signed a consent form which stated that they could withdraw from the study without giving a reason. Participants received £40 compensation for their time upon completion of the experiment. The experiment received ethical approval from the School of Architecture. The full ethics application can be found in Appendix C.3.

5.7. Procedure

The first three experiments were completed at the end of winter/early spring 2013, following the author's completion of DVLA and university minibus driving tests. In the participants' daily routine, they would not be driven to a site to walk a round route to ensure that they begin and ended at the same point. The reason this method was reused was that the act of alighting from a minibus gave participants the same start on the street and may in some cases have succeeded in confusing them as to where they were. This means that comparison can be made between areas, which could not be made as they walked from one to the other as the route may have influenced their perception of the street.

The cost of the minibus driving training was partially mitigated by the increase in sample size possible in the time frame if a minibus rather than people carrier was used, in effect doubling the number of participants per street visit. The minibus driving qualifications are included in Appendix C.4. The first six tests for the first three groups took place at the end of March 2013, around the equinox, just before the clocks moved forward one hour. The summer tests took place in June, around the summer solstice. The dates and times of the tests are shown in Table 5.3. The start times of the tests were consistent and either in daylight or after dark. The summer night time tests took place in dusk (rather than dark) conditions on the first two streets visited (s6 and s7), to ensure that the experiment could be completed by half past midnight. Apart from the first two street visits, the conditions of the tests were obviously day lit or after dark. The precise time of arrival on each street was determined by traffic conditions and the street order determined prior to the experiment.

Group	Test 1	Test 2
1	19.03.2013. 14.30 hours.	20.03.2013. 19.30 hours.
2	21.03.2013. 19.30 hours.	26.03.2013. 14.30 hours.
3	27.03.2013. 14.30 hours.	28.03.2013. 19.30 hours.
4	17.06.2013. 22.30 hours.	18.06.2013. 14.30 hours.
5	19.06.2013. 14.30 hours.	21.06.2013. 19.30 hours.

Table 5.3. Dates and start times of the tests.

5.8. Participants and groups

Five groups of fifteen or sixteen participants completed the experiments. Four out of five groups were formed of students who were recruited using the university mailing list on a first-come first-served basis. One older group was formed of people over the age of 50 for which the recruitment process took much longer. The first step in creating the older group was made by asking if any of those who had attended the interview study would be willing to participate again. These people were found originally at a University of the Third Age coffee morning. Four of them were willing to participate in this further study. They were also asked if they had any friends or relatives who would also be willing to do the study. This created a snowball effect of friends of previous participants who were interested. A notice was placed on the University of the third age website. Elderly acquaintances (for example childhood neighbours) of the author were given information sheets to distribute amongst their social groups. Interested parties either e-mailed or called the author and were given more information. Some elderly people who were approached did not feel physically capable of doing the task after it was described to them, particularly due to the lack of toilet facilities on the streets. Therefore the opinions of the most frail are not recorded in this study.

There was a roughly equal split between sexes in each group. The mean age of group 1 was 24, the median 22. Group 2 had mean and median ages of 23 and 21 respectively, and group 3 mean and median ages were both 61 (Table 5.4). An age gap of approximately 40 years provides a big enough difference between groups to compare the effect of age. Eyesight degenerates with age (Owsley, Sekuler et al. 1983), and previous research has shown an effect of age on perceptions of safety (Mansfield and Raynham 2005). A more detailed description of participants can be found in Appendix C.5, including how long they had lived in Sheffield and their country of origin. The full details show that a high proportion of students (36 out of 62, 58%) were non-natives, of these, six were European. All elderly people who participated were local, having lived in Sheffield for at least 17 years. This could have had an effect on the results.

		Number of participants			Age in years	
	Group	Female	Male	Total	Mean	Median
Winter	1	10	6	16	24	22
	2	7	8	15	23	21
	3	6	9	15	61	61
Summer	4	8	7	15	23	23
	5	8	8	16	26	24

Table 5.4. Age and gender profile of five groups.

5.9. Test procedure

Participants met in the Arts Tower car park where the minibus was parked. They were given folders containing surveys and instructed to number the sheets 0-11 and walk a trial route around the car park, stop at a specific point, fill in the survey facing a particular viewpoint, and then return to the start point where they could ask any questions they may have about the surveys. The questions that they asked are listed in Appendix C.6. The participants were given a chance to ask questions after the trial run to provide an opportunity to define the meaning of the items in the survey.

They then boarded the minibus and were driven by the author to the first street. The order in which the areas of Netherthorpe and Broomhall were visited was random except for the summer groups for which Netherthorpe was visited first because dusk fell during the journey from Netherthorpe and Broomhall ensuring that most streets were visited in a clearly after dark condition. The order in which the three subareas within Broomhall were visited, was random. Within each subarea street order was random, except for group 2 whose order was changed in response to circumstances on the street. In order to randomise the area/ subarea/street order, a random sequence generator software was used (http://www.random.org/sequences/). The resultant street orders for the groups are listed in Table 5.5. The order of the day and night visits was rotated between groups. No two street orders are the same.

Group	Day/Night order	Street order - Day	Street order - Night
1	Day - Night	7,6,9,8,2,10,5,4,1,3.	4,11,3,1,5,10,2,8,9,6,7.
2	Night - Day	10,2,8,9,4,5,1,3,7,6.	6,7,5,4,3,1,11,2,8,9,10.
3	Day - Night	6,7,5,4,10,8,2,9,3,1.	7,6,9,2,8,10,11,4,5,1,3.
4	Night - Day	6,7,10,8,2,9,1,3,4,5.	7,6,11,4,8,9,2,10,3,1,5.
5	Day - Night	3,1,8,9,2,10,5,4,6,7.	7,6,4,5,10,8,2,9,1,3,11.

Table 5.5. Order in which the streets were visited.

Pedestrian traffic flow tended to be low unless there were university facilities or nurseries in the area. Weather conditions on all visits were overcast which meant low luminance differences of surfaces. The weather conditions and the author's count of how many vehicles or people passed by from alighting to reembarking the minibus are tabulated in Appendix C.7. Upon arrival on the test streets, an attempt was made to park the minibus in the same location on each street however this was not always possible because parking was not always available in the same place. Therefore the minibus was parked wherever parking was available, however aiming for the same spot each time.

Pen torches were attached to the folders for use during the night-time visits (Figure 5.17). Participants were asked to only use the pen torches if they had to in order to see the surveys. One question on the survey asked them if they had used the pen torch to fill in the form. More of the elderly participants (41%) required pen torches than the younger participants (14%). The luminance of the survey sheet when a pen torch was clipped to the folder was measured in laboratory conditions. Luminance at the brightest point on the page ranged from 52-208 cd/m^2

in a sample of five torches selected randomly. At the centre of the text on the page, luminance ranged from 14-23 cd/m^2 and at the edges of the text furthest away from the torch it was measured as 1.3-2.5 cd/m^2. Pedestrians see other bright points on a street, for example headlights, luminaires and internal lighting.

Approximately halfway through the street visits, participants were provided with snacks (mini chocolate bars and water). When walking the street routes, the students tended to stay in one large group, whereas the the older group broke up into smaller groups of similar walking speed abilities. The street visits took between 2 hours and 15 minutes and 3 hours and 30 minutes, depending on the group.

Figure 5.17. Example of participants using pen torches to fill in surveys on William Street.

5.9.1. Routes

On each street, participants were asked to complete an identical route at night and during the day, covering both sides of part of a street (Figures 5.18 to 5.26). Participants were asked to stop in a specific location and fill in the survey facing a specific view, so that variations in view and route would not be variables to consider in the analysis. The vantage point was chosen based on the author's interpretation of the most 'residential' view. This meant the presence of houses on both sides of the street. The routes are denoted by a blue dashed line on the following drawings and the survey filling in points are denoted by a solid blue arrow. Participants were asked to judge the whole street environment according to the route that they had walked. Route lengths ranged from about 160m to 200 m (Table 5.6) and were determined by the author's judgement of a route which would give a balanced overall impression of the street.

Street	Route length (metres)
Broomhall Road (s1)	184
Clarke Street (s2)	168
Collegiate Crescent lower end (s3)	155
Collegiate Crescent upper end (s4)	161
Park Lane (s5)	152
Roscoe Road (s6)	175
St Philips Road (s7)	209
Wharncliffe Road (s8)	177
William Street (s9)	155

Table 5.6. Length of street route.

The routes were chosen to give an overview of the street and to be similar to the route on the comparable street (see key pairs). For example both the routes on St Philips Road and on Roscoe Road were facing uphill, away from the busier street, and with the Arts Tower in view. Wherever the minibus was parked, the participants were led to the same starting point and asked to walk the same route towards the survey completion point. As up to 16 participants filled the survey simultaneously, the survey filling in location had a radius of no more than 2 metres. The survey filling in point referred to throughout this thesis is the centre of the approximate circle occupied by participants whilst filling in the surveys.
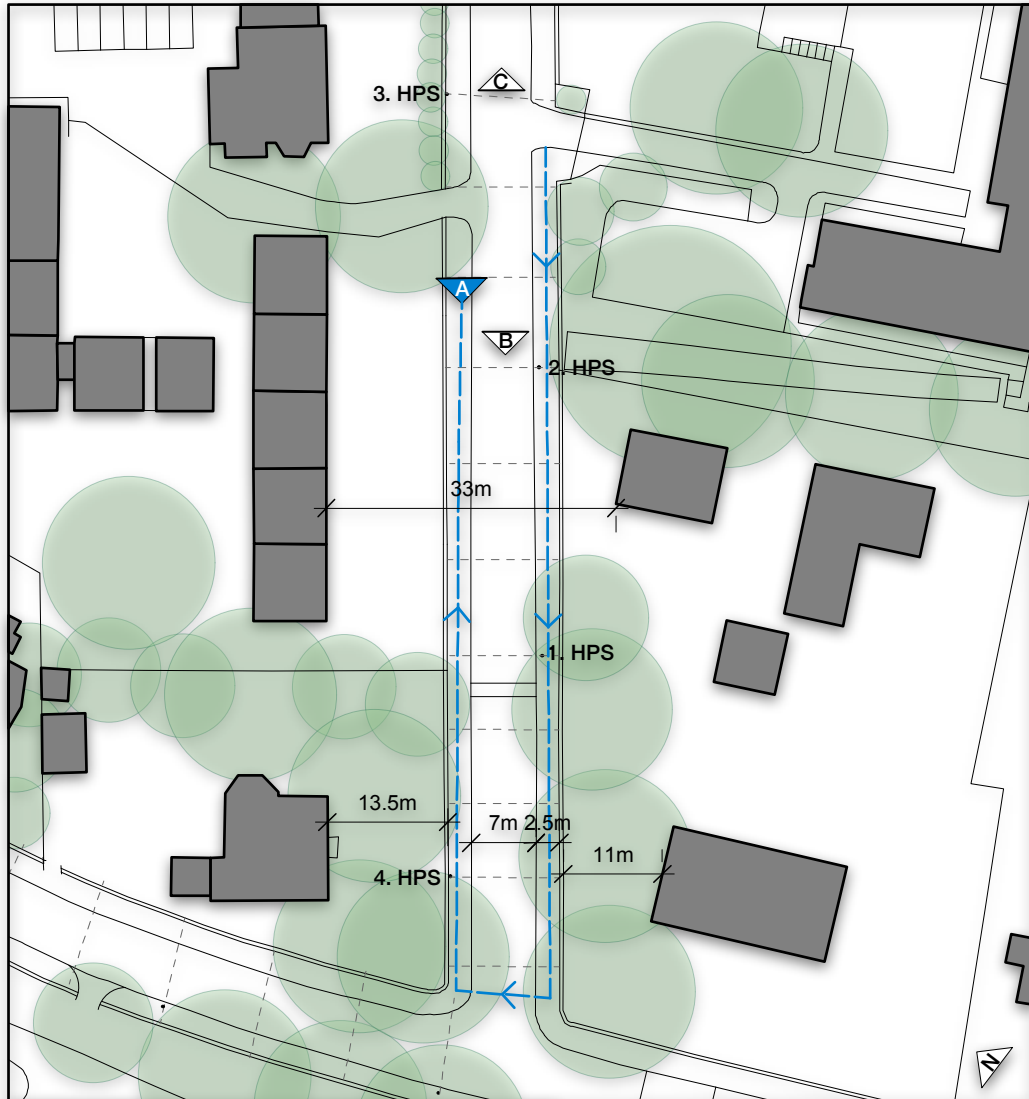
1:850 plan showing Broomhall Road (s1) in Ecclesall. Blue dashed line denotes route walked by participants.

3. HPS

C

A

B

2. HPS

33m

1. HPS

13.5m

7m 2.5m

11m

4. HPS

View from survey filling in point at night (A)

Daytime view from (B)
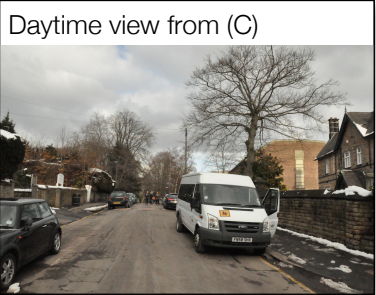
Daytime view from (C)

Figure 5.18. Street 1 route and photographs.

1. HPS

2.5m 7m

2. HPS

C

18m

2m

3.5m

3. HPS

B

A

4. HPS

N
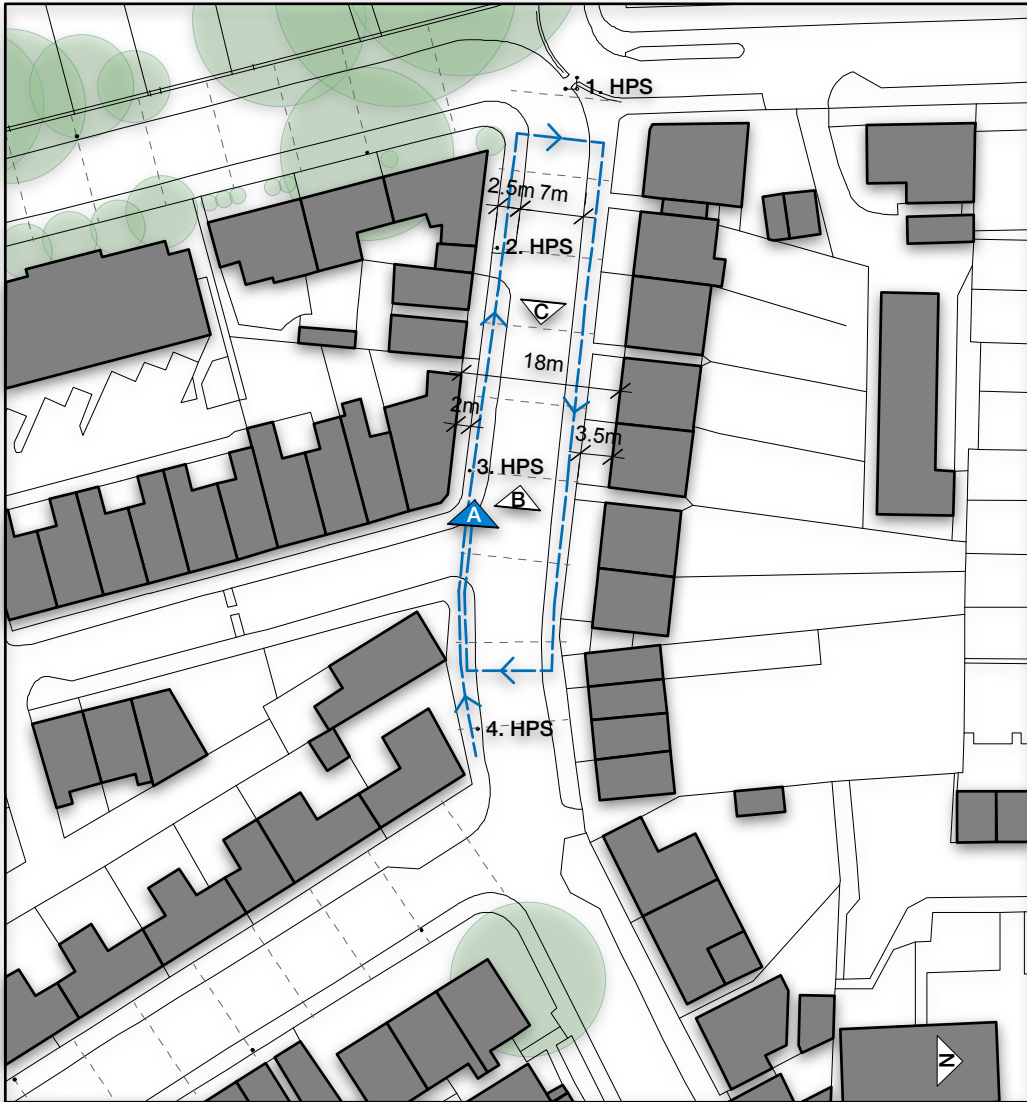
1:850 plan showing Clarke Street (s2) in Broomhall. Blue dashed line denotes route walked by participants.

Daytime view from (B)

View from survey filling in point at night (A)

Daytime view from (C)

Figure 5.19. Street 2 route and photographs.

1:850 plan showing lower end of Collegiate Crescent (s3) in Ecclesall. Blue dashed line denotes route walked by participants.

Daytime view from (B)

View from survey filling in point at night (A)
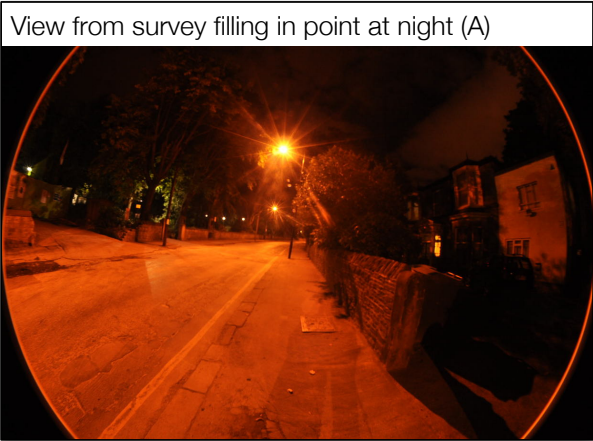
Daytime view from (C)

Figure 5.20. Street 3 route and photographs.

1. HPS

6.5m

48m 3m 13m

22m

3. HPS

C

B

A

12m

1. HPS

1:850 plan showing the top end collegiate Crescent (s4) in Broomfield. Blue dashed line denotes route walked by participants.

Daytime view from (B)

View from survey filling in point at night (A)

Daytime view from (C)

Figure 5.21. Street 4 route and photographs.

125

1. HPS

A

37.5m

C

3. LPS

B

17.5m

19.5m

9.5m

3m 7m 2.5m

2. HPS

1:850 plan showing Park Lane (s5) in Broomfield. Blue dashed line denotes route walked by participants.

Daytime view from (B)

View from survey filling in point at night (A)

Daytime view from (C)
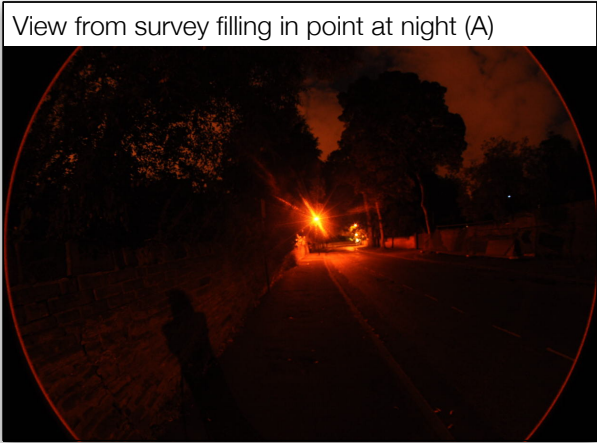
Figure 5.22. Street 5 route and photographs.

126

HPS •

5m
4m   5. MH
7.5m
13m
16m
4. MH
12m
2m 7m 2m
1m
B   A
3. HPS
2. MH
C
1. MH
N
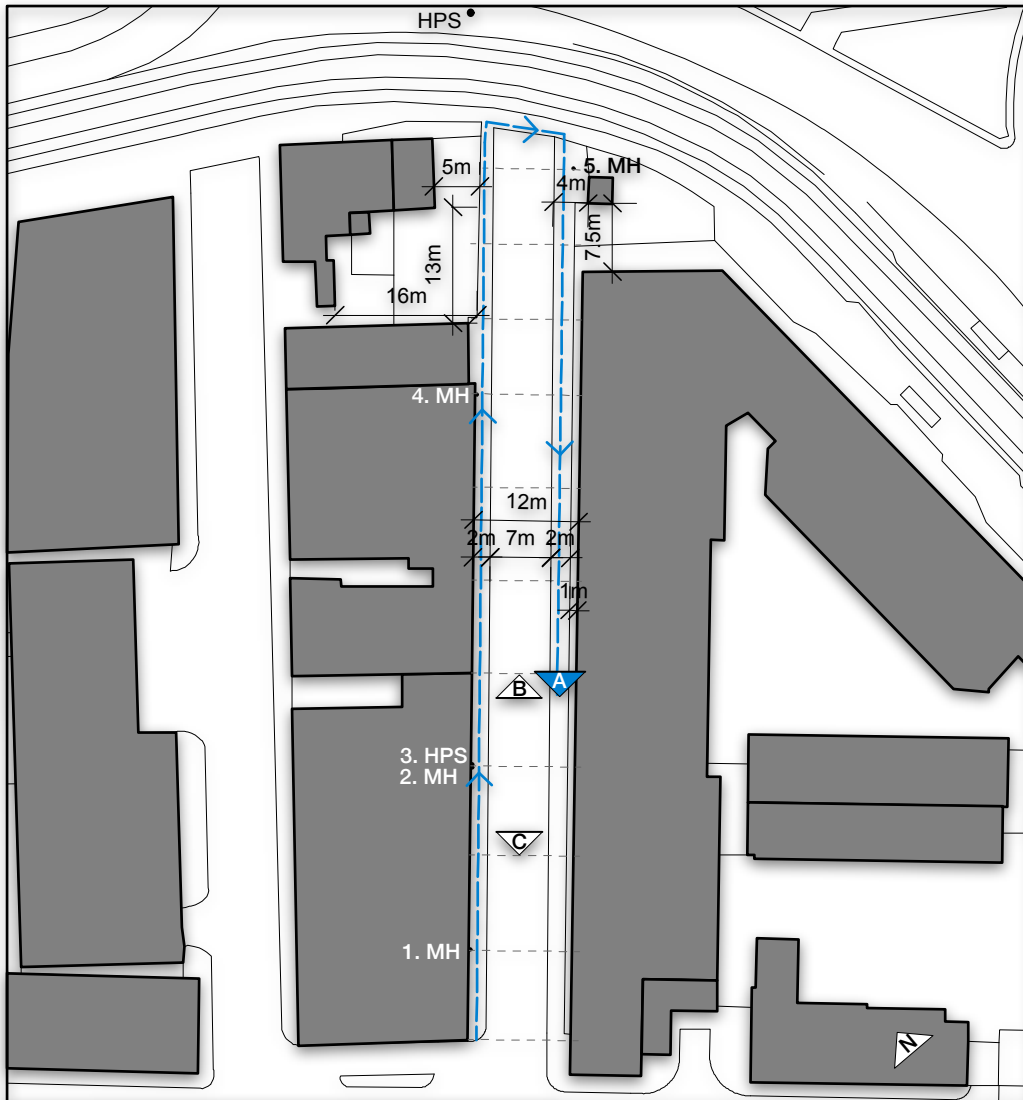
1:850 plan showing Roscoe Road (s6) in Netherthorpe. Blue dashed line denotes route walked by participants.

Daytime view from (B)

View from survey filling in point at night (A)

Daytime view from (C)
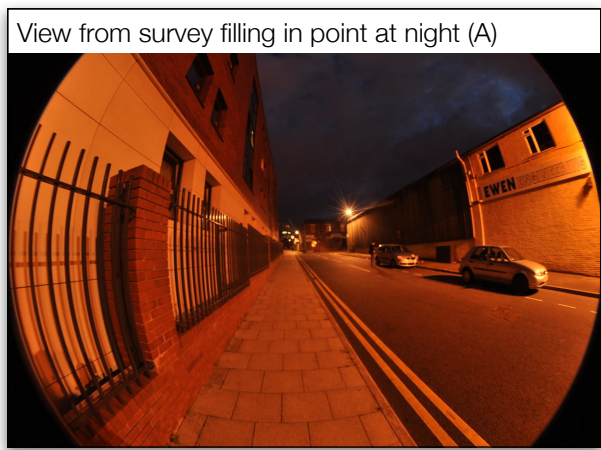
Figure 5.23. Street 6 route and photographs.
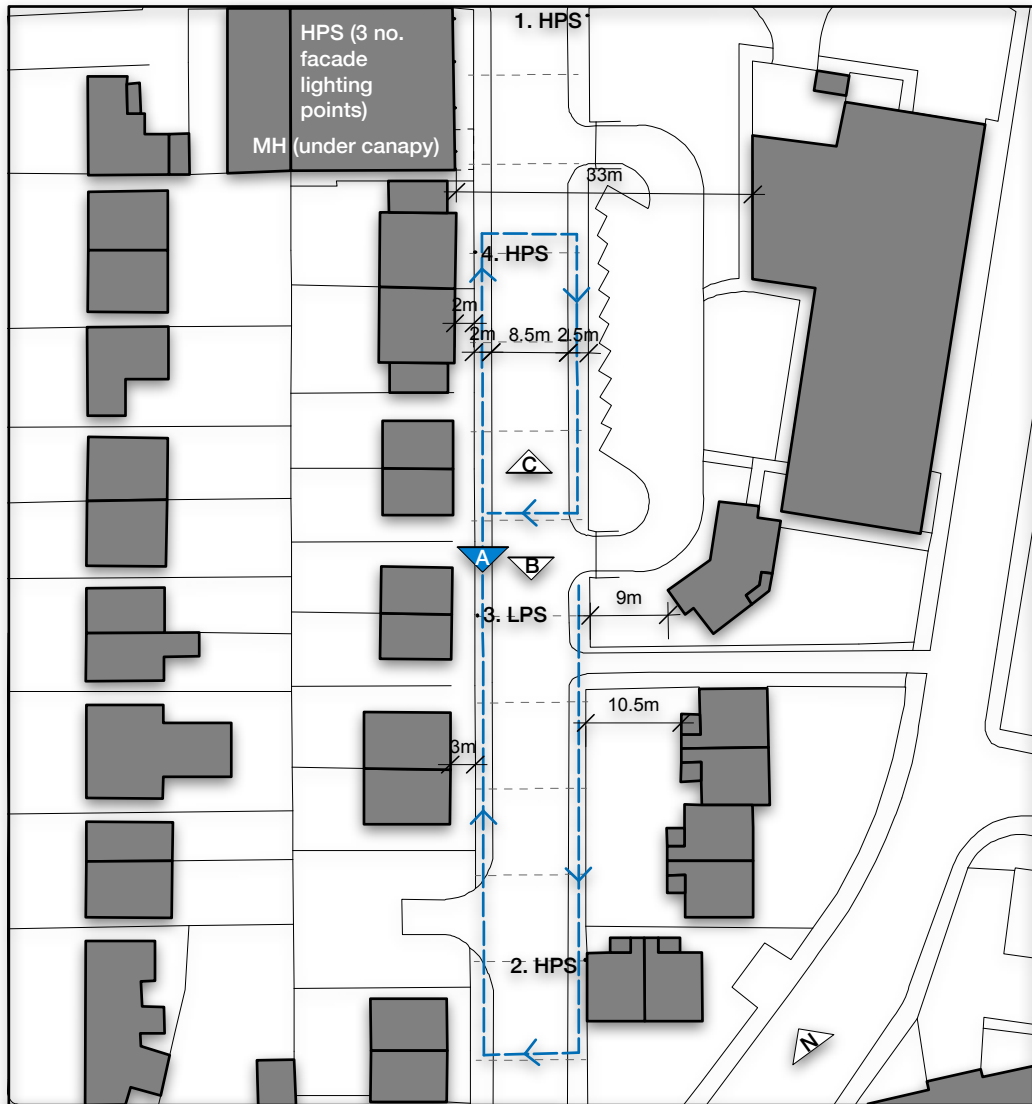
1:850 plan showing St Philip's Road (s7) in Netherthorpe. Blue dashed line denotes route walked by participants.

View from survey filling in point at night (A)

Daytime view from (B)

Daytime view from (C)

Figure 5.24. Street 7 route and photographs.

1:850 plan showing Wharncliffe Road (s8) in Broomhall. Blue dashed line denotes route walked by participants.

Labels on plan: 3. HPS, 30.5m, 2. LPS, 14.5m, 3m, 7m, 2.5m, 4m, C, 4. LPS, 15.5m, B, 1. HPS, A, N

View from survey filling in point at night (A)

Daytime view from (B)

Daytime view from (C)

Figure 5.25. Street 8 route and photographs.

1. HPS

B

A
2. HPS
C

2.5m
8m
2m
5m
1.5m
15.5m
1.5m

3. HPS

HPS

N

1:850 plan showing William Street (s9) in Broomhall. Blue dashed line denotes route walked by participants.

Daytime view from (B)

View from survey filling in point at night (A)

Daytime view from (C)
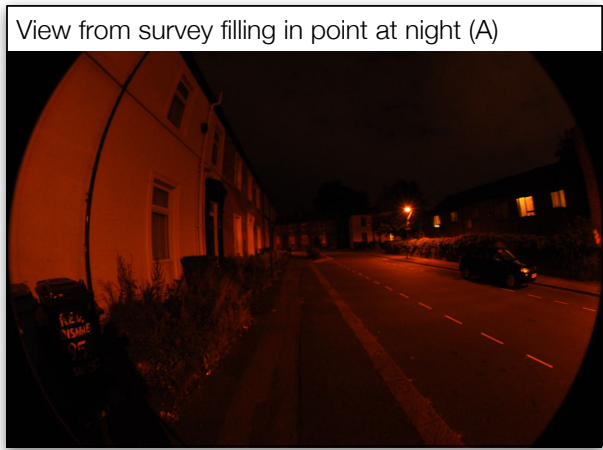
Figure 5.26. Street 9 route and photographs.

5.10. Field measurements

Photometric measurements enable comparison between lighting conditions on the selected streets. As the luminaire maintenance, pole height, wattages and intensity distribution were unknown, the photometric characteristics of the environment were measured as they could not be calculated. This is a more reliable method of collecting data regarding street conditions (Keck and Odle 1975) as the assumptions which are made for manual or software calculations can be avoided.

A range of measurements were recorded after dark on the nine streets used in the study by the author and four assistants in June 2013. The pavement was dry and the sky cloudy for all three sessions. The following measurements were taken for the purpose of exploring the lighting characteristics of the street: Horizontal illuminance, luminance, semi-cylindrical illuminance, indirect illuminance, chromacity coordinates. A list of the equipment used is described in Appendix C.8. The reasons these measurements were taken are described below.

5.10.1. Horizontal illuminance

Horizontal illuminance is the illuminance measured on the horizontal surface of the pavement or road. This photometric measurement is the first port of call for lighting practitioners using BS BS5489-1 which recommends minimum maintained average and minimum horizontal illuminance for areas adjacent to the carriageway. By following the standards, road lighting engineers and lighting designers can provide evidence that their professional obligations have been met.

Median and mean averages were calculated. The mean is used in BS5489-1 and the median was used in the Boyce et al car park study (Boyce, Eklund et al. 2000) due to non-uniformity of the chosen sites. Lowest and highest illuminance values give an indication of horizontal illuminance distribution on the street, typically highest under a lamppost and darkest at the mid point between lamp posts.

Measurement procedure

Illuminance measurements were taken on a grid defined by the lampposts locations. Measurements were recorded in the middle of the pavements and road in rows. The spacing of the grid was designed to ensure that no two measurement points were more than 5 metres apart. An example of how the measurements were recorded on Broomhall Street is shown in Figure 5.27. At the lamppost measurement point, readings of horizontal illuminance were taken in the middle of the pavement irrespective of whether the lamppost was located to the edge or to the rear of the pavement, and 1 metre either side of this point (parallel to the pavement edge). An average was taken of these three points and this value used for the under lamp post measurement point. Averages (mean and median) for the whole street were calculated using this value, and the other readings taken in between lampposts.

0.85	1.33	1.05			

(handwritten measurement tables on map)

0.85 | 1.33 | 1.05   2.42 | 2.85 | 0.66
3.70 | 9.66   2.47 | 15.49
1.44 | 2.52 | 1.79   1.56 | 2.51 | 3.09
3.33 | 2.69 | 0.96   3.63 | 2.34 | 1.29

17.96 | 9.16 | 2.66

Broomhall Street

8.41 | 5.42 | 262
18.0 | 7.79 | 1.95

Lamp post on edge of pavement		
1m	Centre	1m
17.30	18.48	17.56

Lamp post on edge of pavement		
1m	Centre	1m
30	30.5	31.5
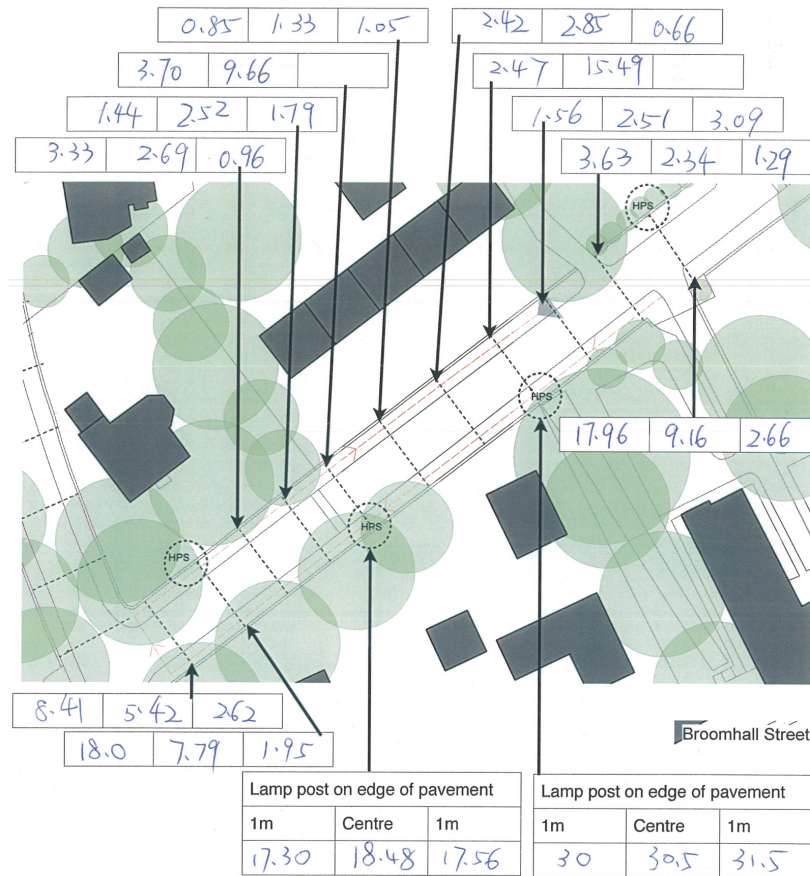
Figure 5.27. Sample horizontal illuminance measurements taken on Broomhall Street (s1).

5.10.2. Luminance

Luminance has been advocated as a useful design tool (Bodmann 1967). Luminance changes depending on the direction of view therefore is not specified in recommendations for subsidiary roads with pedestrians in mind. It is included in the ME classes for drivers (BS EN 13201-2) because it is assumed that the driver is looking at the road surface, and the reflectance of the road surface can be reasonably assumed to be that of tarmac.

Measurement procedure

A street is a complex environment with an infinite number of potential luminance measurement points. Spot luminance measurements were taken on the streets so that they could be used to calibrate photographs to a luminance map using ImageLUM software. A couple of measurements from what appeared to be the darkest, lightest, and mid-range areas of luminance were recorded. These are shown in appendix C.9. Some images required more measurements than others to be read by ImageLUM. Eventually, the luminance mapping software was not used. However the following provided a useful means of further characterising the lighting conditions at the survey filling in point.

The luminance meter was pointed at three sheets of paper (white, grey and black, mounted on cardboard), measurements recorded and an average taken of these three measurements. Vertical luminance was measured at a height of 1.5 m (to the centre of the A4 sheet) at 2 metres in front of and facing the survey filling in point. Horizontal luminance was also measured

132

on the ground in front of the survey filling in point by the same method of aiming the luminance meter at the three sheets of paper.

Reflectance of the card was recorded firstly by measuring luminance of the three sheets of paper and a reference white (Konica Minolta CS-A5) in a booth under two Verivide Artificial Daylight lamps (BS950 Pt1, F20T12/D65), using Equation 1:

Target reflectance = Standard reflectance x $\dfrac{\text{Target luminance}}{\text{Standard luminance}}$ (Equation 1)

The result was checked by measuring illuminance at the same point, using Equation 2:

Luminance = $\dfrac{\text{Illuminance x Reflectance}}{\text{pi}}$ (Equation 2)

Strong agreement between the two methods is shown in Table 5.7, demonstrating the reliability of the equipment used.

Card colour:	White	Grey	Black
Luminance (cd/m^2)	218.8	75.3	18.47
Equation 1	**0.745**	**0.256**	**0.063**
Illuminance (lux)	276.0	276.0	276.00
Equation 2	**0.751**	**0.258**	**0.063**

Table 5.7. Reflectance of card samples calculated from luminance and illuminance measurements.

5.10.3. Semi cylindrical illuminance

Semi-cylindrical illuminance is relevant because BS5489-1:2013 recommends that ES classes for semi cylindrical illuminance tabulated in BS EN 13201-2:2013 and CIE 115:2010 be used in areas where crime prevention and detection, and pedestrian safety are an issue. The reason for this is that facial recognition (discussed in more detail in section 2.7) may affect reassurance. If the face of an oncoming pedestrian is of interest to a pedestrian, then the amount of light arriving on a semi cylindrical illuminance meter (similar to head shape) at 1.5 metres high (approximate pedestrian eye height), may correlate to pedestrian reassurance. The measurement was taken within the 2 metre radius of the survey filling in point (Figure 5.28). Measurements were taken in four directions because this gives an indication of the flow of light. Previous research has identified the flow of illumination as being relevant to quantifying the appearance of a lit scene (Loe, Mansfield et al. 2000).

Measurement procedure

Semi-cylindrical illuminance was measured at the height of 1.5 m in four directions at 90 degree intervals: Facing the road (B); facing the houses (D); facing towards (A) and away (C) from the survey filling in point parallel to the pavement edge (Figure 5.28), with the purpose of exploring

in which direction semi-cylindrical illuminance matters most to reassurance. If facial recognition matters most, View A will have the strongest correlation with reassurance. If the lighting of vertical facades matters View B will have the strongest correlation with reassurance. The semi-cylindrical illuminance meter was attached to a monopod on which a spirit level was mounted to ensure that the meter was level and at a constant height.
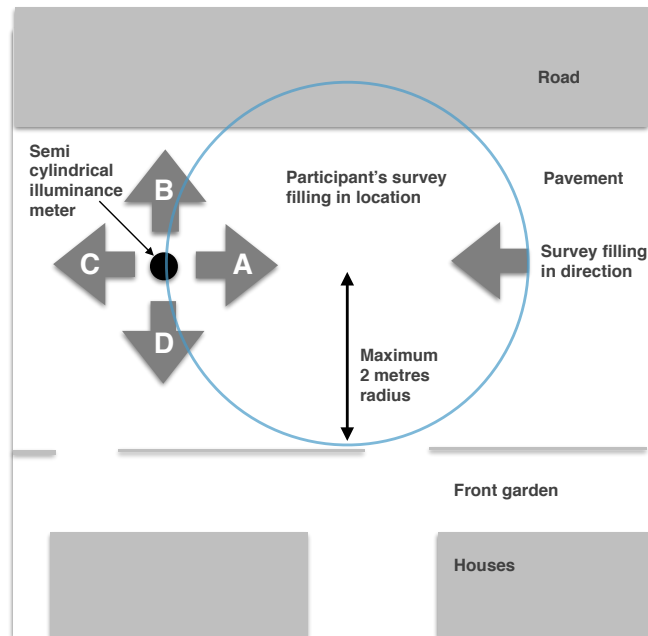
Figure 5.28. Directions in which semi-cylindrical illuminance was measured.

5.10.4. Indirect illuminance
Indirect illuminance gives an indication of the amount of light received by the eye from the whole visual scene. It is the closest metric which could be used to reflect Cuttle's concept of the light received by the eye from the whole scene being important. The purpose of taking this measurement is to explore whether this concept is relevant to reassurance.

Measurement procedure
Indirect illuminance was measured by holding the illuminance meter sensor at a height of 1.5 metres in the vertical plane and blocking out direct light from nearby luminaries by holding cardboard as near to the light source and as far away from the illuminance meter as possible, the ensure that no direct illumination reaches the meter (Figure 5.29).
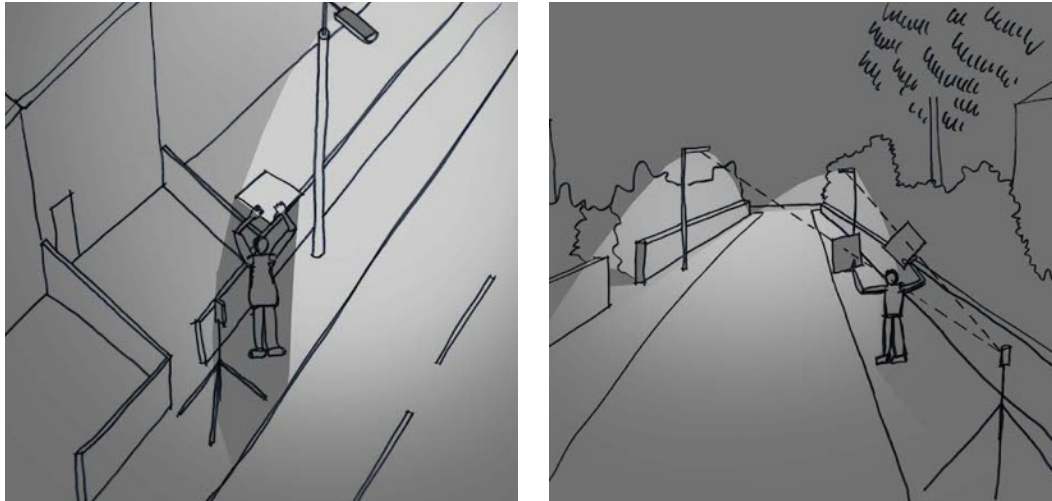
Figure 5.29. Diagrams showing how indirect illuminance was recorded by shielding direct illuminance from the illuminance meter using cardboard.

5.10.5. Uniformity

Overall uniformity is the ratio of the lowest illuminance, occurring at any grid point in the field of calculation, to the average illuminance. Longitudinal uniformity is the ratio of minimum to maximum illuminance occurring along a line of points along the centre of the driving lane (as defined by the ME classes for drivers). The grid used in this field study comprised of three rows of points measured in the middle of road and pavements on both sides in the transverse direction, and points underneath and in between lampposts in the longitudinal direction. No measurement point was greater than 5 metres from another, therefore if the mid point between lamp posts was greater than 5 metres from the lamppost, the area was divided into more subsections so that the grid resolution remained at approximately 5 metres between points in the longitudinal direction. The line of transversal points are denoted by a light grey dashed line on Figures 5.18 to 5.26. A spreadsheet was used to identify the minimum, maximum and average illuminance measured over the grid and to calculate uniformities for the extent of the environment covered by the participants' routes.

5.10.6. Chromaciticy coordinates

In order to identify the light source, chromaticity coordinates were measured under each lamp post using a Chroma meter at a height of 1.2 metres. The light source was identified by matching measured x and y coordinates defined by the CIE chromaticity chart as closely as possible to light source data measured in laboratory conditions. Data from Sheffield City Council was for whole streets therefore did not differentiate between individual lampposts or areas of the streets.

5.10.7. Suggestions for improvement

1. Horizontal illuminance. The most relevant grid is the CEN grid as defined by EN:13201-3. This requires 10 points between lanterns and 6-10 points across the road. However limited funding meant that further resources could not be employed to complete more extensive measurements. This would have also required attending a Traffic Management course to ensure the safety of those collecting the measurements. The effect of a finer grid compared to the grid used on calculations is unknown. The CEN

grid is implemented as a design tool where software can automatically plot the grid. This is much more difficult to use when taking measurements on a real street with parked and passing vehicles.

2. Indirect illuminance. Assistants were asked to block out any illuminance (by holding a piece of card between the luminaire and the sensor) which could arrive on the sensor from nearby luminaires. On one occasion (on s2) the measurement point was almost directly below a lamppost, therefore although the person holding up the card did not cast a shadow, the fact that they were in close proximity to the illuminance meter may have affected the measurement. In future the effect of a person in close proximity to the meter would be tested before measurement points are chosen.

3. It is noted that pavement luminance was calculated using illuminance measurement points and the assumed pavement reflectance was 0.2. In reality the pavement reflectance was varied as the surfaces were poorly maintained. Roadway luminance is calculated at an angle of observation of 1°. On uneven surfaces reflectance can change depending on the angle of observation. Therefore the calculation of pavement luminance was simplified.

4. E_{sc} and vertical luminance could be measured on the target face and body at different distances from the survey filling in point after previous research (Rombauts, Vandewyngaerde et al. 1988), to identify if there are any distances which matter more than others to pedestrian reassurance. Measurements such as this are unnecessarily complex for the purpose of this work which concentrates on reassurance as a whole, rather than distances between pedestrians.

5.11. Summary

This chapter has described an experiment which closely repeats that of Boyce et al.'s field study 3 (Boyce, Eklund et al. 2000). The experiment was extended to include summer as well as winter conditions so that the effect of the seasonal variations in lighting conditions could be investigated. The surveys were extended to include questions which addressed aspects of the environment other than lighting which maybe of concern to pedestrians, for example, spatial features and perceived access to help raised in Study 1. Streets were chosen according to variation in illuminances in comparable environments. The challenge posed by the comparison of different streets was addressed by the use of the day minus night safety rating, also after Boyce et al.. The aim of this experiment was to test how participants' reassurance was affected by the change in residential environments brought by nightfall. A range of photometric measurements were taken with the aim of thorough comparison of lighting conditions, to find out if any lighting characteristics mattered more than others to reassurance. This proposed experiment addresses gaps in existing research by considering residential environments and thoroughly reporting environmental conditions. The results of this experiment are presented in Chapter 6.

6. Residential Street Surveys Results and Analysis

6.1. Introduction

This chapter describes the results of the on street surveys experiment (Study 2) which took 77 participants to 9 residential streets in Sheffield in winter and summer during the day and at night with the aim of finding out if lighting matters to pedestrian reassurance in real environments. The method for this study is described in Chapter 5.

Study 2 was designed to present participants with a range of situations of varying illuminances within different residential areas. Using real environments rather than laboratory conditions may help understand what matters to pedestrians in situations in which they naturally find themselves in their everyday lives. The method of using street surveys is challenging because variables such as weather, pedestrian and vehicular traffic are difficult to control. The method of deducting night safety ratings from day safety ratings in order to obtain a safety score by which sites can be meaningfully compared to each other was adopted from Boyce et al. (Boyce, Eklund et al. 2000). As there is no difference in the spatial features of a street between day and night, the difference in score is likely to be highly influenced by the lighting conditions, which is the only change in the physical environment between day and night. Participants were driven to a range of residential streets in Sheffield during the day and at night to complete surveys which required them to rate safety amongst other factors. This experiment was completed in 2013, in winter with 46 participants and in summer with 31 participants.

6.2. Measurements

Table 6.1 summarises the range of lighting conditions on the selected streets using a variety of lighting metrics, measured or calculated. The reasons for taking the measurements described in Table 6.1, and the procedures used to do so, are described in section 5.10. The measurements suggest that the visual conditions on all streets were mesopic because all luminances fall between 0.001 and 3 cd/m^2 (CIE 1989). This also applies to conditions where low transmission glasses were worn. The conditions on s10 and s11 were calculated as being 10% of the values on s9 and s5, except for uniformity, which remained the same.

Street reference:	Streets selected for study									LT glasses*	
	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10**	s11***
Mean horizontal illuminance (lux)	5.76	12.56	13.17	10.47	3.42	10.92	8.65	4.80	8.38	0.84	0.33
Median horizontal illuminance (lux)	2.66	7.39	9.98	6.31	1.92	7.50	3.43	2.77	6.00	0.60	0.17
Lowest illuminance (lux)	0.66	1.84	2.59	0.65	0.20	2.22	0.60	0.34	2.35	0.24	0.02
Highest illuminance (lux)	30.67	46.50	38.80	31.60	18.12	31.90	38.90	33.40	26.33	2.63	1.81
Luminance on ground **** (candela per metre squared)	0.26	2.63	1.32	0.55	0.11	0.45	0.48	0.08	0.32	0.03	0.01
Vertical luminance **** (candela per metre squared)	0.27	0.22	0.28	0.26	0.03	0.73	0.09	0.03	0.44	0.04	0.00
Semi cylindrical illuminance on target face **** (lux)	1.63	10.30	5.69	0.96	0.33	1.71	1.12	0.45	0.47	0.047	0.033
Semi cylindrical illuminance facing road (lux)	2.24	3.86	4.31	1.67	0.29	4.63	1.14	0.78	2.82	0.282	0.029
Semi cylindrical illuminance**** (mean of four directions) (lux)	1.79	6.05	3.83	1.32	0.25	2.99	0.98	0.61	1.72	0.17	0.02
Indirect illuminance at the eye (lux)	0.61	0.86	0.78	0.82	0.15	0.87	0.62	0.06	0.43	0.04	0.02
Longitudinal Uniformity	0.09	0.08	0.13	0.13	0.01	0.21	0.04	0.02	0.12	0.12	0.01
Overall Uniformity	0.11	0.15	0.20	0.06	0.06	0.20	0.07	0.07	0.28	0.28	0.06

*	Low transmission glasses.
**	10% of value of measurement taken on street 9.
***	10% of value of measurement taken on street 5.
****	Measurement taken in front of survey filling in point.

Table 6.1. Summary of photometric measurements and calculations on the streets used in this study.

6.2.1. Light source

Chromaticity coordinates were measured using a chromaticity meter and plotted on the CIE 1931chromaticity diagram. Using chromaticity coordinates of high pressure sodium, low pressure sodium, ceramic metal halide, and compact fluorescent lamps measured in laboratory conditions for previous lighting research, a spreadsheet was used to identify the closest lamp match to the measured coordinates of the light source. Full measurements and details of the reference light sources are listed in Appendix D.1. Table 6.2 lists the light sources identified by this process, and compares them to those reported by Sheffield City Council. On all except one street (s6) the findings match. The information in the last column of Table 6.2 was filtered by light source and gives a possible range of luminaire wattage.

Street	Number of lamp posts on route	Light source determined by measured chromaticity	Light source as reported by Sheffield City council
s1	4	All high pressure sodium.	50 or 70 Watt SON.
s2	4	All high pressure sodium.	50, 70 or 100 Watt SON.
s3	4	All high pressure sodium.	50 or 100 Watt SON.
s4	3	All high pressure sodium.	50 or 100 Watt SON.
s5	4	3 no. high pressure sodium and 1 no. low pressure sodium.	50 or 70 Watt SON and 35 Watt SOX.
s6	5	4 no. metal halide and 1 no. high pressure sodium.	60 Watt CPO TW. High pressure sodium not listed.
s7	4	3 no. high pressure sodium and 1 no. low pressure sodium.	50, 70, 100 or 150 Watt SON and 35, 55 or 180 Watt Sox
s8	4	2 no. high pressure sodium and 2 no. low pressure sodium.	50 or 70 Watt SON and 35 Watt Sox.
s9	3	All high pressure sodium.	50 or 70 Watt SON.

Table 6.2. Summary of light sources on streets.

6.2.2. P classes

Table 6.3 lists the P classes allocated to the streets according to data received from Sheffield City Council, and compares this to the P class met by the lighting conditions on the streets. The S classes to which the streets were originally designed is unknown. The measurement grid used to determine the mean and lowest illuminances values, is the grid reported in section 5.10.1 rather than the CEN grid. This information is shown to emphasise the importance of taking measurements and to demonstrate that sometimes the real-life situation on the street bears little resemblance to the requirements of the lighting class allocated to the street. This could be for many reasons: spot luminaire replacement policy; poor maintenance of trees and luminaires or wrong information provided by the Local Authority. On s5, s7 and s9 the council report different lighting classes for different segments of the street, however these were not identified, therefore the segment into which the experimental portion fell is unknown. On streets s1 and s9, mean illuminance is lower than the P class allocated, and on streets s2, s3, s4 and s6, it is higher. On streets s1, s4, s5 and s8 the lowest illuminance value recorded places the street in a lower P class to that which it was designed, and on s9 the opposite is the case. On s2, s3 and s6 the lowest illuminance value recorded meets the class to which the street was designed. The reason for these anomalies could be partially due to the fact that as most of the installations are at least a couple of decades old (s1,s5-9), the original classes allocated to the streets had different illuminance requirements to those allocated more recently. This shows that in the case of large-scale public sector works such as street lighting, classification and implementation is sometimes ad hoc in nature.

		Class determined from field measurements			
Street	**P class designed to***	**Mean illuminance (lux)**	**P class met**	**Lowest illuminance (lux)**	**P class met**
s1	**P3**	5.8	P4 (≥5 lux)	0.7	P5/P6 (≥0.6 lux)
s2	**P3**	12.6	P2 (≥10 lux)	1.8	P3 (≥1.5 lux)
s3	**P3**	13.2	P2 (≥10 lux)	2.6	P3 (≥1.5 lux)
s4	**P3**	10.5	P2 (≥10 lux)	0.7	P5/P6 (≥0.6 lux)
s5	**P3 or P6**	3.4	P5 (≥3 lux)	0.2	None
s6	**P3**	10.9	P2 (≥10 lux)	2.2	P3 (≥1.5 lux)
s7	**P2, P3, P5 or ME2.**	8.7	P3 (≥7.5 lux)	0.6	P5/P6 (≥0.6 lux)
s8	**P3 or P6**	4.8	P5 (≥3 lux)	0.3	None
s9	**P6**	8.4	P3 (≥7.5 lux)	2.4	P3 (≥1.5 lux)

* According to data received from Sheffield City Council. More than one class is allocated to streets with crossroads (s5 and s7), it is not known which class applies to the part of the street used in the study.

Table 6.3. Presence of extremes of path measurements in the field of view from survey filling in point.

6.2.3. Correlation between measurements

Table 6.4 demonstrates correlations (Pearson 2-tailed correlation using SPSS) between photometric measurements and is used to confirm the reliability of measurements. If the expected correlations exist then the data collected is likely to be accurate. For example, a strong correlation is expected between illuminance and luminance measurements, because they express the amount of luminous flux arriving on and departing from a surface. Expected significant correlations are between mean and median horizontal illuminances; median and lowest horizontal illuminances; mean and highest horizontal illuminance; mean horizontal luminance and illuminance; semi-cylindrical illuminance on target face and mean of semi cylindrical illuminance from four directions. Table 6.4 shows that all expected correlations exist.

		Key
1		Mean illuminance (lux)
2		Median illuminance (lux)
3		Lowest illuminance (lux)
4		Highest illuminance (lux)
5		Mean luminance on ground using black/grey/white card (cd/m^2)
6		Mean vertical luminance (cd/m^2)
7		Semi cylindrical illuminance on target face (lux)
8		Semi cylindrical illuminance facing road (lux)
9		Mean semi cylindrical illuminance (4 way) (lux)
10		Indirect illuminance at the eye (lux)
11		Longitudinal Uniformity
12		Overall Uniformity

Bold denotes strong correlation (correlation coefficient of > 0.9).

	1	2	3	4	5	6	7	8	9	10	11	12	D-N
1	-	**0.95**	0.77	<u>0.83</u>	0.72	0.57	0.67	<u>0.84</u>	0.8	**0.91**	0.44	0	-0.7
2	-	-	<u>0.88</u>	0.67	0.65	0.63	0.62	<u>0.89</u>	0.78	<u>0.8</u>	0.56	0.21	-0.9
3	-	-	-	0.46	0.52	0.75	0.52	**0.92**	0.73	0.62	0.62	0.56	-0.9
4	-	-	-	-	0.67	0.26	0.65	0.6	0.7	0.72	-0	-0.4	-0.3
5	-	-	-	-	-	0.12	**0.98**	0.62	**0.93**	0.62	0.1	0.05	-0.5
6	-	-	-	-	-	-	0.11	<u>0.8</u>	0.43	0.64	<u>0.84</u>	0.41	-0.7
7	-	-	-	-	-	-	-	0.64	**0.94**	0.58	<u>0.09</u>	0.07	-0.5
8	-	-	-	-	-	-	-	-	<u>0.85</u>	0.8	0.68	0.37	-0.8
9	-	-	-	-	-	-	-	-	-	0.73	0.35	0.2	-0.7
10	-	-	-	-	-	-	-	-	-	-	0.55	-0.5	-0.7
11	-	-	-	-	-	-	-	-	-	-	-	0.61	-0.8
12	-	-	-	-	-	-	-	-	-	-	-	-	-0.5

Table 6.4. Summary of correlation between measurements.

Where the correlation coefficient is >0.9, it could be suggested that some measurements are redundant (Tavakol and Dennick 2011) and that both need not be analysed. The measurements were selected on the basis of the strength of correlation to the outcome variable (D-N safety rating) when the difference in correlation coefficients was greater than 0.1. Otherwise reasons given for the retention of the lighting metric are given in Table 6.5.

Pair of lighting metrics with correlation coefficient >0.9		Lighting metric pair	Correlation coefficient with D-N safety rating	Is the difference in correlation coefficient to D-N safety rating greater than 0.1?	Selected lighting metric	Reason
1	0.946	Mean	-0.748	**Yes**	**Median**	Median illuminance is more highly correlated with D-N safety rating.
		Median	**-0.861**			
2	0.905	Mean	-0.748	No	**Indirect illuminance at the eye (lux)**	Mean is highly correlated with median covered in pair 1 selection.
		Indirect illuminance at the eye (lux)	-0.735			Relevant to lighting research as suggested as a new metric.
3	0.920	Lowest illuminance (lux)	-0.856	No	**Both**	Lowest illuminance specified in BS5489-1.
		Semi cylindrical illuminance facing road (lux)	-0.841			Could be a proxy for the amount of illuminance arriving on vertical surfaces.
4	0.984	Mean luminance on ground using black/grey/white card (cd/m2)	-0.492	No	**Semi cylindrical illuminance on target face (lux)**	BS5489-1 states Esc on target face be considered in areas where perceived safety is an issue.
		Semi cylindrical illuminance on target face (lux)	-0.462			
5	0.932	Mean luminance on ground using black/grey/white card (cd/m2)	-0.492	**Yes**	**Cylindrical illuminance (lux)**	Ground luminance is highly correlated with semi cylindrical illuminance on target face covered in pair 4 selection.
		Cylindrical illuminance*(lux)	**-0.658**			Mean semi cylindrical illuminance (4 way) (lux) is more highly correlated with D-N safety rating.
6	0.942	Semi cylindrical illuminance on target face (lux)	-0.462	**Yes**	Neither	Both are covered by pair 4 and pair 5 selection.
		Cylindrical illuminance*(lux)	**-0.658**			
*		Measured by taking a Mean of semi cylindrical illuminance measurements in 4 directions				

Table 6.5. Selection of lighting metric.

143

A graphical representation of two highly correlated variables (measurement reference 1 and 2 in Table 6.4), is shown by Figure 6.1. The reason the mean and median values are different is because the measurement points were taken under lampposts (higher illuminance) and between lampposts (lower illuminance) and the environments are non-uniform. As the mean value is composed of the whole range of values, it includes the extremes which have an effect on the resultant average value.
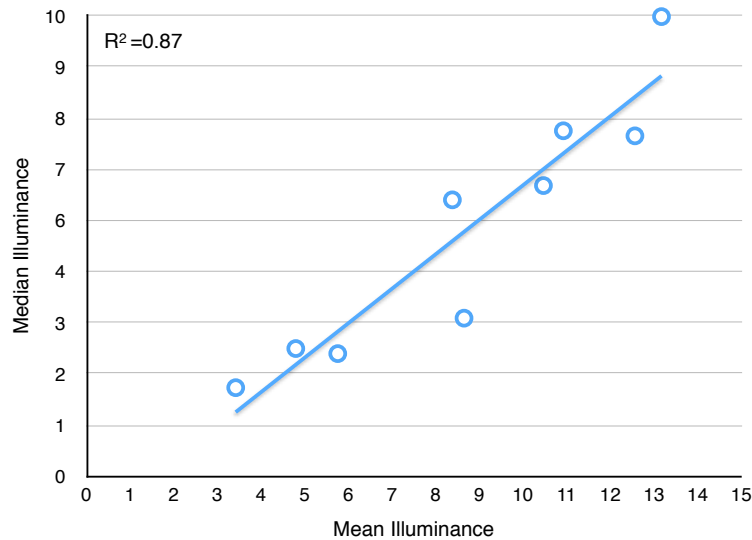
Figure 6.1. Correlation of mean and median illuminances using linear trend line.

The R^2 value is a numeric expression of how well the data fit the regression line, also known as the coefficient of determination. It is the percentage of the variability of the data which can be predicted by the model (the distance that the data points are from the line), and is used to explain how well a model fits a set of observations.

Throughout this chapter P values are calculated using the square root of the R^2 value given by the trend line and checked against critical absolute values of correlation coefficient (Crow, Davis et al. 1960).

6.2.4. Confirmation of variation in lighting levels between streets

Figure 6.2 plots a selection of measurements in order of increasing mean illuminance, to communicate the variation in the lighting conditions of the selected streets. This is necessary to find out whether light matters to pedestrian reassurance in real environments as if there were no difference between the lighting conditions on the streets, it would be impossible to explore the effect of lighting. Key pairs were selected on the basis of the author's subjective impression of a range of lighting conditions after visiting the streets (amongst other factors discussed in sections 5.3 and 5.5) because full measurements prior to the experiment start were not feasible in the time frame. Therefore this validation is critical. The range of lighting levels shown in Figure 6.2 validates the choice of key pairs of streets and shows the predictions described in the previous chapter, and reiterated in Table 6.6, to be correct. Streets s2, s3 and s6 have the highest mean and median illuminance and streets s5 and s8 the lowest. Connection lines

between points are used for graphical clarity rather than there being any connection between sites.
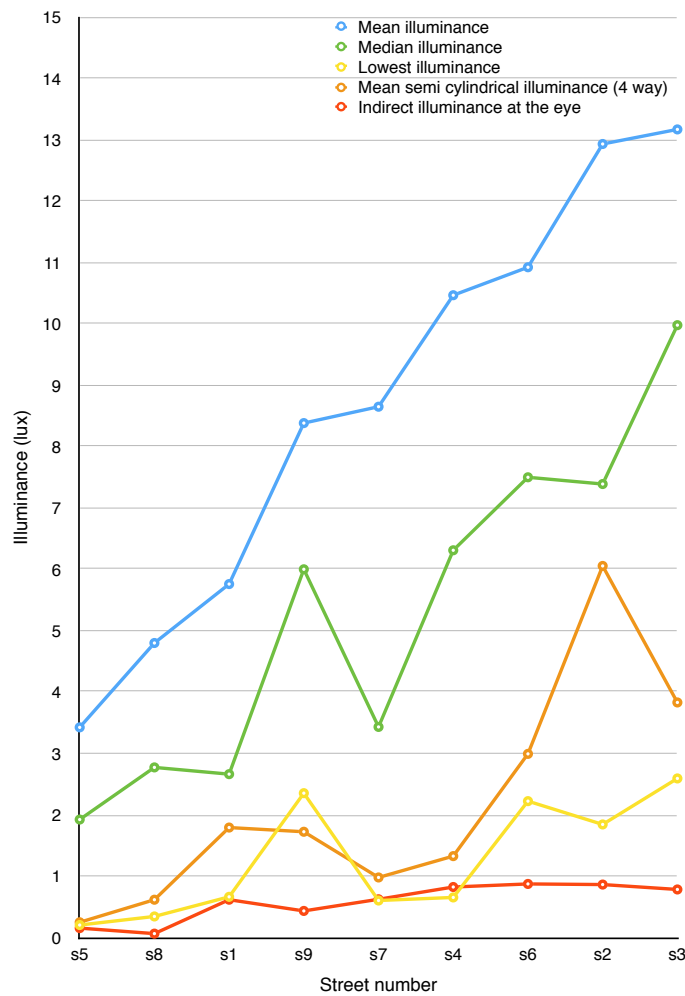
Figure 6.2. Selection of photometric measurements on streets. Shown in order of ascending mean illuminance. Connection lines are used the emphasise variability between sites, there is no relationship between data points.

Pair	Street	Street	Predicted higher mean illuminance	Confirm prediction?
1	William Street (s9)	William Street with sunglasses (s10)	s9	Yes
2	Collegiate Crescent (s4)	Park Lane (s5)	s4	Yes
3	Clarke Street (s2)	William Street (s9)	s2	Yes
4	Clarke Street (s2)	Wharncliffe Road (s8)	s2	Yes
5	Wharncliffe Road (s8)	William Street (s9)	s9	Yes
6	Broomhall Road (s1)	Collegiate Crescent (s3)	s3	Yes
7	Roscoe Road (s6)	St. Philip's Road (s7)	s6	Yes

Table 6.6. Confirmation of predicted variability in mean illuminance levels between streets.

16

6.3. Other noteworthy conditions of experiments
6.3.1. Familiarity

Study one identified that familiarity, which is the existing knowledge of conditions in an environment based on experience, had an effect on reassurance. In recognition of this participants were asked (1) whether they had visited the street before, and (2) if so, whether that fact affected their survey response in a negative or positive way. The purpose of (2) was to obtain a subjective impression of the street selected for the study.

It can be seen in Figure 6.3, that most people (89%) were familiar with the Arts Tower car park, probably because the Arts Tower is a university building prominent on the Sheffield skyline. The majority (82%) of participants were unfamiliar with the test streets. When those who remembered that they had had visited the streets before (18% of total) were asked whether that fact affected their survey response 47% said that it did.
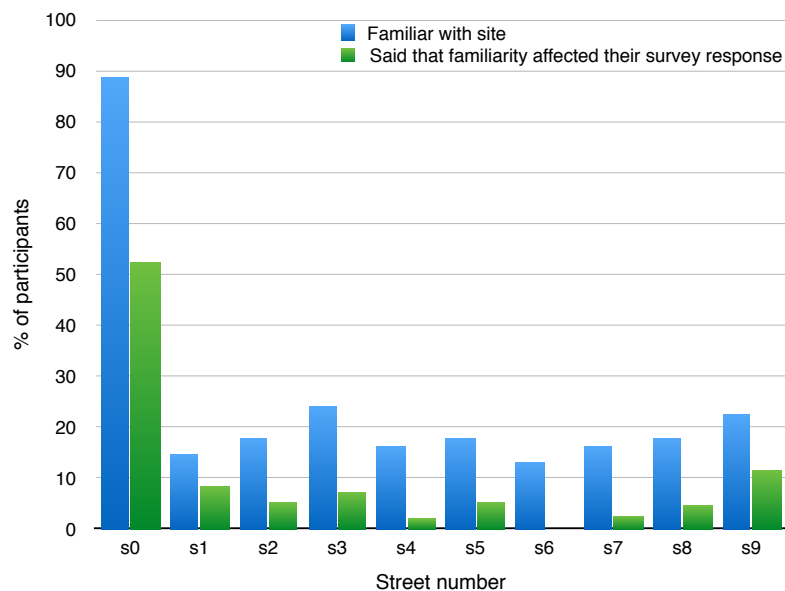
Figure 6.3. Percentage of participants familiar with sites and proportion who said that familiarity would affect their survey response. 0 refers to the Arts Tower car park.

When observing the effect of familiarity it is important to be aware that the number of participants who acknowledged an effect of familiarity (positive or negative) is relatively small. Figure 6.4 shows the streets on which familiarity had a positive effect and streets on which the effect was mixed. Examples given by participants of a positive effect of familiarity are "I have been here quite late alone several times and nothing has ever happened" and "I come here often and never had trouble". Examples of the negative effect are: "I've been told this area is quite dangerous" and "I remember there were gangs at night".
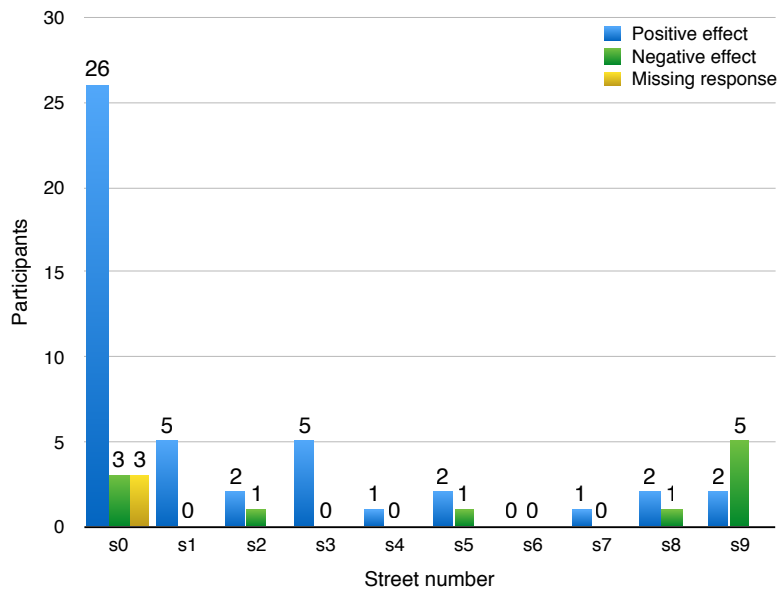
Figure 6.4. Effect of familiarity on participants. Self reporting of whether familiarity had a positive or negative affect.

Streets were partially selected on the basis of different distinct subjective feelings to the area which are listed on Table 5.1 Section 5.3. Within the very small numbers of people who gave their opinion, Figure 6.4 shows a variety of subjective impressions. Nobody familiar with street s1, s3 or s4 said that this would have a negative affect on their survey responses, whereas a higher proportion of people familiar with s9 said that familiarity had a negative effect on their responses. However, as the numbers who gave their subjective impressions are so small, it is impossible to draw conclusions regarding the successful selection of areas of mixed perceived safety. Interestingly, familiarity with s7 had a mostly positive effect on participants, which is different to the author's experience on an adjacent street in a pilot study in the area.

The bar charts shown here are based on findings from 62 participants because of an error on the surveys which meant that the question regarding familiarity was accidentally missed off for 15 out of 77 participants (group 2). As the graphs include the findings for the older group, and as the student groups were very similar in composition of people of a broad range of international backgrounds who had lived in Sheffield for the duration of their studies, this omission is not expected to have a significant effect as the data collected is representative of the data not collected.

6.3.2. Pedestrian and vehicular traffic

The use of day minus night safety rating enables the day safety rating to act as a control on the night safety rating, as the resultant value reflects the effect of lighting which is the only physical difference between day and night time conditions. One criticism of this approach is that there may be differences other than the physical, for example streets may have been busier during the day compared to the evening, and it is not known whether a decreasing safety rating is due to this, or a change in lighting conditions. One of the reasons that pedestrians may be more reassured during the day could be that if they are threatened, there may be more people around to help. At night, there are less people around therefore other other road users may be of more interest as there may be less informal surveillance from passers by. The number of people and vehicles using the street was recorded during the test times, along with weather conditions (Appendix C.7).

Figure 6.5 summarises the number of other pedestrians and passing vehicles recorded on the streets for all visits of all groups. There was an increase in passing pedestrians during the day compared to night on all streets except s7 and s10. On these streets the difference was less than six pedestrians. The largest differences (greater than 10 pedestrians) were on s1, s3 and s4. There was an increase in passing vehicles during the day compared to at night on all streets except s2 and s9, of a difference of 2, and 4 cars respectively. The only streets on which the increase in passing vehicles were more than 10 cars was s5. As s11 (s5 with sunglasses) was only visited at night comparisons can not be made between day and night conditions.
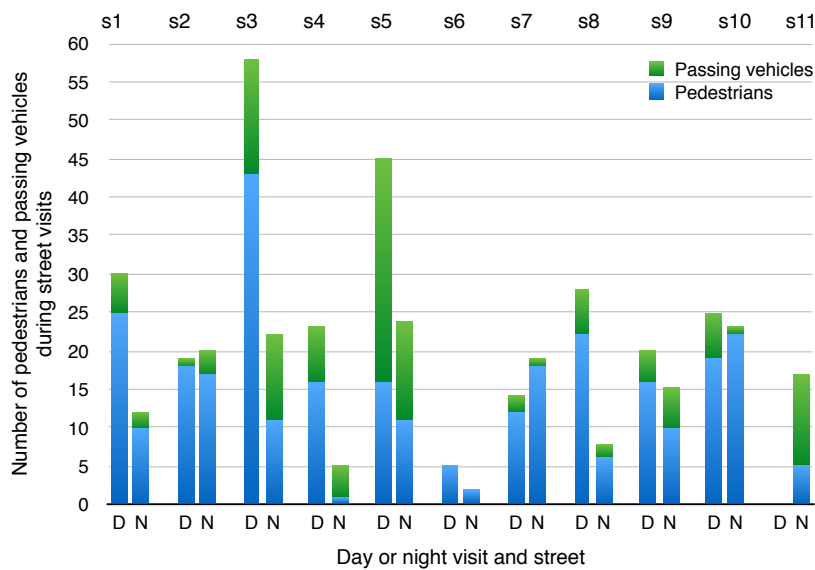
Figure 6.5. Numbers of other pedestrians and passing cars on the streets during the time taken to complete the route and fill in the surveys.

Figure 6.6 shows the same data for winter groups only, which follows the same pattern as for all data.
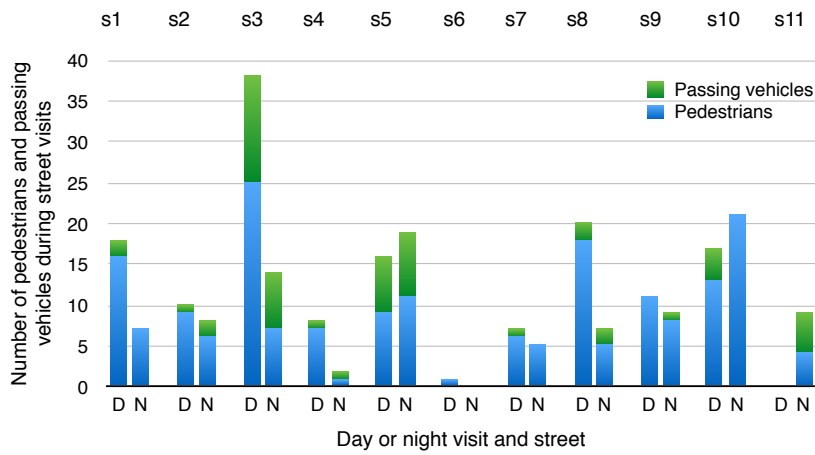
Figure 6.6. Numbers of other pedestrians and passing cars on the streets during the time taken to complete the route and fill in the surveys, for winter groups only.

Table 6.7 compares the predicted activity levels on the streets, to the recorded activity levels on the streets, using the winter data only. As there was a maximum difference (of both pedestrians and vehicles at night) on the same streets, of 12 (s9 & 10) this was used as the value over which a difference would be acknowledged, as that value may reflect the fluctuation in traffic possible within one street. Using this method, the predictions were confirmed for pair 2 at night, and pair 6 during the day, and all other pairs.

R²=0.74

Very risky 1 - 6 Not at all risky

Dangerous 1 - 6 Safe

R²=0.44

Very risky 1 - 6 Not at all risky

Dangerous 1 - 6 Safe
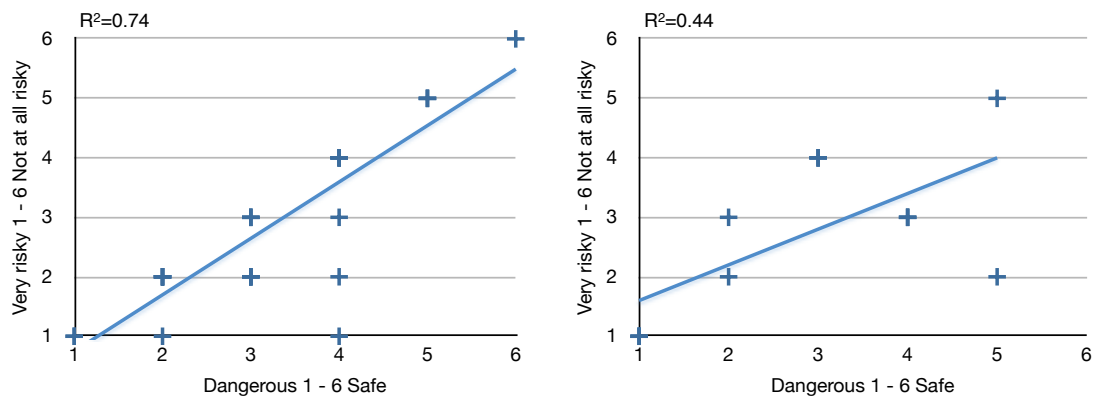
Pair	Street	Street	Predicted Activity levels on street (from Table 5.2).	Recorded higher activity level on street. Is this a difference of more than 12 (people and cars)?		Prediction confirmed?
				Day	Night	
1	William Street (s9)	William Street with sunglasses (s10)	Equal	No (difference of 6)	No (difference of 12)	Yes
2	Collegiate Crescent top end (s4)	Park Lane (s5)	s5	No (difference of 8)	Yes (difference of 17)	Yes at night
3	Clarke Street (s2)	William Street (s9)	Equal	No (difference of 1)	No (difference of 1)	Yes
4	Clarke Street (s2)	Wharncliffe Road (s8)	Equal	No (difference of 10)	No (difference of 1)	Yes
5	Wharncliffe Road (s8)	William Street (s9)	Equal	No (difference of 9)	No (difference of 2)	Yes
6	Broomhall Road (s1)	Collegiate Crescent bottom end. (s3)	s3	Yes (difference of 20)	No (difference of 7)	Yes during the day
7	Roscoe Road (s6)	St. Philip's Road (s7)	Equal	No (difference of 6)	No (difference of 5)	Yes

Table 6.7. Activity levels on street.

6.4. Normality of data

The Central Limit Theorem on which probability theory is based assumes the normal distribution of random variables. Normal distribution means that the data follows a "normal" pattern resulting in a histogram of the values forming a bell shaped curve (Field 2005). It is important to establish whether the data is normally distributed because this affects the choice of statistical test.

Three ways of testing normality of the answer to the safety question were used. Firstly, the Shapiro-Wilk test, secondly histograms were plotted to see if a bell shaped curve was formed, and thirdly by examining the residuals. A residual is the difference between the observed value for each individual and the mean of the group fitted by the model. Previous research has used the variance of the residuals to estimate between subject variability against which to evaluate between group variance (Altman 1991). The distribution of the residuals matters, because they reflect the random part of the model.

The data failed the Shapiro-Wilk test on the whole dataset which means significant evidence against normality ($p = <0.05$), however this is to be expected as the streets are different to each other. Histograms were plotted breaking down the data by day/night and by street. They revealed a range of rough rather than neat bell shaped curve, examples are given in Figure 6.7. A repeated measures ANOVA can be used if data is not normally distributed as long as the residuals (observed value minus the fitted value) are normally distributed (Altman 1991). Q-Q plots plot the residuals against the model data. It can be seen that the residuals are very near-normally distributed because they are very close to the line (Figure 6.7). In conclusion, the data is not normally distributed however the residuals are. Therefore statistical tests chosen assume normality. In some cases non parametric tests are also used as a means of comparison.
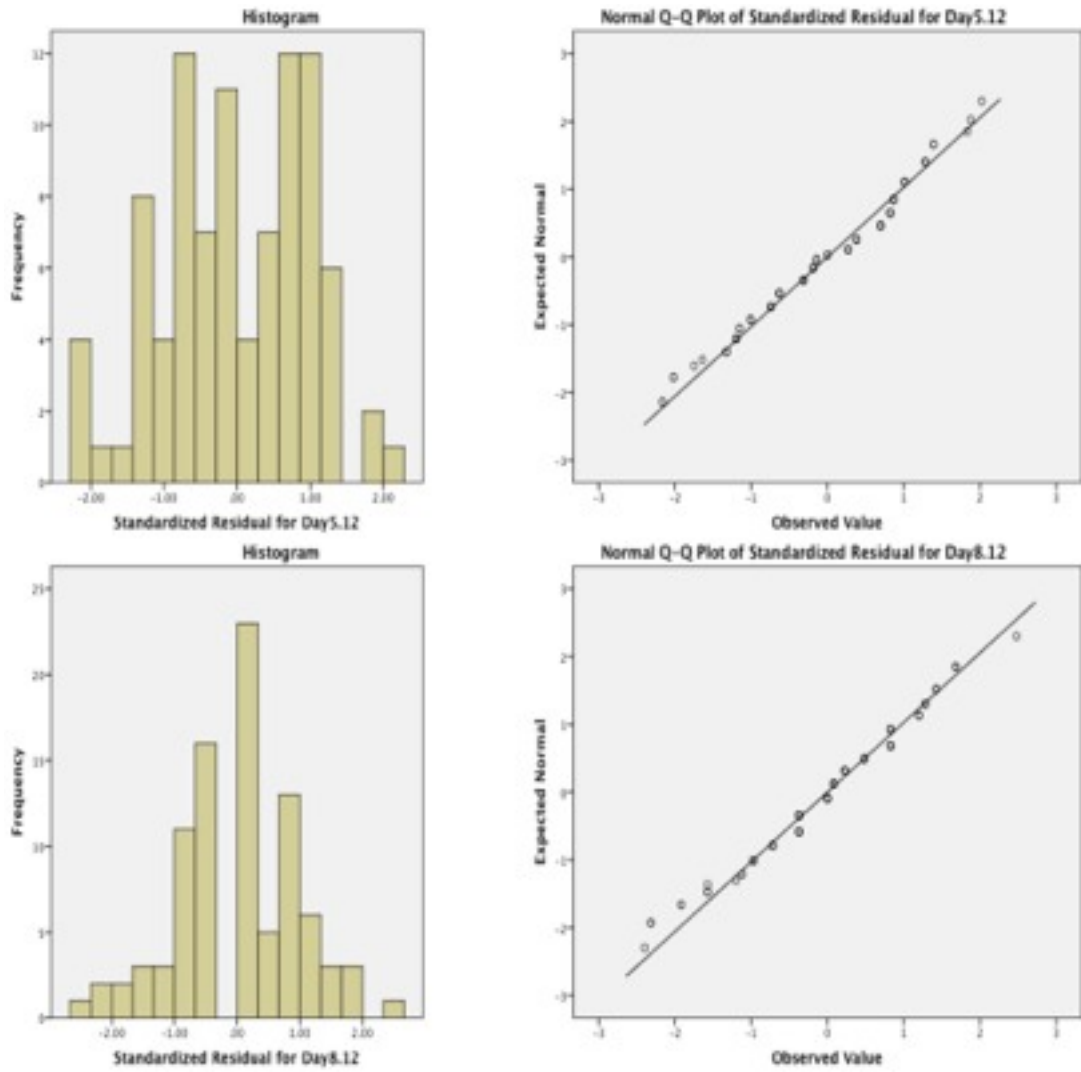
Figure 6.7. SPSS plots showing examples of histograms and distribution of residuals on two streets during the day.

6.5. Mean safety ratings on each site
6.5.1. Safety and risk correlation

Both perceived safety and perceived risk could be seen as being synonymous with pedestrian reassurance or lack thereof. Two questions "How safe do you feel this area is?" and "How risky do you think it would be to walk alone here at night?" were included to address both perceived safety, and perceived risk, after Boyce et al.. A correlation between the two scores was analysed to ascertain whether it mattered which variable was chosen for further analysis. Figure 6.8 shows a strong correlation between mean safety scores and mean risk scores. It can be seen that the day and night time data follows a slightly different pattern.
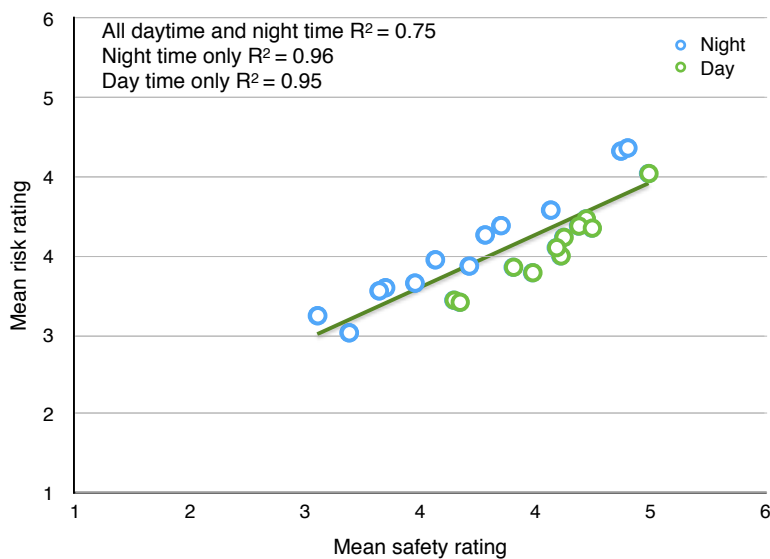
Figure 6.8. Correlation between mean safety and mean risk ratings at night and during the day.

These findings were supported by a Pearson correlation (parametric test) between all daytime and night time answers to the safety and risk questions which showed the correlation to be significant to the $p \leq 0.01$ level. Kendall's Tau and Spearman's rho (non-parametric tests) showed the same level of significance. Therefore the safety ratings were so closely correlated to risk ratings that these items did not need to be analysed separately. Following this validation safety ratings were judged to be robust enough to be used for further analysis in this study.

In order to demonstrate the range of values which inform the $p \leq 0.01$ result, Figure 6.9 gives an example of a high correlation between safety and risk on street 11 for groups 1 and 2 (student groups), and a lower correlation for group 3 (older group).
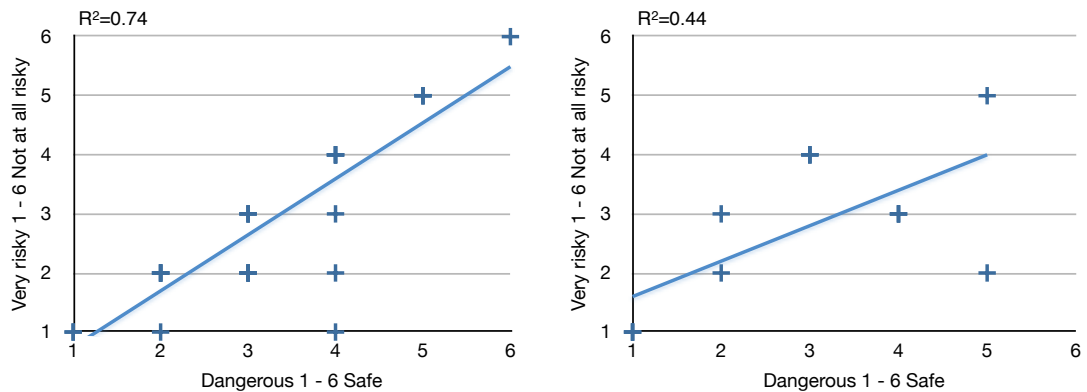
Figure 6.9. Night time safety and risk correlation for student winter groups 1 & 2 (left, comprising 31 points of higher correlation) and older group 3 (right, comprising 15 points of lower correlation), on street 11.

6.5.2. Mean safety ratings of winter groups

From this point, until Section 6.10 (difference between groups), all data analysed refers to the winter groups only. Summer data are excluded from this analysis because they test different hypotheses, firstly in variation in lighting level (group 4) and secondly in time of day (group 5).

Figure 6.10 shows mean safety scores for the winter groups during the day and at night. Participants rated all streets except s3 to be safer during the day than at night. A variation in safety ratings across streets is observed. Street s11 (Park Lane wearing low transmission glasses) was not visited during the day therefore this value is missing from Figure 6.10.The Arts Tower car park where the practice survey took place is s0.
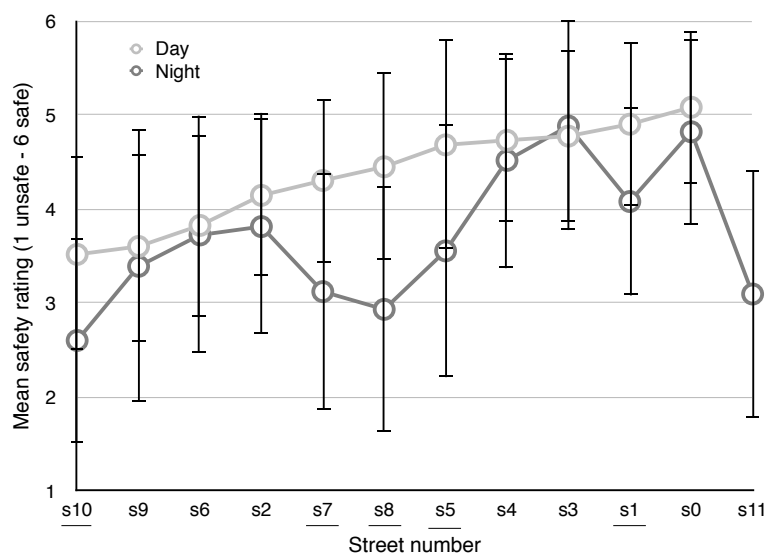
Figure 6.10. Mean safety ratings on all streets in order of ascending day safety rating. S0 denotes the Arts Tower car park. Line under street number on the X axis indicates a street with a median illuminance of less than 3.5 lux. Error bars denote standard deviations.

The lines move independently of each other which indicates that the change between perceived safety during the day and night is not consistent between streets. The five streets which appear to have the largest difference between day and night safety rating are s10, s7, s8, s5 and s1. These also have the lowest median illuminances (below 3.5 lux, Table 6.1).

6.5.3. Difference in day minus night mean ratings of perceived safety

Figure 6.11 shows that the highest day minus night safety ratings are on streets s1, s5, s7, s8 and s10. The higher the length of the bar, the higher the day minus night safety rating, unless the bar is shaded grey in which case the day minus night safety rating is a negative value, which means that the day rating is lower than the night rating. This demonstrates a trend towards larger day minus night rating on streets with the lowest median illuminance levels which are s5, s8, s10 when compared to streets with higher median illuminance levels which are s2, s3 and s6.
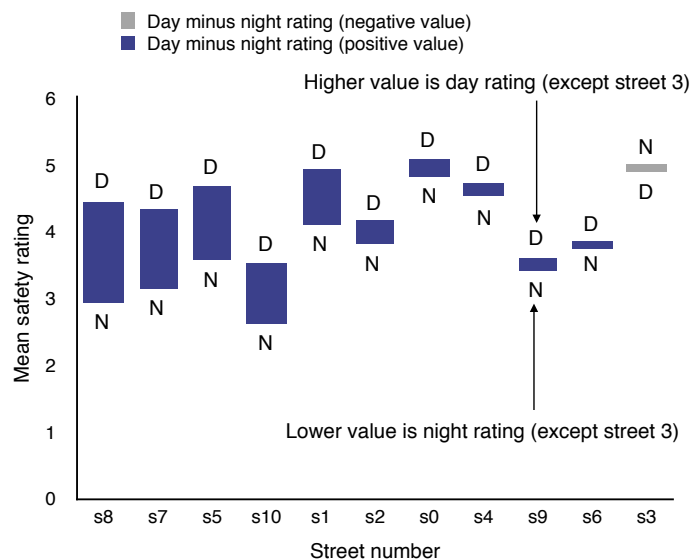
Figure 6.11. Mean day minus mean night safety ratings on each street in order of descending D-N value.

6.5.4. Mean and median safety ratings

One potential problem of using a mean value, is that extremely anxious or confident people in the group could skew the results by scoring the extremes. Therefore the median safety ratings were also abstracted from the dataset and plotted against mean safety ratings in Figure 6.12.
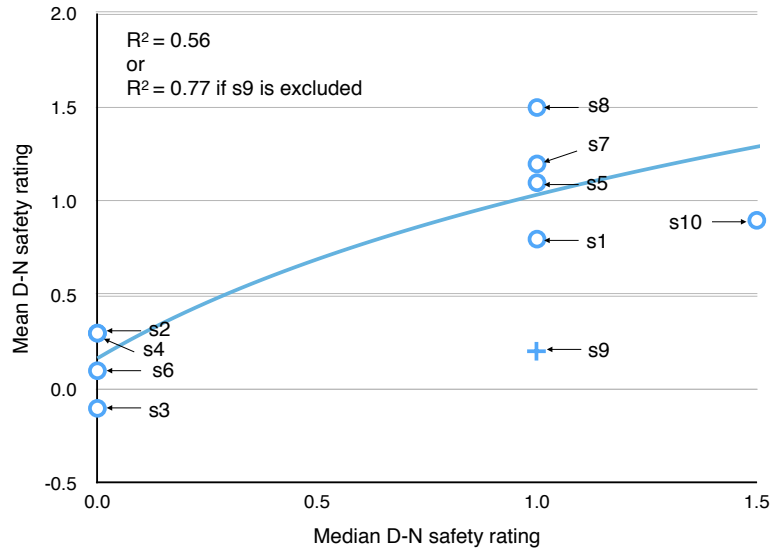
Figure 6.12. Median and mean day minus night safety ratings.

Figure 6.12 shows that the only road on which the mean and median did not follow the same pattern was s9. This is because the median split occurred on the borderline between two scores (Figure 6.13). As the median and the mean are otherwise clustered as expected, this exercise validates the use of the mean throughout.
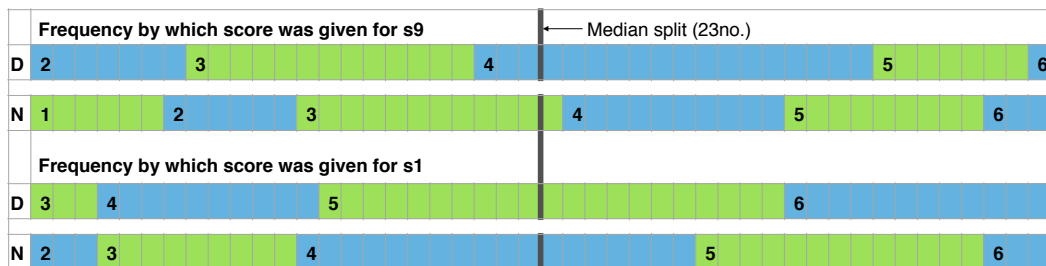
Figure 6.13. Demonstrating the difference between where the median split falls for s9 and s1.

6.6. Is the difference in safety ratings between streets significant?

The previous two sections have discussed an observable range in safety ratings between streets during the day and at night. In order to determine whether these differences are significant, a repeated measures ANOVA pairwise comparison was completed. Table 6.8 summarises the results of the analysis, identifying differences in the safety ratings of pairs of streets, and highlighting where these differences are significant.

Sidak correction

The Italian mathematician Cardano was first recorded to have made the observation that uncertainty decreases as the number of observations increases (Mlodinow 2008). This is otherwise known as the law of large numbers which addresses the concept that the more something is done, the lower the likelihood that outliers are reflected in the average. This breaks down the concept of independence on which probability theory is based. Therefore adjustment for the number of comparisons is required is to remove type 1 and type 2 errors (incorrect assumptions that differences do or do not exist). The Sidak correction was used to compensate for this.

Street		s0	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10
s1	Night	↑ **0.006**										
	Day	n.s. >1.000										
s2	Night	↑ **0.001**	n.s. >1.000									
	Day	↑ **<0.001**	↑ **<0.001**									
s3	Night	n.s. >1.000	← **0.001**	← **<0.001**								
	Day	n.s. 0.957	n.s. >1.000	← **0.003**								
s4	Night	n.s. 0.999	n.s. 0.451	n.s. 0.134	n.s. 0.968							
	Day	n.s. 0.721	n.s. >1.000	← **<0.001**	n.s. >1.000							
s5	Night	↑ **<0.001**	n.s. 0.111	n.s. >1.000	↑ **<0.001**	↑ **0.002**						
	Day	n.s. 0.781	n.s. 0.990	n.s. 0.780	n.s. >1.000	n.s. >1.000						
s6	Night	↑ **<0.001**	n.s. 0.921	n.s. >1.000	↑ **<0.001**	↑ **0.033**	n.s. >1.000					
	Day	↑ **<0.001**	↑ **<0.001**	n.s. 0.985	↑ **<0.001**	↑ **<0.001**	↑ **0.001**					
s7	Night	↑ **<0.001**	↑ **<0.001**	n.s. 0.053	↑ **<0.001**	↑ **<0.001**	n.s. 0.476	n.s. 0.464				
	Day	↑ **<0.001**	↑ **0.013**	n.s. >1.000	n.s. 0.171	n.s. 0.378	n.s. 0.812	n.s. 0.338				
s8	Night	↑ **<0.001**	↑ **<0.001**	↑ **0.002**	↑ **<0.001**	↑ **<0.001**	↑ **0.013**	n.s. 0.056	n.s. >1.000			
	Day	↑ **0.014**	n.s. 0.091	n.s. 0.920	n.s. 0.836	n.s. 0.910	n.s. 0.986	← **0.027**	n.s. >1.000			
s9	Night	↑ **<0.001**	↑ **0.033**	n.s. 0.862	↑ **<0.001**	↑ **<0.001**	n.s. >1.000	n.s. >1.000	n.s. >1.000	n.s. 0.734		
	Day	↑ **<0.001**	↑ **<0.001**	↑ **0.004**	↑ **<0.001**	↑ **<0.001**	↑ **<0.001**	n.s. >1.000	↑ **<0.001**	↑ **<0.001**		
s10	Night	↑ **<0.001**	↑ **<0.001**	↑ **<0.001**	↑ **<0.001**	↑ **<0.001**	↑ **<0.001**	↑ **<0.001**	n.s. 0.348	n.s. 0.961	↑ **<0.001**	
	Day	↑ **<0.001**	↑ **<0.001**	↑ **0.006**	↑ **<0.001**	↑ **<0.001**	↑ **<0.001**	n.s. 0.996	↑ **<0.001**	↑ **<0.001**	n.s. >1.000	
s11	Night	↑ **<0.001**	↑ **<0.001**	n.s. 0.189	↑ **<0.001**	↑ **<0.001**	↑ **0.040**	n.s. 0.490	n.s. >1.000	n.s. >1.000	n.s. >1.000	n.s. 0.917

Key

↑   Arrow points in direction of safer street as identified in header.

Analysis identifies night/day difference on street for groups 1,2,3.

Bold means a significant difference to $p \leq 0.05$ level.

Table 6.8. Difference between winter safety ratings of streets at night and during the day.

6.6.1. Confirmation or rejection of hypothesis based on significance of differences between streets

Table 6.8 showed where significant differences exist in the perceived safety between streets, during the day and at night. The values on this table are used to determine whether the hypotheses tested, are shown to be true or not. Table 6.9 is a duplicate of Table 5.2, section 5.5, identifying the hypotheses tested by the key pairs. The main hypothesis tested is that light matters to pedestrian reassurance within key pairs of streets described in Section 5.5. As the differences between streets in terms of activity, presence of accessible residences and absence of hiding places are not possible to identify using statistics, these have been replaced in Table 6.10 by the daytime safety difference between streets as this has been proved using a repeated measures ANOVA (Table 6.8).

			Street preference if the following matter most:				
Pair	Street	Street	Illuminance levels - Horizontal	Activity levels on street	Presence of accessible residences	Absence of hiding places	Hypothesis
1	William Street (s9)	William Street with sunglasses (s10)	s9	Equal	Equal	Equal	If light matters (H1) s9 is significantly safer at night.
2	Collegiate Crescent top end (s4)	Park Lane (s5)	s4	s5	Equal	Equal	If light matters (H1) s4 is significantly safer at night.
3	Clarke Street (s2)	William Street (s9)	s2	Equal	Equal	s9	If light matters (H1) s2 is significantly safer at night.
4	Clarke Street (s2)	Wharncliffe Road (s8)	s2	Equal	Equal	Equal	If light matters (H1) s2 is significantly safer at night.
5	Wharncliffe Road (s8)	William Street (s9)	s9	Equal	Equal	s9	If light matters (H1) s9 is significantly safer at night.
6	Broomhall Road (s1)	Collegiate Crescent bottom end. (s3)	s3	s3	Equal	Equal	If light matters (H1) s3 is significantly safer at night.
7	Roscoe Road (s6)	St. Philip's Road (s7)	s6	Equal	s7	s6	If light matters (H1) s6 is significantly safer at night. If light compensates for no access to help participants will prefer s6 (H2).

Table 6.9. Street choice hypotheses. This is a duplicate of Table 5.2 in Section 5.5.

Table 6.10 uses the results shown in Table 6.8 to confirm or reject the hypotheses. It can be seen that hypothesis one, that light matters (H1), was confirmed on four occasions and rejected on three occasions. Twice, (pair 3 and pair 5) when there was a significant difference during the day between the perceived safety on the streets being compared, and once (pair 7) when there were no accessible residences fronting the pavement. Pair 5 supports previous

159

findings that in an area which is perceived to be less safe than another during the day, higher illuminances do not increase perceived safety (Mansfield and Raynham 2005). Pair 3, is more difficult to explain because it is expected that an area which has a higher recorded mean illuminance and is perceived to be more safe during the day, would also be perceived to be significantly safer at night. The reason for there being no significant difference between the streets at night is unclear, it could be due to the close vicinity of a street perceived to be less safe during the day as found in previous research (Fisher and Nasar 1992), however the effect of this is unknown and not measured in this experiment. Pair 7, rejects hypothesis 2, that light compensates for no access to help. It is interesting to note that the differences between s9 and s10 (pair 1) are significant at night however not during the day.

Pair	Street	Street	Higher mean horizontal illuminance	Higher perceived safety during day	Hypothesis	Result (street safer at night)	Confirm or reject hypothesis
1	s9	s10	s9	n.s.	If light matters (H1) s9 is significantly safer at night.	s9	Confirm
2	s4	s5	s4	n.s.	If light matters (H1) s4 is significantly safer at night.	s4	Confirm
3	s2	s9	s2	s2	If light matters (H1) s2 is significantly safer at night.	n.s.	Reject.
4	s2	s8	s2	n.s.	If light matters (H1) s2 is significantly safer at night.	s2	Confirm
5	s8	s9	s9	s8	If light matters (H1) s9 is significantly safer at night.	n.s.	Reject.
6	s1	s3	s3	n.s.	If light matters (H1) s3 is significantly safer at night.	s3	Confirm
7	s6	s7	s6	n.s.	If light matters (H1) s6 is significantly safer at night. If light compensates for no access to help participants will prefer s6 (H2).	n.s.	Reject H1 & H2

n.s.   No significant difference.

Table 6.10. Street choice hypotheses.

To summarise, the hypothesis that light matters was confirmed except in cases where:

1) The street with higher measured illuminance at night is perceived to be significantly less safe during the day.

2) The street with higher measured illuminance at night has no access to help.

3) The street with higher measured illuminance at night is adjacent to a street perceived to be significantly less safe during the day.

This suggests that higher illuminances do not make a significant difference if an area is perceived to be less safe during the day, and do not compensate for no access to help.

6.6.2. Is there a significant difference between day and night safety ratings on streets?

A difference between night and day responses implies an effect of lighting, as this is the consistent difference between night and day. A within street comparison of day and night safety ratings is necessary to identify the streets on which conditions are perceived to be significantly different between day and night. Streets on which there is no difference means that the lighting conditions may contribute to similar reassurance levels between day and night.

Whether the safety levels on the streets were judged to be different during the day and at night is summarised in Table 6.11, using both parametric and nonparametric tests to see whether the type of test makes any difference to the p value.

As a rule of thumb used in this situation only, if the p value is ≤0.025 above 0.05, then it is identified as "approaching significance". Therefore, based on the test results shown in Table 6.10, all streets show a significant difference between day and night safety ratings, except streets s3, s6 and s9. The results show a small difference in p value depending on whether a parametric or non-parametric test is used.

Street	Paired samples t-test (Parametric test) P value	Wilcoxon Signed Ranks Test (Non parametric test) P value	Significant difference between day and night ratings?
s1	**<0.001**	**<0.001**	
s5	**<0.001**	**<0.001**	
s7	**<0.001**	**<0.001**	**Highly significant**
s8	**<0.001**	**<0.001**	
s10	**<0.001**	**<0.001**	
s2	**0.046**	*0.061*	
s4	*0.052*	**0.044**	*Approaching significance*
s0	*0.070*	*0.063*	
s3	0.481	*0.578*	
s6	0.647	0.843	Not significant
s9	0.304	0.310	

Key: **Bold** means significant to the p<0.05 value.

         Bold italics means approaching significance to the p<0.05 value.

         Light font means not significant.

Table 6.11. Comparison of the difference between day and night safety ratings using parametric and non parametric tests.

6.6.3. Sorting of day minus night safety ratings

Having adopted the method of using a D-N safety score to give a numeric expression of the effect of changes at night, the critical question is of what deviance from a D-N value of zero is acceptable. Boyce et al. used a seven point scale and this study used a six point scale. Therefore the 1-7 data was mapped on to a 1-6 scale using an equation for the straight line between the plotted points (1,1) and (7,6). These updated values are discussed below.

As a first step in determining on which street lighting may have the most effect, the streets were sorted into those which had the highest and lowest D-N safety ratings, within an equal division of the upper and lowest value. Table 6.12 provides a reminder of the D-N values on residential streets. Table 6.13 to be read in conjunction with Figure 6.14 shows which streets fall into which half, tertile or quartile and explores how the division of values can influence the conclusions drawn. For example, if 1 is seen to be acceptable, then the streets with the top tertile of D-N ratings (sB, Figure 6.14) would be seen to be streets on which lighting conditions have an effect. Streets s5, s7 and s8 fall in the upper quartile of the range of differences between all streets, and streets s3,s4,s6 and s9 fall into the lower quartile (see column sA, Figure 6.14).

Street	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10
D-N	**0.83**	**0.33**	-0.11	**0.28**	**1.13**	0.09	**1.17**	**1.51**	0.20	**0.91**

* **Bold** means statistically significant difference between mean day/night safety score on streets.

Table 6.12. Summary of mean D-N safety ratings for winter groups. These values are used to divide the data in Table 6.13, and are residential data plotted in Figure 6.14.

On the residential streets selected for this study, the maximum deviation of D-N value from zero is 1.51 (Table 6.12). The whole range of day minus night safety ratings is 1.62. Therefore 0.53 is a third of the maximum difference, and 0.8 a half. If up to a half of the maximum range is acceptable then 0.7 (the lowest score plus 0.8) would be the cut-off point for acceptability. In field study 3 by Boyce et al. the range of D minus N safety rating is 3.1 in suburban areas and 3 in urban areas, which is about twice that in this study. Boyce et al. observed that above 10 lux the difference between day and night safety rating was less than one scale point (on a seven point scale) and that above 30 lux the difference was less than half a scale point. On a comparable 6 point scale, 1 scale point would translate to 0.83 and half a scale point to 0.42. When the original scale is matched to a 0-6 point scale, 1 scale point and 0.83 scale point fall into the bottom quartile of D-N differences of both suburban and urban car parks, and half a scale point and 0.415 scale point fall into the bottom eighth, whereas for the residential study one scale point (on a 6 point scale) falls into the top third or top half of D-N differences and 0.5 falls into the bottom half or mid tertile on residential streets (sB, sC, Figure 6.14). In the Boyce et al. study, 0.83 scale point is 2.57 scale points from the maximum difference between day and night safety ratings, using the matched scale. In this study, one scale point is only about half a scale point from the maximum. Therefore, as the differences in this study are much smaller, the divisions are also much smaller. It is important to be aware of the importance placed on very small differences for the purpose of this discussion. As mentioned previously, the fact that the differences are small does not mean that they are not significant (Table 6.11). Dividing the streets into those with significant and not significant differences between day and night ratings as discussed previously provides another means of sorting the D-N values and would mean a cut-off point somewhere between 0.2 and 0.28. As the results for residential areas are discussed in the following sections, reference is made to around one scale point (any value greater than 0.8 scale point, comfortably falling into the top half (column sC)) and half a scale point (which is less than 0.4 scale point), and significant/not significant differences between day and night.

	Street in:	Upper quartile	Upper tertile	Upper half	Lower quartile	Lower tertile	Lower half
Range of differences between all streets		1.619	5,7,8	5,7,8	1,5,7,8,1	3,4,6,9	2,3,4,6,9	2,3,4,6,9

Table 6.13. Summary of where mean D-N safety ratings for winter groups fall within the range of differences (to be read in conjunction with Figure 6.14).
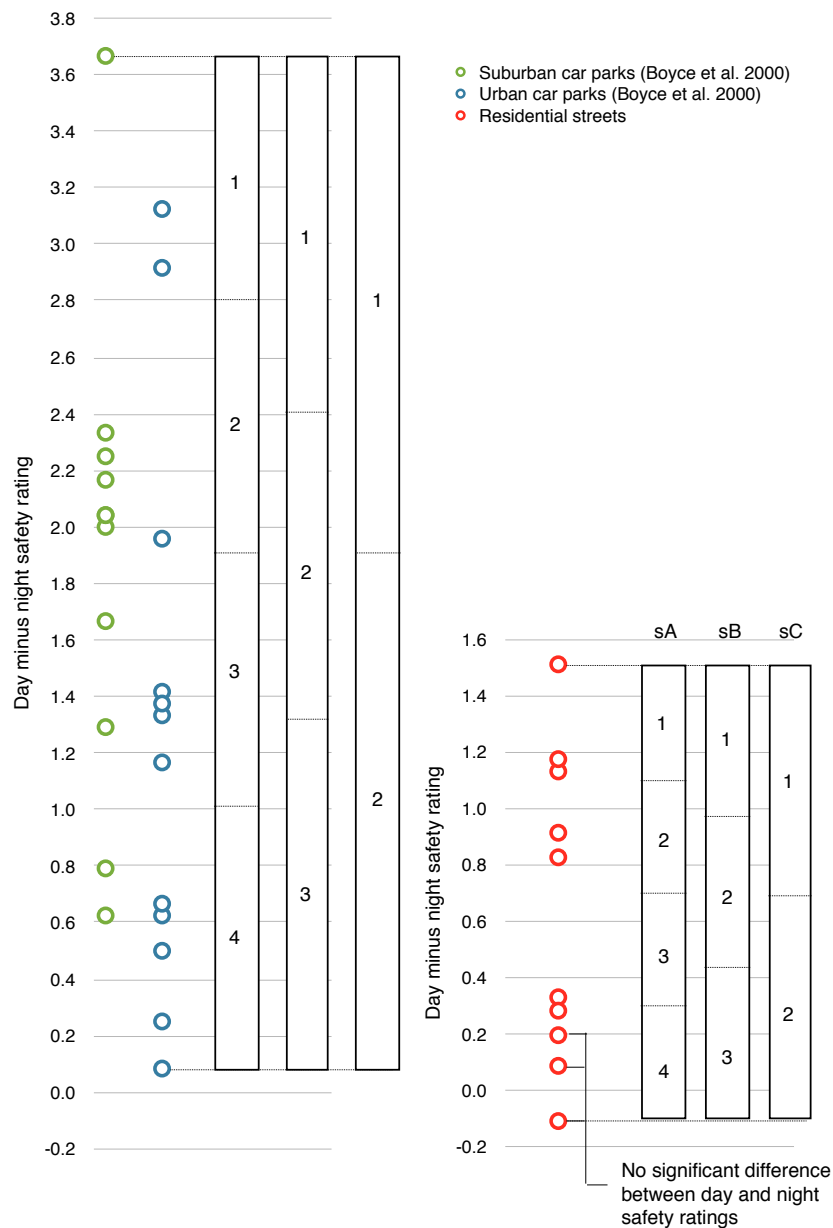
Figure 6.14. Range of differences between residential street and car park D-N safety ratings, to be read in conjunction with Table 6.12.

6.7. Perceived access to help

Perceived access to help may affect how participants rate the safety of a street (Jacobs 1961). This was acknowledged and addressed in the survey question "Do you think there are other people who could come to your assistance should you encounter trouble on the street?" the aim of which was to provide a judgement of whether people are nearby, and if so, their capability to provide assistance if needs be. This is referred to as the presence of assistance rating, and is synonymous with perceived access to help. Figure 6.15 presents the results of the day and night time mean answers to the assistance question.

g to make not
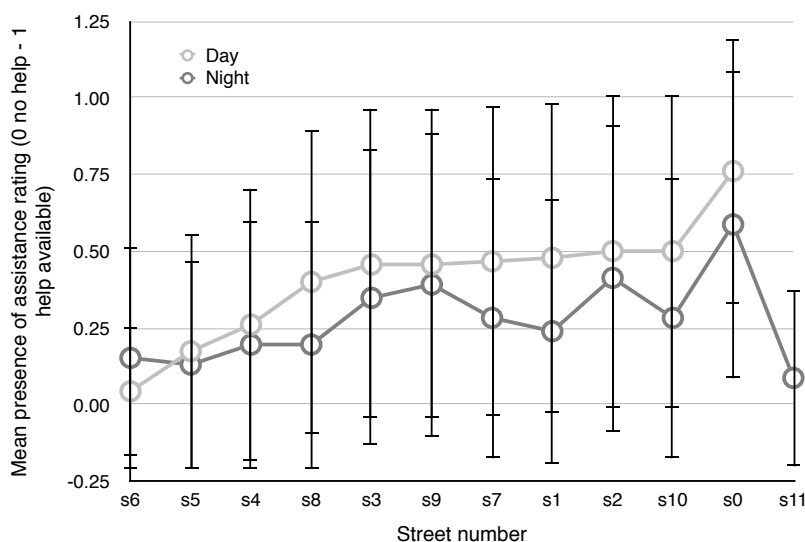
Figure 6.15. Mean presence of assistance rating in ascending by day rating order.

Both streets s7 and s1 were reported anecdotally by a couple of participants as being "rough" areas because of the presence of a block of flats on s1 and the perception of the residents on s7 not being friendly therefore possibly not a source of help. The fact that streets s7 and s1 rank highly during the day shows that the streets are not perceived to have less access to help during the day, when compared to other streets. However at nighttime, the perception changes and they are perceived to have less access to help. This could be partly because these streets are quiet at night (see Figure 6.5). Half as many cars and pedestrians were counted on s1 at night, compared to during the day whereas s7 was relatively quiet during the day and night, suggesting that perceived access to help could also be related to lighting conditions, regardless of other pedestrians on the street.

Figure 6.16 plots the difference in day and night time presence of assistance ratings (D-N), which is the gap between values given on Figure 6.15. It also plots the difference in day minus night safety rating as a means of comparison. Although both s7 and s1 fall into the top four streets with the highest D-N access to assistance score, it can be seen that when compared to the mean safety score, there is very little difference between perceived access to help during the day and night on the same street. The almost horizontal line of day minus night time presence of assistance ratings demonstrate that perceived access to help is almost constant

6

between streets when compared to perceived safety. The pattern of change between the two variables is different, inferring no consistent relationship and that the safety rating is independent of access to assistance rating.
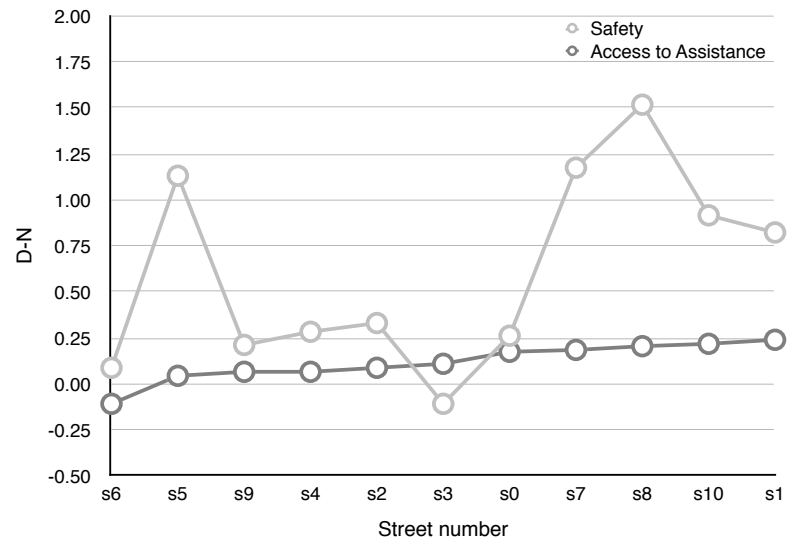
Figure 6.16. Difference between means of D-N presence of assistance rating, plotted in ascending order, along with D-N safety rating, for comparison.

7

6.8. To what extent is D-N safety rating explained by answers to street lighting questions?

Figure 6.17 plots the mean score of the lighting questions and the mean D-N safety rating on each street. Observation of the graph reveals that the mean answers to the lighting questions mirror the D-N safety rating, showing a negative correlation, except for the question regarding the glaring or not glaring appearance of the environment where the points move independently of other lighting parameters and D-N safety rating.
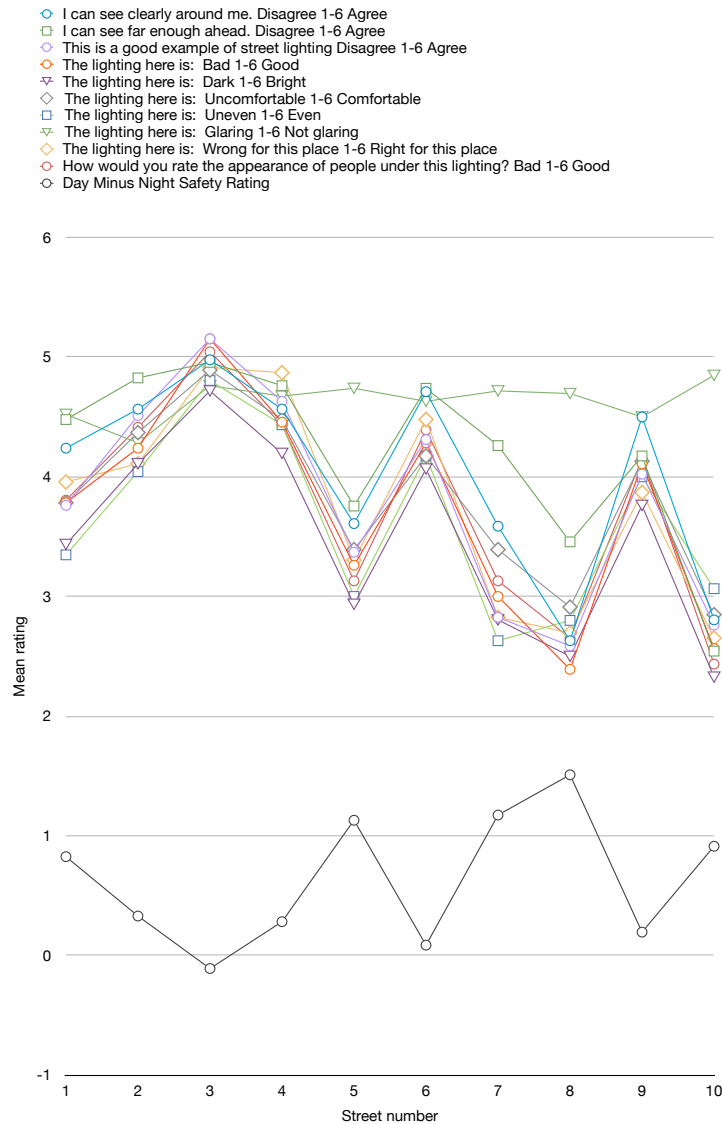
Figure 6.17. Mean answers to lighting questions and D-N safety rating on each street.

A two tailed Pearson's correlation between the mean scores of the lighting questions for the winter groups and D-N safety rating found high correlation coefficients for all questions except two. This shows that lighting conditions highly explain the variation in D-N safety ratings. The questions in Table 6.14 are arranged according to the strength of the correlation coefficient. The highest correlation coefficient and intraclass correlation exists between "The lighting here is: Uneven/Even" and the mean difference between day and night safety ratings.

Question	Correlation Coefficient (with D-N safety rating)
The lighting here is: Uneven/Even	-0.956
The lighting here is: Bad/Good	-0.925
This is a good example of street lighting.	-0.920
The lighting here is: Dark/Bright	-0.913
How would you rate the appearance of people under this lighting? Bad/Good	-0.907
The lighting here is: Uncomfortable/Comfortable	-0.904
I can see clearly around me.	-0.896
The lighting here is: Wrong/Right	-0.880
I can see far enough ahead.	-0.666
The lighting here is: Glaring/Not glaring	0.317

Table 6.14. Summary of correlation coefficients between lighting parameters and D-N safety rating.

6.9. Day minus night mean ratings of perceived safety plotted against lighting

The purpose of a trend line is to present a model which best fits the pattern of points given by the dataset. A trend line only represents the data which has been collected. Although in some cases a linear trend line fit the data better than a logarithmic trendline (for example D-N plotted against median and mean illuminance), a logarithmic trendline was selected for use throughout the thesis because it has more applicable meaning than a linear trendline because it can be used to explain data which falls outside the trendline.

For example, if other streets had been selected and were added to the dataset then they could follow the pattern predicted by a logarithmic trendline. They could not follow a pattern predicted by a linear trend line because the point after which the trendline hits the X or Y axis becomes irrelevant in explaining the data. For example, a D-N value of less than zero is not a useful as a higher night rating than day will never be due to street lighting which cannot compete with the illuminance and uniformity provided by the sky in daytime. Likewise, illuminance conditions of street environments are not cut-off at an arbitrary point where the trend line hit the x axis.

6.9.1. Median horizontal illuminance

Figure 6.18 shows the results of day minus night safety rating plotted against median illuminance. This follows the trend of existing research illustrating increasing day minus night safety rating as median horizontal illuminance levels decrease (Boyce, Eklund et al. 2000). The graph shows two clusters of points. The higher cluster is formed of streets s1,s5,s7,s8 & s10 which all have a day minus night safety rating of around one to one and a half scale points. All median illuminance values are below 3.5 lux for this group. The second lower cluster of day minus night safety ratings is formed of D-N safety ratings below 0.5 points for median illuminance values of 6 lux or more. These results could be used to suggest that lighting makes a difference to reassurance somewhere between median illuminances of 3.5 and 6 lux. However caution should be exercised if recommended median illuminances are to be extrapolated from these results, because as evident by observing the x axis, no median horizontal illuminance values fell between 3.5 and 6 lux therefore it is not known whether had they done so, they would have followed the same pattern.
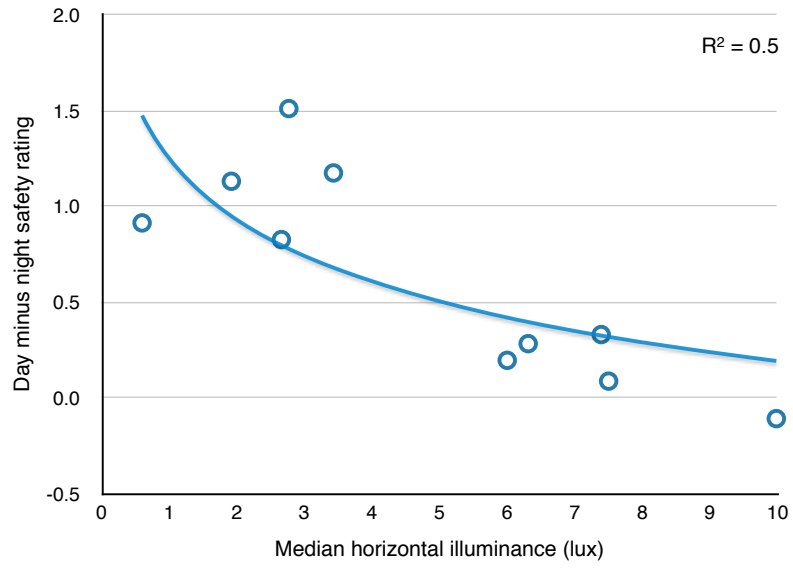
Figure 6.18. Day minus night mean safety rating and median illuminance.

6.9.2. Semi cylindrical illuminance

Semi-cylindrical illuminance at a point is specified as 1.5 metres above the pavement surface facing parallel to both directions of traffic flow (BS EN 13201-3 2003) and recommended in areas of potential threat, as defined by a risk assessment (BS 5489-1:2013). Semi-cylindrical illuminance was recorded in four directions, the relevant measurement to the standard is that facing towards the survey filling in point (direction A, Figure 6.19) as this shows the amount of light which would fall on an oncoming pedestrian's face.
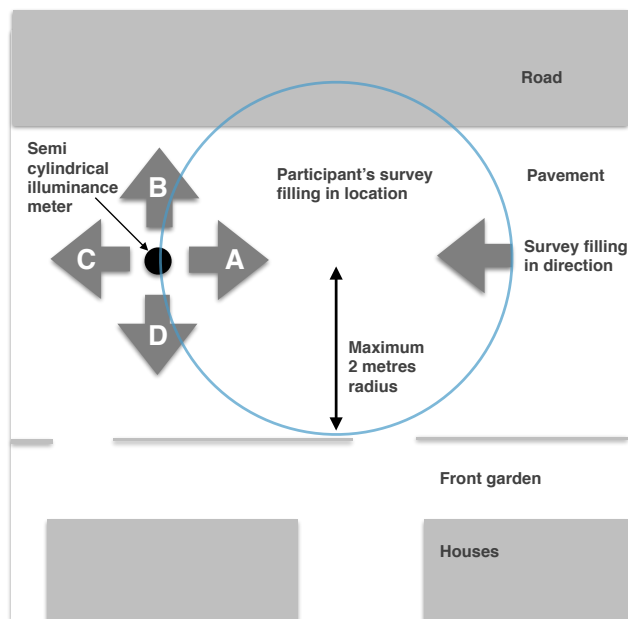
Figure 6.19. Directions in which semi-cylindrical illuminance was measured included here as a reminder of the direction in which the measurements were taken.

It is interesting to observe that a stronger correlation exists between the semi cylindrical illuminance reading when the meter was facing the road than that on the target face (Figure 6.20). Semi cylindrical illuminance facing the road could be a proxy for the amount of illuminance arriving on the vertical surfaces, for example those of buildings parallel to the pavement of a typical street which could help pedestrians define the boundaries of their environment. There was a low correlation between D-N safety rating and Esc facing the houses (view D R^2=0.19) and Esc facing the view from where the participant was standing (view C R^2=0.21).
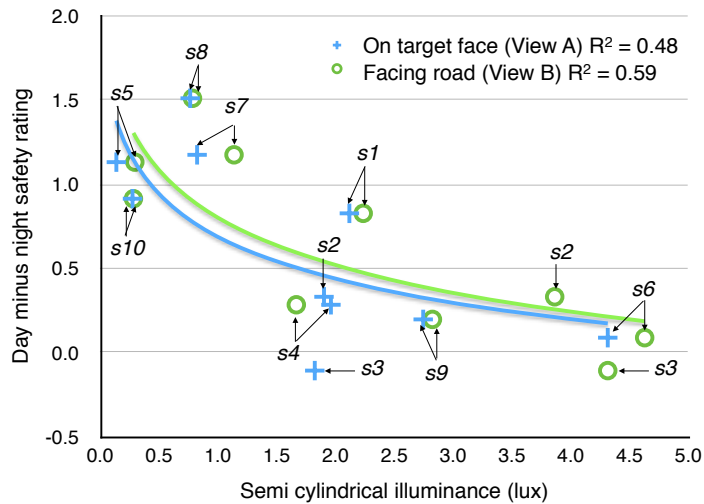
Figure 6.20. Semi cylindrical illuminance on target face (A) and facing towards the road (B).

6.9.3. Uniformity

Although overall uniformity is not directly mentioned by BS5489-1:2013 in the lighting of subsidiary roads, it is implicit in the specification of recommended average and minimum illuminances, the ratio between which is the definition of overall uniformity (E/Emin). Table 6.15 shows the recommendations for the overall uniformity of subsidiary streets ranges from 0.17–0.3, however is 0.2 for most classes.

Class	Benchmark (S/P ratio unknown, Ra <60)	S/P ratio 1.2	S/P ratio 2
P1	0.2	0.2	0.2
P2	0.2	0.2	0.2
P3	0.2	0.2	0.2
P4	0.2	0.2	0.2
P5	0.2	**0.17**	0.2
P6	0.2	**0.25**	**0.3**

Table 6.15. Overall uniformity resulting from specification of average and minimum horizontal illuminances.

Longitudinal uniformity is the ratio of the lowest to highest luminance and is recommended on traffic routes (BS EN 13201-2: 2003). As pedestrians often use traffic routes, it would be interesting to find if any correlation with reassurance exists. People, like drivers, are transitory objects passing through an environment therefore patterns perceived by drivers are also perceived by pedestrians albeit at a slower pace. The recommended longitudinal uniformity for the lowest M class for drivers is 0.4. Both overall and longitudinal uniformity are discussed in this section.

Overall uniformity

Overall uniformity is defined as being the maintained average illuminance divided by the minimum illuminance, including the road surface in the calculation. Using the grid of the data points measured, uniformity was plotted against the day minus night safety rating. The correlation is not significant however Figure 6.21 shows a downward trend of decreasing D-N value as overall uniformity increases.
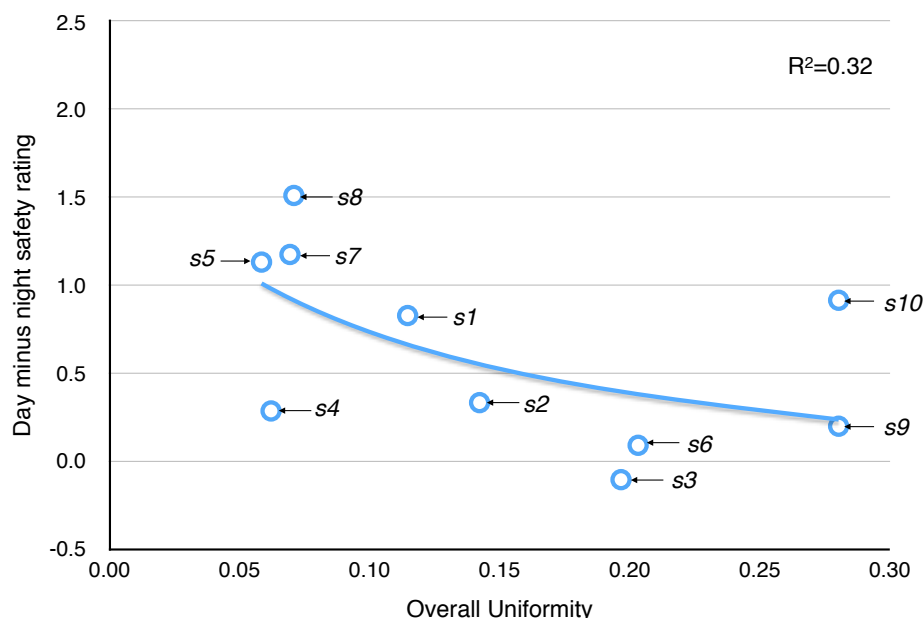
Figure 6.21. Overall uniformity and day minus night safety rating.

Longitudinal uniformity

Longitudinal luminance uniformity, included in the M classes for drivers listed in BS EN 13201-2:2013, is the ratio of the lowest to highest luminance found along the centre of the driving lane. Longitudinal luminance uniformity was plotted against D-N safety rating for comparison with overall uniformity (Figure 6.22). The correlation was significant to the $p < 0.05$ level and suggests that longitudinal uniformity may be more closely correlated to reassurance than overall uniformity.
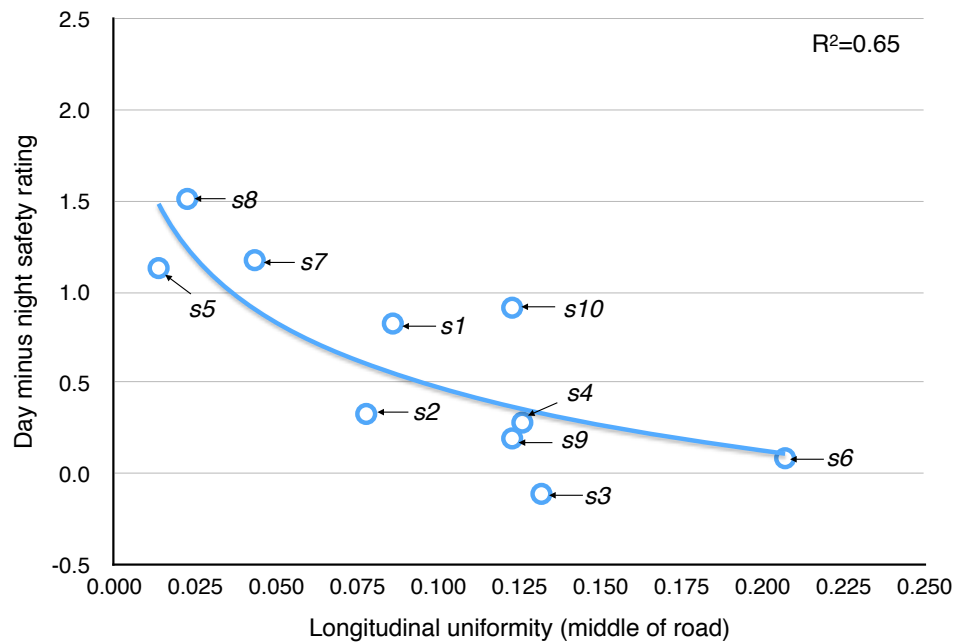
Figure 6.22. Longitudinal uniformity along the middle of the road.

The low levels of uniformity are surprising. For a D-N score of <0.5, longitudinal uniformity was as low as 0.075 on s2. The highest longitudinal uniformity recorded in this study was 0.2 on s6 which has a D-N safety rating of 0.09. Therefore acceptable longitudinal uniformity for pedestrians is a lot less than 0.4 which is recommended for drivers.

It is not known whether the potential relevance of longitudinal uniformity on the road is due to (1) concern that other road users could approach participants from the direction of the road, or (2) that the general appearance of the street expressed in the luminance pattern is what matters. Further work might be well invested in exploring the importance of luminance patterns further, to ascertain whether uniformity is as, or more or less important than illuminance to reassurance or whether there is an illuminance cut-off point below which uniformity makes no difference (for example 0.6 lux as on s10). Longitudinal uniformity on the pavement was also plotted, to see if the surface on which participants walk was more important than the road. The correlation (R^2=0.55) was not significant.

D-N safety ratings were plotted against lamppost spacing to ensure that the significant correlation with longitudinal uniformity is not a proxy for lamp post spacing. Maximum lamp post spacing considering (1) the staggered arrangement on the road, and (2) maximum distance between lampposts along either pavement regardless of staggered arrangement (Figure 6.23) were plotted against D-N safety ratings. The resultant R^2 values were 0.16 and 0.004 respectively, therefore it is reasonable to assume that longitudinal uniformity is not a proxy for lamp post spacing.
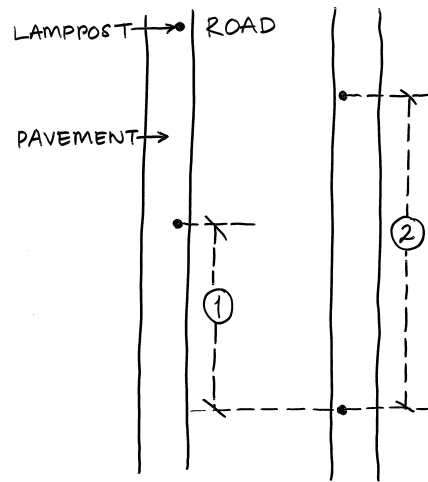
Figure 6.23. Two methods for measuring maximum lamp post spacing.

Given the possible relevance of longitudinal uniformity to reassurance, Figure 6.24 plots the illuminances measured on the streets to the resolution of the measurement grid. The method by which these images were made, is described in Appendix D.2. On some streets the routes were longer than others, therefore the measured area was larger and this is reflected in the different sizes of the diagrams. These plots give a graphical indication of the distribution of illuminance on the horizontal plane and led to the identification of dark patches as a possible contributing factor to higher D-N safety ratings on s1,s5, s7 and s8.
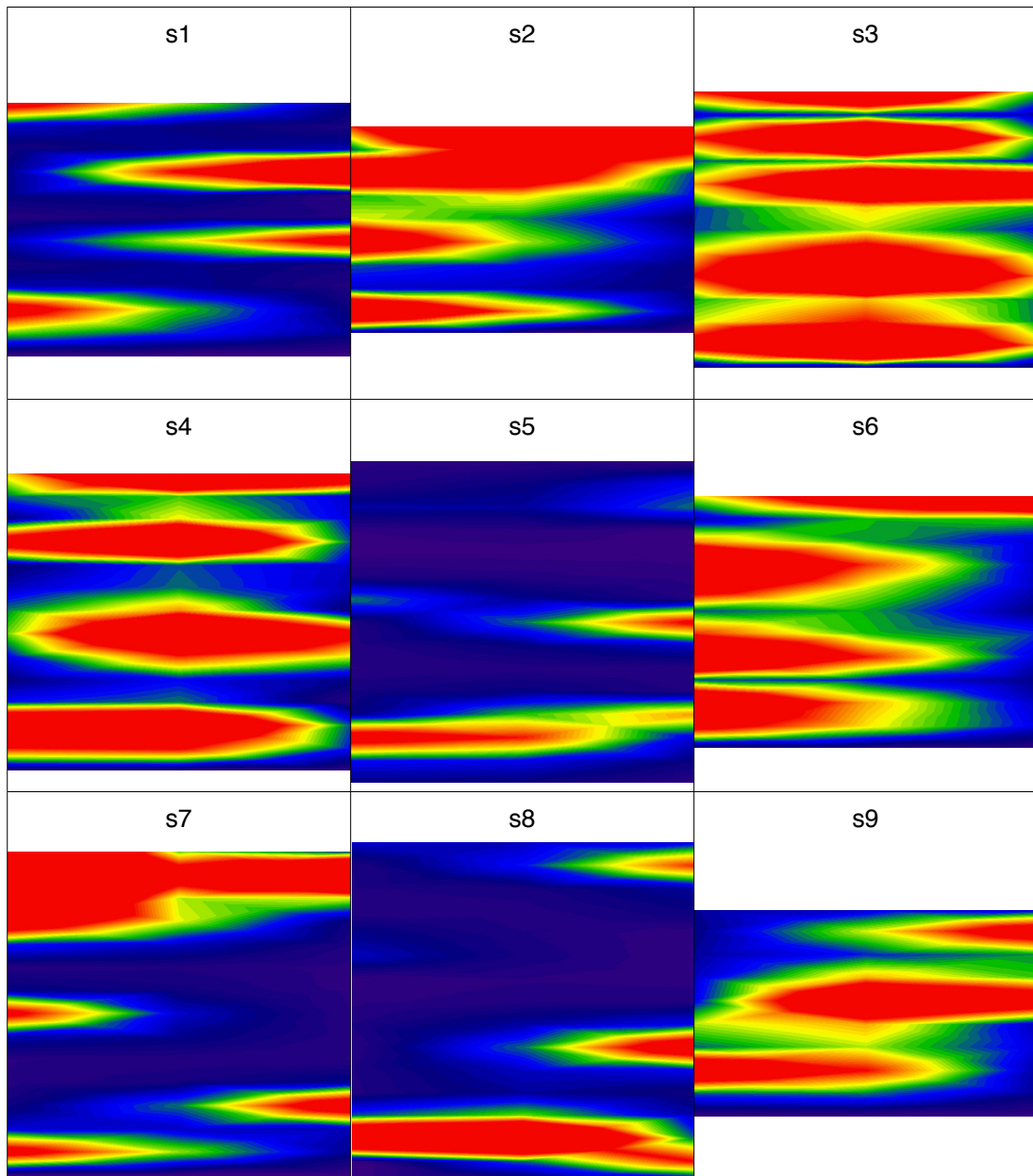
Figure 6.24. Plots of illuminances recorded on the horizontal surfaces along the middle-of-the-road and middle of the pavement using a measurement grid of no more than five metres.

6.9.4. Pavement luminance along route

As longitudinal uniformity has a higher correlation with D-N safety ratings than overall uniformity, this was explored further. Longitudinal distance in metres (x) was plotted against luminance cd/m^2 (y) after Keck (Keck and Odle 1975), along the area of study including the participant route. Luminance was calculated by multiplying the illuminance measurement by an assumed pavement reflectance of 0.2 and dividing the result by pi. The resultant plots are shown in Figure 6.25 for street 1 and Figure 6.26 for street 2, the rest of the plots can be found in Appendix D.3. These graphs show the luminance along the routes walked by the participants, assuming a pavement reflectance of 0.2. They highlight the survey filling in locations and direction of view. The route starts with the first measurement point on the Y axis. The luminance measurement where the participant crossed the road is not included for consistency of on path measurements and because this is the point where it is most likely their intention be turned away from the path and onto oncoming vehicles.

Key (for following two graphs):
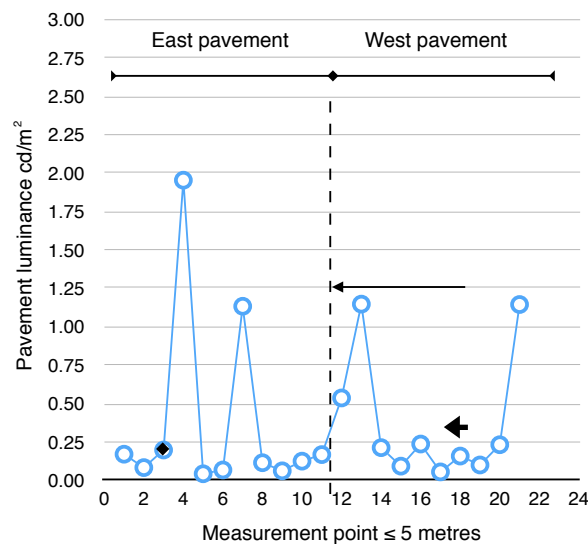
Figure 6.25. Luminance points along route on street 1.

177
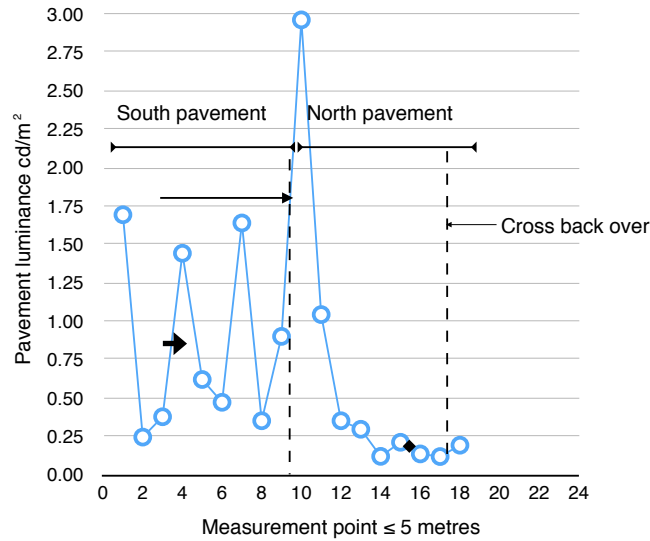
Figure 6.26. Luminance points along route on street 2.

Examination of the luminance along the route plots revealed that streets of highest D-N ratings fall into the upper quartile of the range of differences (>1 scale point, s5,s7 and s8) and tended to have longer areas of low luminance along the route walked. Therefore the maximum length of areas of less than 3 lux and 1 lux were plotted in Figures 6.27 and 6.28. Figure 6.27 shows that s10 does not follow the same pattern as the other streets. This maybe because much less light was received by the eye due to the wearing of low transmission glasses, and although the participants recognised this it was not exposed in a proportionate increase of D-N safety rating.
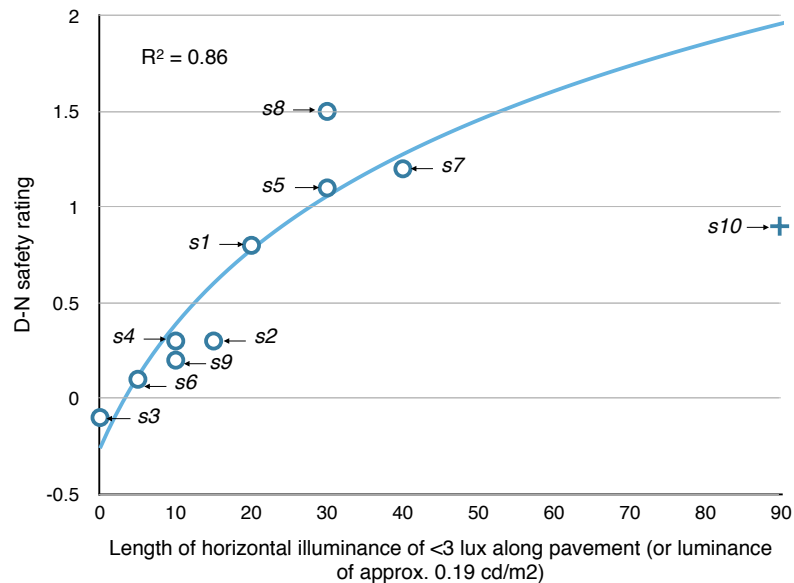
Figure 6.27. Day minus night safety rating and longest stretch of pavement in the area walked by participants lit to less than 3 lux.

Illuminances of less than 3 lux (or luminances of 0.19 cd/m² assuming pavement reflectance of 0.2) did not occur for more than 20 metres for a D-N satety rating of less than half a scale point.

178
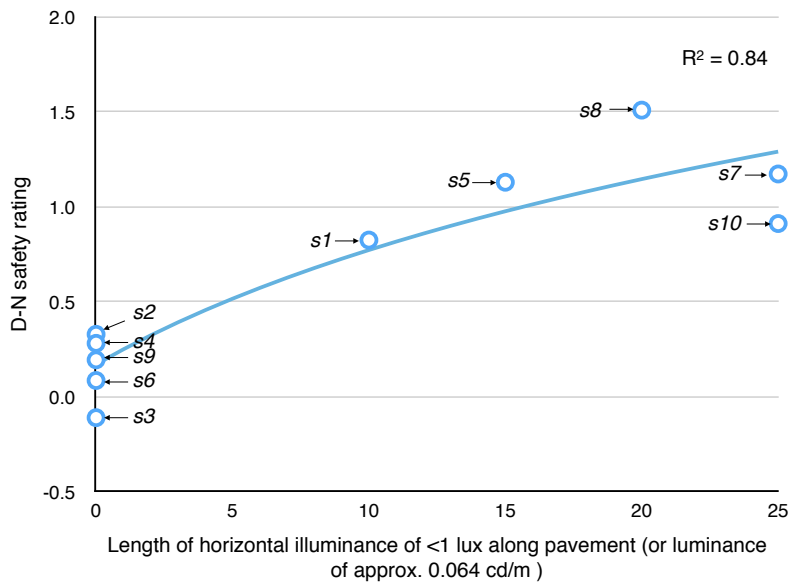
Figure 6.28. Day minus night safety rating and longest stretch of pavement in the area walked by participants lit to less than 1 lux.

1 lux (or approx. 0.064cd/m^2) did not occur for more than 5 metres for a D-N safety rating of less than half a scale point. It is important to remember that Figures 6.27 and 6.28 are only as good as the resolution of the measurement point grids. A suggestion for further work would be to explore the extent and illuminance of the darkest area on the route in more detail using a finer grid.

6.9.5. Lowest illuminance measured

Figure 6.29 shows day minus night safety ratings decreasing as the lowest illuminance recorded on each street increases (p<0.05). The lower cluster is formed of streets s2,s6,s9 and s3, and the higher of streets s5, s10, s7 and s1 (D-N safety rating is >0.8). These results contribute to the discussion of whether reassurance is generated by the worst condition or by the average condition.
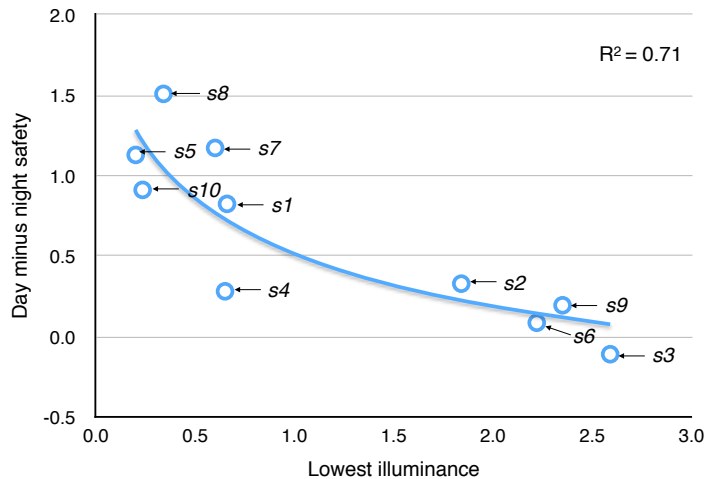
Figure 6.29. Lowest illuminance and day minus night safety rating.

Figure 6.29 implies that the threshold of minimum path illuminances for pedestrian reassurance fall between 0.7 lux (0.04 cd/m^2) and 1.8 lux (0.11 cd/m^2). This is lower than the recommendations for minimum maintained horizontal illuminance in s1 (5 lux) and s2 (3 lux) however is higher than the recommendations for s5 and s6 (0.6 lux). The location of s4 below the higher cluster is an example of a low minimum illuminance (0.7 lux) having a low D–N safety score of 0.3. Further work should investigate environments such as s4 further to find out what it is that makes a relatively low point illuminance acceptable in this case. The overall uniformity of s4 is the second lowest at 0.06, however the longitudinal uniformity is the second highest at 0.126 demonstrating that longitudinal uniformity may be more relevant to reassurance than overall uniformity.

6.9.6. Indirect illuminance

Figure 6.30 shows the results of the day minus night safety ratings plotted against indirect illuminance at the survey filling in point at a height of 1.5 m. The values are well correlated when s7 is removed from the dataset. On s7 it was impossible to shield all sources of illumination which could have affected the illuminance meter reading, because the view faced up a hill which was lit by high pressure sodium lamp posts, demonstrated by Figure 6.31. The results point to the validity of further research into the effect of indirect illuminance on reassurance.
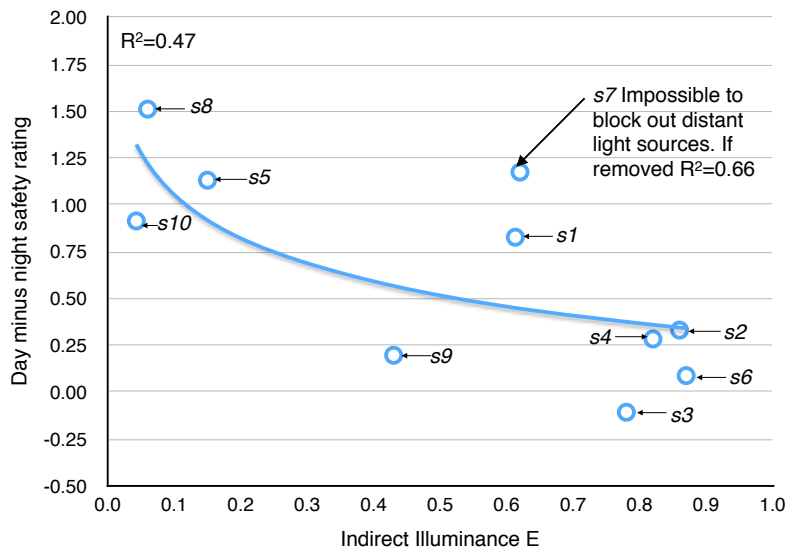
Figure 6.30. Correlation of day minus night safety rating with indirect illuminance at 1.5 metres high at the survey filling in location.

Figure 6.31. View from s7 showing distant light sources which were impossible to block from the illuminance meter when recording indirect illuminance.

6.9.7. Vertical luminance or illuminance

Vertical illuminance was calculated from the luminance measurement points because the reflectance of the card was known and had been validated in laboratory conditions (see Table 5.7). The resultant illuminances varied slightly depending on the piece of card used for the calculation. In this case, a mean was taken of the white and grey card results and plotted in Figure 6.32. The black card measurement was not used in this case because very low readings could exaggerate the difference between lighting conditions as, for example 0.2 is double 0.1 cd/m^2.

Figure 6.32 indicates the correlation of vertical illuminance at a point 1.5 metres above the pavement in front of the survey filling in point, i.e. vertical illuminance arriving on a hypothetical oncoming pedestrian, with D-N safety rating. People are the only vertical objects which could appear at 1.5 m in front of the survey point, these results point to the relevance of considering

vertical illuminance in street lighting design. The minimum Ev recommended in CIE115:2010 is 0.6 lux for P6 (Table 1.2). The findings broadly support this as a minimum recommendation because s10, s8 and s5 all fall below 0.6 lux. The Ev value for s7 is 0.7 lux. The Australian standards recommend a minimum point vertical illuminance of 2, 0.7 and 0.3 lux depending on the type of area. Illuminances in the range of 0.3 to 0.7 lux on the below graph could result in a D-N safety rating of less than one point (on a six-point scale).
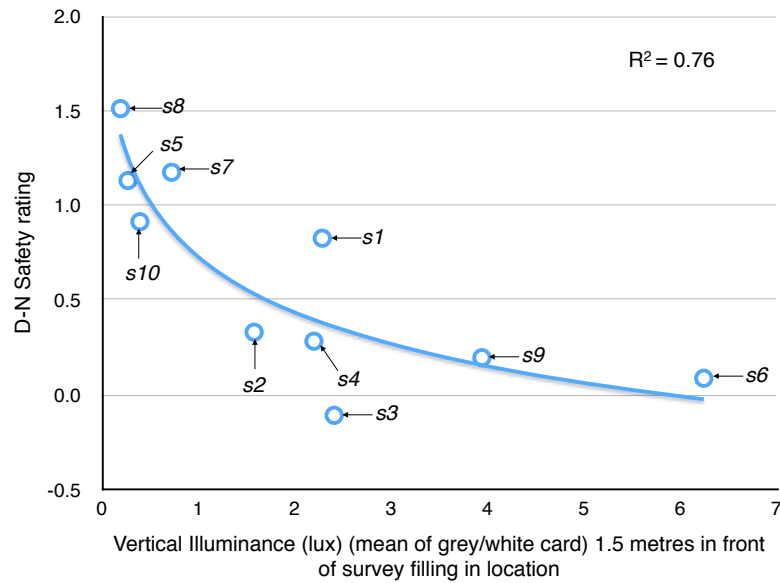
Figure 6.32. Vertical illuminance 1.5 metres in front of the survey filling in point, facing towards the observer (calculated using luminance measurements from white and grey card only).

6.9.8. Other measurements

Table 6.16 shows the results of all other measurements taken or calculated, and plotted against D-N safety. The very low correlation of the highest recorded illuminances measured gives some confidence that the findings discussed so far are relevant to reassurance. Interestingly, the correlation between D-N safety ratings and ground luminance immediately in front of the survey filling in point is low compared to other measurements. This could mean that obstacle detection is not a primary concern for pedestrians.

Lighting metric	R^2 when correlated with D-N safety rating*	Comment
Cylindrical illuminance	0.56	An average of semi cylindrical illuminance in four directions (cylindrical illuminance) at the survey filling in point is as important to reassurance as the illuminance arriving on the target face. Semi cylindrical illuminance is discussed in section 6.9.2.
Ground luminance in front of survey filling in point (mean of black/grey/white card)	0.20	This is surprising as if obstacle detection is important to reassurance it might be expected that this value be higher.
Highest recorded illuminance	0.005	This is the lowest correlation recorded, and points to the irrelevance of areas of higher illuminance on the pavement relative to adjacent area to reassurance.

* Winter groups only

Table 6.16. Summary of measurements plotted against D-N safety not discussed in detail.

6.10. Difference between groups
6.10.1. Background
Groups 1, 2 and 3 completed the experiments in winter and groups 4 and 5 in summer. Group 4 completed the evening survey at 10:30 PM and group 5 at 7:30 PM, to test the effect of the time of day and lighting conditions respectively. Winter group 3 was older than winter groups 1 and 2, with a mean age of 61 as opposed to 24 (group 1) and 23 (group 2). There were no notable differences between the circumstances of the experiments between groups and between day and night visits, except for the night time experiment (first) of group 2. Two unexpected incidents which occurred are described below.

Incident 1

On arrival at s7, St Philips Road (second street visited), a group of men in their mid-20s ran up the street giving the impression that they were running away from something quite urgently. The men passed the student group at a distance of about 4 metres, as they arrived at the survey filling in point. Some of the students found this alarming, two males in the group asked the author whether they should continue with the study. Although the men had noticed the group and whilst observing them slowed down to a walking fast rather than running pace, they seemed to be more interested in their progression up the street rather than the group. Therefore the author informed the students that they were not objects of interest and asked them to continue filling in the surveys.

Incident 2

Before arrival on William Street (s9, eighth street visited) the group were asked to put on their sunglasses in the minibus. On arrival at the street there was a group of six young men in their mid 20s and three teenagers (one with a bike) standing at the survey filling in point facing the minibus about 15 metres away from the minibus on the opposite side of the road. On approach to the street, participants had been occupied with putting on their sunglasses and finding the correct sheet in their folders, and alighted calmly from the minibus. When the participants grouped adjacent to the minibus ready for the route instructions, members of the group already on the street started shouting. One of the teenagers approached the participants on a bike. When the author tried to engage with him (by presenting him with an information sheet), he ignored her and rode the bicycle into the participant group. The participants dispersed to avoid the bicycle. As the older men were still shouting, the author asked participants to remove their sunglasses and walk to the next street round the corner. Therefore the street order was changed in response to the circumstances. By the time the group had completed surveys on two nearby streets and returned to William Street, the group of men had left and the three teenagers remained. They were play fighting and mimicking sex acts whilst recording their activities on a phone, informing the group as they passed that "this is what makes as tough". The walking route on this street was shortened to avoid the area where the teenagers were showing off. The shortened route was completed twice, with and without low transmission glasses. As the groups on the streets were not present during the subsequent daytime visits, there is an additional D-N difference present for group 2 which was not present for the other groups. Therefore the results do not compare similar circumstances as with the other four groups. This may have had an effect on the responses of this group.

6.10.2. Comparison of day and night mean safety ratings

The mean safety ratings during the day and at night on each street by group are recorded in Figures 6.33 and 6.34. The graphs show less variance in the mean safety scores on each street during the day compared to the evening or night. This is to be expected as the time of day and lighting conditions are constant. It is interesting to note that the night-time survey results show that on 8 out of 11 streets the lowest mean safety score is given by group 2, followed closely by group 3, the older group (Figure 6.34). This indicates that group 2 and group 3 behaved in the most similar manner.
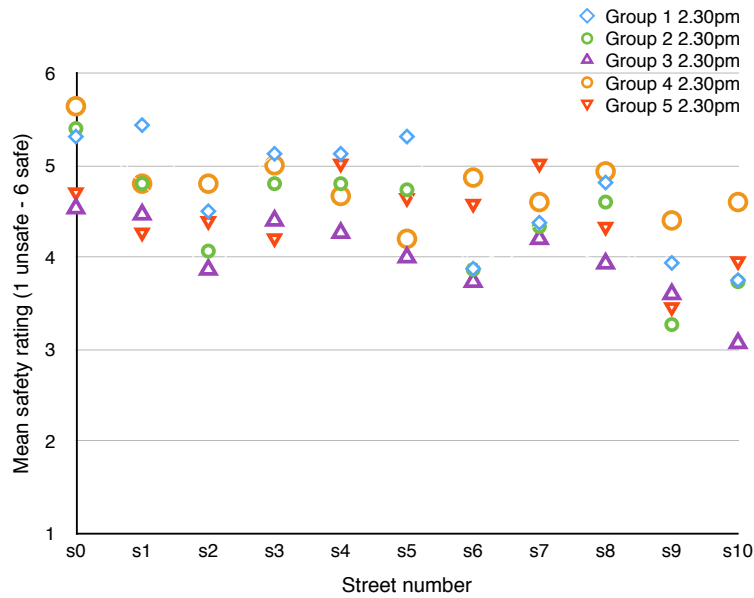
Figure 6.33. Daytime mean safety ratings by group.
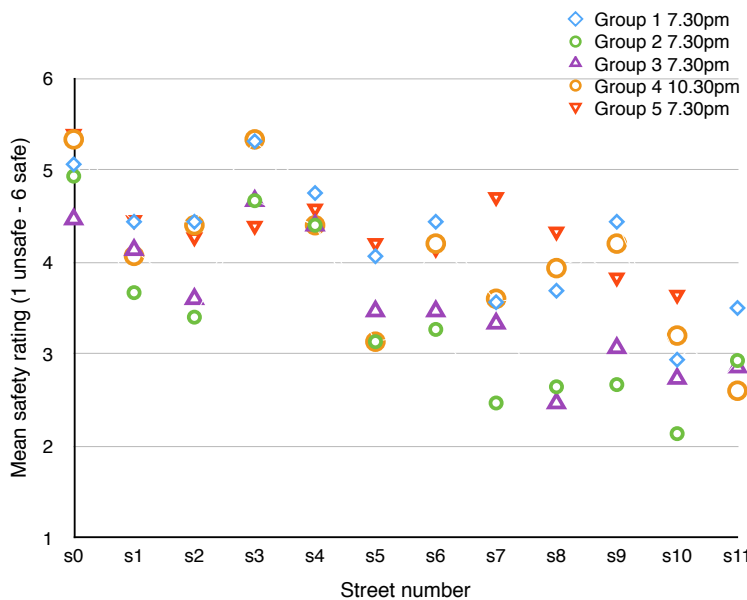
Figure 6.34. Evening and night time mean safety ratings by group.

185

The variance between groups is highest on s5, s9 and s10 during the day, and highest on s7, s8 and s9 during the evening. This could be because extremes bring out more variance in response. S7 could be seen as an extreme condition because of low perceived access to help, s8 because of low illuminance levels and s9 because of it's vicinity to a street corner where young men congregate. S5 appears secluded because overhanging trees block the view. Plots showing the difference in the D–N rating for each street for each group can be found in Appendix D.4.

Possible effect of recent experience

Group 2 demonstrated the highest difference between daytime and nighttime ratings of safety on all streets after the first incident (therefore excluding s6). The reason for this could be that other people are the most important feature in the environment in affecting judgements of safety. Group 2 was the only group where the subtraction of the mean safety rating at night from the mean safety rating during the day always resulted in a positive value. This means that they did not think s3 was safer at night compared to during the day, however all other groups on average rated s3 to be safer at night compared to during the day. The streets in Broomhall (s2, s8 and s9) where the second incident took place were rated lowest by group 2. S7 where incident one took place was also rated the lowest by this group. This suggests that the presence of other people matters most to D-N safety scores. Figure 6.35 summarises the differences between all groups for all streets. It can be seen that the largest gap (ie. D-N difference) is for group 2. This may be the effect of the two incidents which took place.
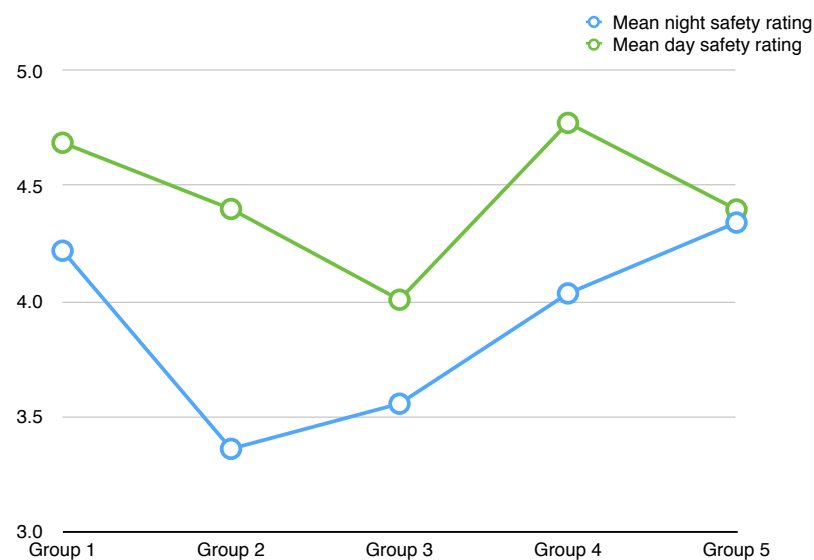
Figure 6.35. Daytime and night time mean safety ratings on all streets for all groups.

Possible effect of time of day

Group 4 visited the streets at 2:30 PM and 10:30 PM, to test the effect of time of day, because the lighting conditions are similar to winter conditions at 7:30 PM. It was dusk on two of the streets which were visited first (s7 and s6). The reason for this was that it was not seen to be acceptable that the experiments carried on much later than midnight, as less public transport would be available for pedestrians to find their way home. By the time the minibus reached

Broomfield (s4, s5) darkness had fallen completely. The street order for the nighttime group was s7, s6, s4, s5, s10, s8, s2, s9, s1, s3, s11. Despite this situation, participants did not rate s6 and s7 to be significantly less safe than the others. When the daytime and nighttime mean safety ratings of all streets for all groups were plotted (Figure 6.35) it can be seen that the second highest gap between day and night safety rating is for group 4 which indicates an effect of the time of day. In summer increased foliage on the trees on s3, s4, s5 and s8, may have affected the results.

Possible effect of lighting conditions

Group 5 completed the daytime survey at 2:30 PM and 7:30 PM, in summer, therefore there was little difference between the lighting conditions on both occasions. The street lighting was not on at 7.30 PM in the evening in summer. The mean of all the safety scores on all the streets (Figure 6.35) is highest for group 5 at 7:30 PM and this may be the effect of the daylight conditions. As expected, there is little difference in the mean day and night ratings of all streets for group 5. When compared to the other mean safety scores, this indicates that the fall of darkness may have an effect in reducing reassurance. This implies that street lighting could partially mitigate this effect.

6.10.3. Difference between groups

Table 6.17 summarises the results of an ANOVA with Sidak correction comparing the responses of the safety ratings of the groups. It confirms that night time group 2 is significantly less reassured than all other groups at night except group 3. This may be because of the unplanned street encounters described earlier. Otherwise, the only significant difference between groups is that group 3 is significantly less reassured than groups 1 and 4, during the day. As group 3 was the only older group, this shows the possible effect of age.

Group		1	2	3	4
2	**Survey** **Day**	n.s 0.749		↑	Arrow points in direction of more reassured group
	Night	↑ **0.002**			
3	**Day**	↑ **0.022**	n.s 0.692		
	Night	n.s 0.094	n.s 0.926		
4	**Day**	n.s >1.000	n.s 0.548	← **0.011**	
	Late night	n.s 0.999	← **0.020**	n.s 0.402	
5	**Day**	n.s 0.919	n.s >1.000	n.s 0.423	n.s 0.772
	Night (light)	n.s >1.000	← **0.001**	n.s 0.068	n.s 0.998

Table 6.17. Results of ANOVA with Sidak correction showing whether differences exist between groups during the day and at night.

Further analysis was carried out to break down the difference between groups on a street by street basis, to extrapolate the results presented in Table 6.17. Table 6.18 shows that the most reassured groups during the day are groups 1 and 4, and the least reassured is group 3. If group 2 were affected by the two incidents that took place at nighttime then it is expected that on the streets where these incidents took place (s7 & s9), they would be less reassured than other groups. Table 6.19 suggests this to be the case as on both s7 and s9 group 2 is significantly less reassured than at least two other groups. Streets that were visited immediately after the encounter (s2 and s8) were also rated to be significantly less safe by group 2 than other groups. It is interesting to note that the first street visited by group 2 before any incidents took place was s6 and on this street group 1 was significantly more reassured than group 2. However as group 1 is the most confident group overall then this this does not necessarily detract from the findings on other streets.

Street	Summary of difference between groups day surveys completed at 2.30pm	Significance level
s0	**Group 2** is more reassured than **group 3** (p=0.04). Group 4 is more reassured than **group 3** (p=0.004). Group 5 is more reassured than group 4 (p=0.017). Approaching significance: Group 1 is more reassured than **group 3** (p=0.081).	$p<0.05$ $p<0.01$ $p<0.05$ n.s.
s1	Group 1 is more reassured than **group 3** (p=0.025). Group 1 is more reassured than group 5 (p=0.002).	$p<0.05$ $p<0.01$
s2	Group 4 is more reassured than **group 3** (p=0.032).	$p<0.05$
s3	Group 1 is more reassured than group 5 (p=0.036).	$p<0.05$
s4	Approaching significance: Group 1 is more reassured than **group 3** (p=0.73).	n.s.
s5	Group 1 is more reassured than **group 3** (p=0.005). Group 1 is more reassured than group 4 (p=0.029).	$p<0.01$ $p<0.05$
s6	Group 4 is more reassured than **group 3** (p=0.027). Approaching significance: Group 1 is more reassured than group 4 (p=0.071). Approaching significance: **Group 2** is more reassured than group 4 (p=0.075).	$p<0.05$ n.s. n.s.
s7	Group 4 is more reassured than **group 3** (p=0.025). Approaching significance: Group 1 is more reassured than **group 3** (p=0.065).	$p<0.05$ n.s.
s8	Group 4 is more reassured than **group 3** (p=0.025). Approaching significance: Group 1 is more reassured than group 3 (p=0.065).	$p<0.05$ n.s.
s9	Group 4 is more reassured than **group 2** (p=0.025). Approaching significance: Group 4 is more reassured than group 5 (p=0.084).	$p<0.05$ n.s.
s10	Group 4 is more reassured than **group 3** (p=0.001).	$p<0.01$

Table 6.18. Summary of difference between groups (ANOVA with sidak correction). All p values under 0.1 were noted as approaching significance as a means of observing trends rather than stating significance.

Street	Summary of difference between groups night surveys completed at 7.30pm and 10.30 pm in summer and winter	Significance level
s0	Approaching significance: Group 5 is more reassured than **group 3** (p=0.089).	n.s.
s1	No p values under 0.1.	n.s.
s2	Group 1 is more reassured than **group 2** (p=0.049). Approaching significance: Group 4 is more reassured than **group 2** (p=0.074).	p<0.05 n.s.
s3	Approaching significance: Group 1 is more reassured than group 5 (p=0.066). Approaching significance: Group 4 is more reassured than group 5 (p=0.063).	n.s. n.s.
s4	No p values under 0.1.	n.s.
s5	No p values under 0.1.	n.s.
s6	Approaching significance: Group 1 is more reassured than **group 2** (p=0.077).	n.s.
s7	Approaching significance: Group 1 is more reassured than **group 2** (p=0.071). Approaching significance: Group 1 is more reassured than group 5 (p=0.051). Approaching significance: Group 4 is more reassured than **group 2** (p=0.062). Group 5 is more reassured than **group 2** (p<0.001). Group 5 is more reassured than **group 3** (p=0.011). Approaching significance: Group 5 is more reassured than group 4 (p=0.071).	n.s. n.s. n.s. p<0.001 p<0.05 n.s.
s8	Approaching significance: Group 1 is more reassured than **group 2** (p=0.067). Group 1 is more reassured than **group 3** (p=0.015). Group 4 is more reassured than **group 2** (p=0.012). Group 5 is more reassured than **group 2** (p<0.001). Group 4 is more reassured than **group 3** (p=0.002). Group 5 is more reassured than **group 3** (p<0.001).	n.s. p<0.05 p<0.05 p<0.001 p<0.01 p<0.001
s9	Group 1 is more reassured than **group 2** (p=0.002). Group 1 is more reassured than **group 3** (p=0.035). Group 4 is more reassured than **group 2** (p=0.014).	p<0.01 p<0.05 p<0.05
s10	Group 5 is more reassured than **group 2** (p=0.005).	p<0.01

Table 6.19. Summary of difference between groups (ANOVA with sidak correction). All p values under 0.1 were noted as approaching significance as a means of observing trends rather than stating significance.

The D-N value was analysed separately using a one way ANOVA with Sidak correction for all participants (dependant variable) to identify whether there was any difference by group (factor). The results are shown in Table 6.20 and demonstrate significant differences between the D-N ratings of groups 1 and 2; 2 and 3; 2 and 5; 4 and 5. This reiterates that group 2's responses are the most different to the other groups, followed by group 5. This implies that other people on the street has more of an effect on reassurance than daylight conditions in summer at 7:30 pm.

Group	1	2	3	4	5		
1							
2	↑ 0.014					**Key**	
						↑	Arrow points in direction of group which gave a lower D-N value.
3	← >1.000	← **0.017**				**Bold** means a significant difference to p<0.05 level.	
4	↑ 0.957	← 0.288	↑ 0.963				
5	← <0.308	← **<0.000**	← 0.326	← **<0.020**			

Table 6.20. Difference between D-N safety ratings by group (ANOVA with Sidak Correction).

6.10.4. Range of D-N safety ratings by group

Figure 6.36 summarises the variability of D-N safety ratings given on each street, by group. It can be seen that the range is similar for groups 1 to 4 however is more condensed for group 5, which is to be expected given that it was still daylight at 7:30 PM.
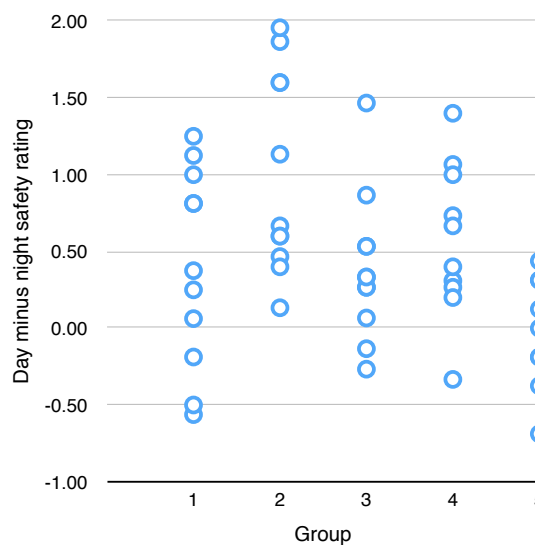
Figure 6.36. Range of day minus night safety ratings by group.

When this information is examined in more detail (Table 6.21) it can be seen that during the day the difference between the highest and lowest mean safety scores is around 1.5-2 for all groups. During the evening the range between the highest and lowest mean safety scores on streets varies between 1.75 for group 5 to 2.7 for group 4 with the winter groups ranging between 2.2 and 2.8.

The difference between day and night range gives an indication of the effect of the change in conditions on the variance in responses. The variance within the winter groups is consistently higher in the evening compared to during the day, by about 0.65- 0.75 points. Table 6.21 shows a larger range for summer group 4 (1.3 points), when time-of-day has an effect, and a lower range for summer group 5 (0.2 points), when evening lighting levels at 7.30 PM are similar to daytime. This demonstrates an effect of time of day (group 4) and time of year (group 5) even if the D-N scores are not consistently significantly different (Table 6.20).

Group	1	2	3	4	5
Range during the day	1.69	2.13	1.47	1.44	1.56
Range during the night	2.38	2.80	2.20	2.73	1.75
Difference between night and day range	0.69	0.67	0.73	1.29	0.19
	Similar values			Different values compared to groups 1,2,3.	

Table 6.21. Difference between highest and lowest day and night safety rating means between groups

6.10.5. Summary
The original hypotheses tested by the summer groups were (1) if light matters there will be no difference between the behaviour of group 4 and the winter groups, as the dark condition is comparable, and (2) if light matters group 5 will report lower D-N safety ratings than all other groups, despite the constant time of day. The first hypothesis was proved in Table 6.20. The second hypothesis was partially proved as group 5 consistently gave lower D-N ratings than other groups however the effect was only significant when compared with groups 2 and 4.

6.11 Self-reported safest and least safe street compared to mean safety ratings

After each set of surveys participants were asked to state which street they thought was the most and least safe. The reason for this was to test if their answers matched the survey responses. Where participants listed more than one street as being the most or least safe (10 out of 77 participants), only the first street that they wrote down was counted. Participants were not asked to treat streets s5 & s11 or s9 & s10 as separate streets, which resulted in inconsistency as some identified these streets as being the same, and others did not. Therefore these were summated and are presented in Table 6.22.

Table 6.22 compares the rank order according to mean safety ratings and compares this to the order based on self-reported safest/least safe streets. It also lists the expected ranking of streets in order of safety based on the author's experiences in the area. It shows good agreement during the day and at night for the least safe streets (red box) and slightly less good agreement for the safest streets (green box). The findings of the self-reported identification of safest and least safe street largely support the results of the mean safety score, however this could also be a result of participants checking in their folders which street they had rated highest or lowest and duplicating this, rather than recalling their impressions from memory. The author's subjective impression of the area in which s6 and s7 are located did not match the survey findings which demonstrates that subjective impressions of one individual is not representative of a sample of 77 participants.

	Safe ←						→	**Unsafe**	
Rank order based on day safety rating	s4	s1	s3	s5	s8	s7	s2	s6	s9+s10
Mean safety rating	4.78	4.75	4.70	4.58	4.52	4.51	4.32	4.18	3.77
Self reported - Safest (day)	s7	s3	s1	s4	s6	s5+s11	s8	s9+s10	s2
No. votes per street	17	16	14	11	7	6	3	3	0
Self reported - Least safe (day)	s1	s3	s4	s5+s11	s8	s7	s2	s6	s9+s10
No. votes per street	2	3	3	4	4	5	8	15	33
Rank order based on night safety rating	s3	s4	s1	s2	s6	s7	s8	s5+s11	s9+s10
Mean safety rating	4.87	4.47	4.16	4.03	3.91	3.55	3.43	3.30	3.29
Self reported - Safest (night)	s3	s4	s7	s6	s5+s11	s2	s9+s10	s1	s8
No. votes per street*	29	9	9	9	5	5	5	3	0
Self reported - Least safe (night)	s3	s4	s1	s2	s8	s7	s6	s9+s10	s5+s11
No. votes per street**	0	1	1	5	6	7	7	19	27
Author's estimated rank order	s3	s1	s4	s5	s8	s6	s2	s7	s9
	Safe ←						→	**Unsafe**	

*   3 participants did not fill in this page.

**   4 participants did not fill in this page.

Table 6.22. Summary of self-reported safest and least safe streets for all 77 participants.

6.12. Effect of wearing low transmission glasses

Asking participants to wear low transmission glasses, provides a convenient method of reducing illuminance received by the eye whilst keeping all other variables constant. The method of wearing glasses has been used in previous research (Figueiro 2009). The effect of wearing sunglasses may have varied between individuals, as some were able to recognise the repeat visits, whereas others were not. This was reflected in comments made by participants during the experiment, for example one participant asked another "have we been here before?"

Figure 6.37 compares participant's safety scores on Park Lane and William Street, wearing and not wearing low transmission sunglasses. On Park Lane 51% thought that it was safer without the glasses, 33% recorded no difference and 16% thought it was safer wearing sunglasses. On William Street 56% thought it was safer without sunglasses, 34% recorded no difference and 10% thought it was safer when wearing glasses. At night overall, approximately 54% of participants rated the area to be safer when wearing glasses, showing an effect on perceived safety of approximately 90% less light entering the eye.
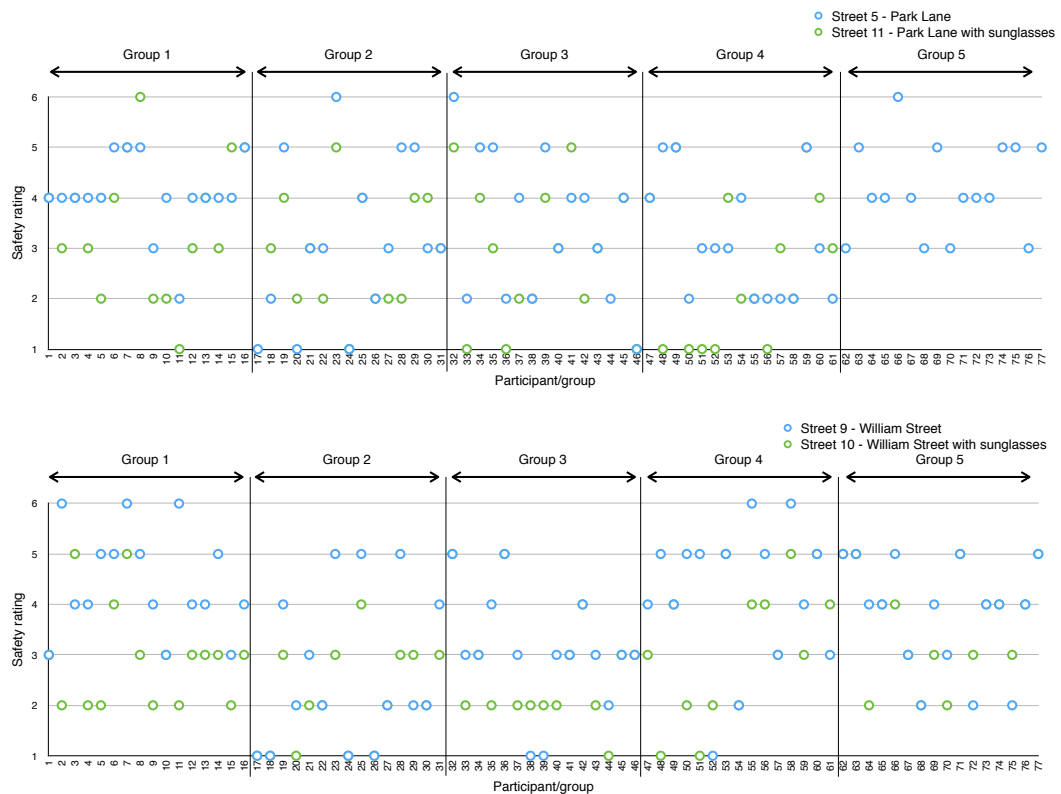
Figure 6.37. Safety scores with and without low transmission glasses at night.

As a means of validating the method of using low transmission glasses, two statements on which it is expected that wearing glasses would have an effect were investigated. These were "I can see clearly around me" and "I can see far enough ahead". Comparisons between the responses with and without the low transmission glasses are recorded in Table 6.23, along with the responses to the safety question. 79% of people on Park Lane and William Street gave a higher score without low transmission glasses in answer to the statement "I can see clearly around me". The score for "I can see far enough ahead" was higher without glasses for 69% of

participants on Park Lane and 80% on William Street. These percentages demonstrate that participants responded to wearing low transmission glasses therefore the effect on perceived safety is valid. Table 6.23 includes a section for daylight conditions showing no effect of wearing low transmission glasses.

			Number of participants		
		Street	No difference between scores with and without sunglasses.	Higher score without low transmission glasses.	Higher score with low transmission glasses.
After dark conditions (groups 1-4).	How safe do you feel this area is?	s5	20	31	10
		s9	21	34	6
	I can see clearly around me.	s5	8	48	5
		s9	9	48	4
		s5	15	42	4
		s9	7	49	5
Daylight conditions (groups 1-5 2:30 PM plus group 5 7:30 PM).	How safe do you feel this area is?	s9	50	20	23
	I can see clearly around me.	s9	51	24	18
	I can see far enough ahead.	s9	52	18	23

Table 6.23. Record of whether wearing low transmission glasses had any effect on safety scores on s5/s11 and s9/s10.

6.13. Findings

The findings of this chapter can be grouped as follows:

Lighting in interaction with other factors affects reassurance.

The results suggest a tendency towards less difference in day and night safety ratings as median illuminance increases however the effect is reduced by (1) low perceived access to help (2) the perception of the streets during the day. Above 6 lux and maybe as low as 3.5 lux, the night safety rating comes within half a scale point of the day score (Figure 6.18).

- Higher median illuminance at night does not compensate for no access to help (Table 6.10).

- Lighting does not affect reassurance if a street with higher measured illuminance at night is perceived to be significantly less safe than another street to which it is being compared, during the day (Table 6.10).

Effects on reassurance independent of lighting.

The experiment points to the possible effect of (1) age, (2) recent experience and (3) time of day on reassurance, independent of lighting conditions.

- There is a possible effect of age on reassurance, as older people gave significantly lower safety ratings than younger people during the day (Table 6.17).

- Recent experiences on the streets effect reassurance independent of lighting conditions (Table 6.18). This is shown by the fact that group 2 rated the streets significantly differently to all other groups except group 3 (Table 6.17).

- Participants may feel less reassured later on in the day (10.30 PM as opposed to 7.30 PM) regardless of lighting conditions. This is shown by the second largest gap in D-N safety ratings being for group 4 (Figure 6.36).

Lighting characteristics which may matter to reassurance:

1. Median illuminance

All streets which had a significant difference ($p<0.001$) between night and day ratings (s1, s5, s7, s8, s10) also had median illuminances of <3.5 lux. (Table 6.11 and Figure 6.18). Further work is required to determine the acceptable mean D-N safety ratings before translating these results into lighting recommendations.

2. Semi-cylindrical illuminance

Semi-cylindrical illuminance facing the road may be more relevant to reassurance than semi cylindrical illuminance on the target face (Figure 6.20). Semi cylindrical illuminance facing the road could be a proxy for the illumination of vertical surfaces parallel to the pavement.

3. Uniformity

Longitudinal uniformity may be more relevant to reassurance than overall uniformity (Figure 6.21 and Figure 6.22). Within this sample, for a D-N of <1 scale point longitudinal uniformity was 0.02 and for a D-N of <0.5 scalar point longitudinal uniformity was 0.03.

Luminance patterns matter to reassurance.
4. Extent of low luminance areas

The length of areas of low luminance are relevant to reassurance (Figure 6.27 and Figure 6.28). Within this sample, for a D-N safety rating of <0.5 scale points, the length of the pavement of <0.064 cd/m^2 did not exceed 5 metres, and for a D-N safety rating of <1 scale points it did not exceed 12 metres. When examining areas of higher luminance, around 0.19 cd/m^2, the findings show that for a D-N safety rating of <0.5 the length of the area did not exceed 18 metres or 27 m for a D-N safety rating of <1.

The lowest illuminance value is as important to reassurance as the median (Figures 6.29 and 6.18). The results imply that the threshold path illuminances for pedestrian reassurance (if defined as being D-N of <0.5 scale points) may fall between 0.7 and 1.8 lux. This is lower than the benchmark recommendations for minimum maintained horizontal illuminance in P1 (3 lux) and P2 (2 lux) however it is higher than the recommendations for P5 (0.6 lux) and P6 (0.4 lux). There is no reason for pedestrians to require more light on the pavement in higher P class areas because P class defining factors such as increased traffic flow traffic are more likely to contribute to increasing reassurance, as found in Study 1.

5. Illuminance of darkest areas

Makes little difference to reassurance (D-N safety rating of <0.5) if the darkest point on the street is greater than or equal to 2 lux or luminance of ≥ 0.13 cd/m^2 (Figure 6.29). In one case a street (s4) with a lowest measured illuminance of 0.7 lux had a D-N safety rating of <0.5.

6. Indirect illuminance

Light received from the visual scene expressed in indirect illuminance may be relevant to reassurance. Results on most streets suggest that for D-N values of less than half a scale point indirect illuminances should be above 0.7 lux (Figure 6.30). On one street (s9) indirect illuminance was 0.4 lux for a D–N as low as 0.2, however on this street lighting had little effect due to other factors.

Table 6.24 lists the lighting characteristics described above in order of effect on reassurance (defined by the R^2 value) and notes whether or not they are already included in the standards.

	Measurement	Coefficient of determination	Significance level	Already in standards?
1	Length of horizontal illuminance of <1 lux on pavement	0.84	$p<0.01$	No
	Comment:	Streets with low illuminance areas of <5 metes had a D-N safety score of <0.5.		
2	Vertical luminance (candela per metre squared)	0.76	$p<0.05$	Yes
	Comment:	In BS549-1:2013 the lowest recommended Ev is 0.5. In CIE 115:2010 the lowest recommended Ev is 0.6. All streets in this study were below this except s6 which means that lower vertical illuminances may be acceptable.		
3	Lowest illuminance (lux)	0.71	$p<0.05$	Yes
	Comment:	The lowest illuminances of P5 and P6 (0.4 lux) may not result in a D-N safety rating of <0.5 if longitudinal uniformity is also low (<0.1). On one street (s4) the lowest point illuminance measured was 0.6 lux for a D-N safety rating of <0.5.		
4	Indirect illuminance at the eye (lux)	0.66	$p<0.05$	No
	Comment:	Indirect illuminance of above 0.7 lux resulted in a D-N value of <0.5. A better method of measurement should be found as this excludes one street from the dataset.		
5	Longitudinal Uniformity	0.65	$p<0.05$	No
	Comment:	All the longitudinal uniformities measured in this study were less than 0.15. The recommended longitudinal uniformity for drivers is 0.4. This implies that longitudinal uniformities acceptable to pedestrians may be less than the recommended level for drivers.		
6	Semi cylindrical illuminance facing road (lux)	0.59	n.s.	No
	Comment:	Esc of around 2.5 lux at the survey filling in point facing the road resulted in a D-N safety rating of <0.5. This could be a proxy for the amount of light arriving on vertical surfaces.		
7	Median horizontal illuminance (lux)	0.50	n.s.	No
	Comment:	The higher relevance of median illuminance compared to mean illuminance could be an expression of (1).		
8	Semi cylindrical illuminance on target face (lux)	0.48	n.s.	Yes
	Comment:	Minimum Esc was 1 lux for a D-N saftey rating of <1 however p classes 5 and 6 (CIE115:2010) specify minimum semi cylindrical illuminances of 0.6 and 0.4.		

9	Cylindrical illuminance (mean of 4 measurements from semi cylindrical meter) (lux)	0.40	n.s.	No
	Comment:	This was included as a measure of the flow of light however did not address what mattered to pedestrians in this study.		
10	Mean horizontal illuminance (lux)	0.32	n.s.	Yes
	Comment:	Mean illuminance is specified in BS5489-1:2013. No significant correlation was found with D-N safety ratings in this study.		
11	Overall Uniformity	0.32	n.s.	Yes
	Comment:	BS5489-1:2013 states that this should be as high as possible.		
12	Highest illuminance (lux)	0.0015	n.s.	No
	Comment:	This was the lowest correlation found and indicates that bright points on the horizontal surface are not what matters to pedestrians.		
13	Luminance on ground (cd/m2)	0.0011	n.s.	No
	Comment:	Surprising low correlation with D-N safety rating given that one of the defining aims of the p classes in BS5489-1 is safe movement.		

Table 6.24. Summary of findings.

6.14. Summary

This chapter verified the predictions made in Chapter 5 regarding variation in lighting levels, confirming the validity of the key pairs. It has examined other parameters of the experiment to find that most people were not familiar with the test sites and that there was a range of activity on the streets. Analysis of key pairs confirmed the hypothesis that light mattered to reassurance in four of seven cases. Once where one street was perceived to be significantly less safe than the other during the day, and once where one street was in the vicinity of such a street, and finally on a street which had lower perceived access to help than the others. Despite small differences in safety ratings during the day and at night within street, these differences were statistically significant except on a busy street, a street where young men congregated nearby and a street which had least perceived access to help, proving the effect of a change in conditions in the fall of darkness on reassurance.

The results have shown that lighting in interaction with other factors such as perceived access to help and daytime perceived safety, affects reassurance. Factors such as age and recent experience such as the incidents experienced by group 2, seem to have an effect independent of lighting. Once these factors are taken into account, further examination of the characteristics of lighting found that median illuminance was well correlated with reassurance. Surprisingly low uniformity was acceptable, as long as the length of areas of low illuminance (1 lux) on the streets did not exceed 15 metres. The lighting measure with highest correlation to D-N safety rating was the length of areas on the street exceeding 1 lux. Vertical illuminance was highly correlated with D-N safety rating however semi cylindrical illuminance on the target face was not. These findings point to the varying relevance of lighting metrics in BS5489-1:2013 and EN 13201-1:2013 to reassurance. In summary, lighting has an effect on reassurance, however it must first be placed in the context of other factors.

7. Discussion

7.1. Introduction

Study 1 - Three Stage Interview was designed to give participants the opportunity to discuss what matters to their reassurance when walking alone after dark, without preconditioning them with assumptions regarding lighting and safety. The results showed that lighting in interaction with other factors affects feelings of reassurance. A supplementary photo study found that lighting mattered when all other variables were controlled. However real environments are less predictable. Therefore, Study 2 - Residential Street Surveys, took participants into real environments and asked them to fill in surveys during the day and at night, designed to understand how reassurance may be affected by lighting amongst other environmental factors. A range of photometric measurements were used to characterise the lit night time environment. The results found that amongst other lighting characteristics participants find environments of extensive areas of low illuminance least reassuring. The measurements and survey results pointed to the importance of the lighting of the whole scene, not just the path ahead. Interestingly, the semi-cylindrical illuminance measurement facing the road had a higher correlation with reassurance than that on a target face in close range. This could be a proxy for the importance of lighting vertical surfaces which could reveal potential hiding places. This emphasises the importance of further research into the way the spatial features of an environment are revealed by light. The aim of this chapter is to discuss why the contributions are valid and reasonable.

7.2. Study 1 - Three Stage Interview

In an interview context participants mention lighting characteristics of a street as a contributing factor to their feelings of reassurance, along with access to help, spatial features, familiarity and the presence of perceived threatening others. The free-flowing nature of the interview meant it was difficult to isolate lighting from other aspects of the built environment as lighting was only once given as a singular reason for the presence or absence of reassurance. This demonstrates that lighting has an effect on reassurance in interaction with other elements of the environment, both sociological and physical. Stages 1 and 2, with and without specific reference to places of the participants' choosing, yielded similar results, which was that about one quarter of all the reasons given for the presence or absence of reassurance were lighting related.

Stage 3, in which participants were shown images, enabled the lighting variable to be controlled more closely by the digital manipulation of one variable only (light). The results of this method suggest a more resounding influence of lighting on reassurance as a significant number of participants preferred images with more light. However when asked whether they would or would not use a street similar to those shown, a significant number of participants were confident to use streets showing residences regardless of the variation in light level. This shows that light may not influence behaviour regardless of the expression of a significant preference for a scene with more light. This demonstrates that controlled experiments using discrimination tasks may oversimplify the factors which affect pedestrian behaviour. It is interesting to note that when a light source at the end of a narrow path was removed, a significant number of

people would not take that path. The reason for this could be a combination of less light and undesirable spatial features.

The difference in results between stages 1 (no visual prompts), 2 (visual prompts) and 3 (use of preselected images) may be related to the different methods of the experiment, the third presenting limited choices which were not present in stages 1 or 2. It could also be related to the difference between familiar and unfamiliar environments, suggesting that lighting matters more when pedestrians do not know the area and therefore need to see more in order to make a judgement. Further work should explore the effect of familiarity further. It would also be interesting to investigate under what circumstances pedestrians find themselves walking in unfamiliar environments.

Lighting is unlikely to turn a couch potato into a jogger, as there are many other socio-economic factors which influence lifestyle changing decisions. Study 1 stage 3 found that in residential areas perceived to be safe, less light compared to more light might be acceptable and unlikely to deter people from using the environment. Understanding how choices are made would help to understand the role that lighting and the environment could have in this process. There is a need to understand what makes lighting good and establish whether it could change behaviour.

7.3. Study 2 - Residential Street Surveys
7.3.1. Comparison with Boyce et al. car park study

Boyce et al. demonstrated that the difference between day and night time safety ratings decreased as median illuminance increased. When the experiment was repeated on residential streets the results followed the same pattern (Figure 7.1). A logarithmic trend line is used in Figure 7.1 because this is the closest to the hyperbolic trend line used by Boyce et al. In both urban and suburban car park settings the highest day minus night safety rating corresponded to the lowest recorded median illuminance value, however this was not the same on residential streets. The highest D - N safety rating in residential environments has the fourth lowest median illuminance.
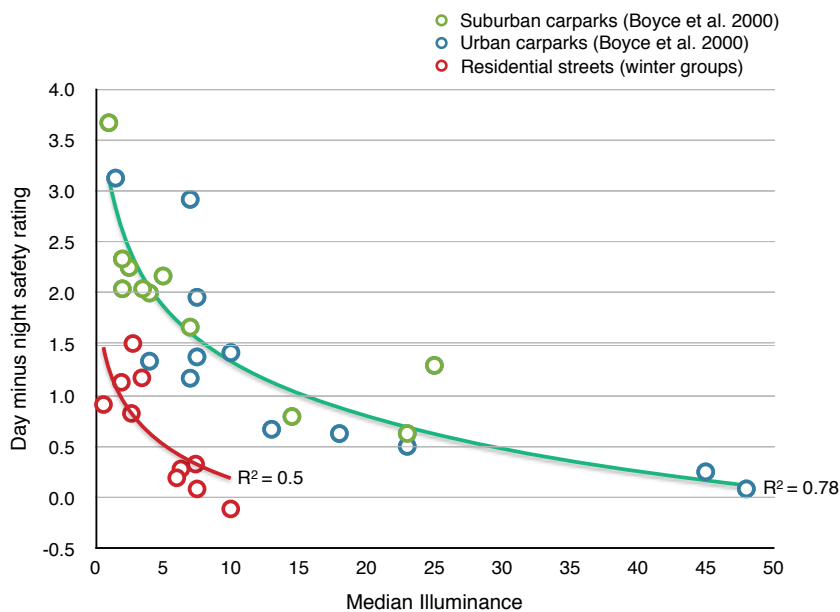
Figure 7.1. Correlation of D-N safety rating and median illuminances on residential streets and in suburban and urban car parks (Boyce et al. 2000). Note: Boyce et al. study scales (1-7) were matched to the residential study (1-6).

Car parks

Not enough is known about the car park locations in the Boyce et al. study to be able to speculate regarding why the D-N safety ratings were higher than the residential streets in this study. In contrast to the car parks used in the Boyce et al. study, the Arts Tower car park was perceived to be significantly more safe than most streets during the day and at night (Table 6.7). This could be because most participants were familiar with the Arts Tower car park (Figure 6.3) or because this car park is in a busy location. Further work should explore the difference between perceptions in familiar and unfamiliar locations, because the familiar car park in this study was also perceived to be the safest environment.

Strength of other correlations

Table 7.1 lists correlations resulting from plots of different dataset combinations at different median illuminance ranges. The reason for this is to observe whether there are any data points on which the significance level depends, sometimes known as anchoring points.

When the car park data is plotted against D-N safety rating data, the correlations are significant to the $p \leq 0.01$ level for the suburban/urban and suburban data (rows 2,3) however is reduced to $p \leq 0.05$ for the urban car park data alone (row 4). When the residential streets data is added to the car park data, the correlation remains significant, however to the $p \leq 0.05$ level rather than the $p \leq 0.01$ level (rows 1 & 2).

There seems to be a stronger anchoring effect of higher median illuminance values (above 15 lux) on the correlation between D-N safety rating and median illuminances in urban car parks (row 4, 7 and 11), when compared to suburban car parks. For suburban car parks the significance is reduced from $p \leq 0.01$ (row 3 and 6) to $p \leq 0.05$ when values below 10 lux are plotted (row 10). The significance of the correlation of suburban and urban data plotted together depends on values above 15 lux (rows 2,8 and 13). The significance of all data points plotted together depends on values above 15 lux (rows 1,9 and 14) therefore further work should collect more data at lower median illuminances.

Row	D-N safety rating plotted against median illuminance (lux)		Coefficient of determination	No. of data points	Sig. (p value)
1		Suburban and urban car parks and residential streets	0.41	33	≤0.05
2	0-50 lux	Suburban and urban car parks	0.89	23	≤0.01
3		Suburban car parks	0.82	11	≤0.01
4		Urban car parks	0.62	12	≤0.05
5		Residential streets (winter groups)	0.50	10	n.s.
6	0-15 lux	Suburban car parks	0.82	9	≤0.01
7		Urban car parks	0.71	8	≤0.05
8		Suburban and urban car parks	0.55	17	≤0.05
9		All	0.19	27	n.s.
10	0-10 lux	Suburban car parks	0.69	8	n.s.
11		Urban car parks	0.13	7	n.s.
12		Residential streets (winter groups)	0.50	10	≤0.05
13	0-10 lux	Suburban and urban	0.38	15	n.s.
14		All	0.15	25	n.s.
15	0-9 lux	Residential streets (winter groups)	0.41	9	n.s.

Table 7.1. Effect of anchoring and different combinations of data points on p value. All trend lines are logarithmic (non linear).

7.3.2. Luminance patterns

In order to make a decision about whether to navigate an environment, a pedestrian needs to glean information regarding whether it is safe to do so. Lighting has a role in this information seeking, because it contributes to the pedestrian's ability to see. A range of measurements were recorded and plotted against D-N safety ratings. This revealed that the pattern of light in an environment expressed in the length and level of areas of low luminance matters to reassurance, as does vertical illumination and light received from the whole scene measured by indirect illuminance.

Luminance patterns of the whole surroundings

The lighting of the whole vicinity is important to reassurance, not just the path which lies ahead which is supported by existing work emphasising the relevance of luminance patterns of the environment (Viliûnas, Vaitkevicius et al. 2013). This study found that the following were correlated with the reassurance: Extent of areas of low luminance; lowest acceptable illuminances; longitudinal uniformity. These are discussed below.

Extent of areas of low luminance

Continuous dark patches on the pavement have a negative effect on reassurance. This may be because the uncertainty presented by darkness means that there are more unknowns in the environment. On the streets used in this study, it was found that luminances of below 0.19 cd/m^2 should not occur continuously for more than 20 metres for reassurance levels of less than half a scale point (when using the D-N safety rating as a measure of the effect of light on reassurance). The importance of the length of the area of low luminance could be related to the time it takes to cross that environment as shorter distances are quicker to cross, and the duration of a perceived increase in threat is reduced. It was reported anecdotally that pedestrians sometimes run through an environment of which they are uncertain, which reduces the amount of time taken to cross that environment. In this study, 1 lux (or 0.064 cd/m^2) did not occur for more than 5 metres for a D-N safety rating of less than 0.5.

Lowest acceptable illuminances

It is important to understand minimum acceptability, because when walking is a realistic option pedestrians should not be deterred by their environment. It was found that the lowest illuminance levels on the street affects reassurance. The illuminance of the darkest spot on street did not fall below 1.5 lux on streets where the D-N safety rating was above 1 scale point (except on s4, Figure 6.32, section 6.9.7). For a D-N safety rating of less than 0.5 scale points on four out of five streets the lowest illuminance measured was greater than 1.8 lux. The results imply that the median path illuminance threshold for pedestrian reassurance (if a D-N value of 0.5 is seen to be acceptable and 1 is not) fall between 0.75 and 1.8 lux. This is lower than the recommendations for minimum maintained horizontal illuminance in P1 (5 lux) and P2 (3 lux) however is higher than the recommendations for P5 and P6 (0.6 lux).

There may be no reason for pedestrians to require more light on the pavement in higher P class areas because P class defining factors such as increased traffic flow traffic are more likely to contribute to increasing reassurance, as found in study 1. On this basis, further work might be well invested in exploring the implications of increasing the minimum maintained illuminance of P5 and P6 to 0.75 lux, and reducing the minimum maintained illuminance of P1 and P2 to 1.8 lux.

A study by Haans and de Kort study claims that pedestrians prefer more light in their immediate surroundings compared to their route ahead. Their study supports the findings that pedestrians do not like dark spots of more than 25 m as in each case when walking or stationary, when pedestrians experienced 0.5 lux for more than 25 m, they expressed a statistically significant reduced preference. There were no statistically significant differences between the pairs of experimental conditions of either walking under 9.5 or 12.5 lux, or

standing within close view of a lamp post providing an illuminance of 7 or 12.5 lux. This supports the findings that it is the luminance of the dark areas rather than the luminance of the light areas which matters to pedestrians. It would be interesting to repeat this study at illuminances levels at the lower end of the P classes because the effect of the lighting conditions on responses may not be as pronounced.

Longitudinal uniformity

The results suggest that the longitudinal uniformity of the horizontal surface including the road area has an effect on reassurance. Longitudinal uniformity was significantly correlated to reassurance ($p<0.05$) however overall uniformity was not. This means that the ratio of minimum to maximum illuminance matters more than the ratio of minimum to average. The acceptability of low uniformity is surprising. For a D-N of ≤1 scalar point longitudinal uniformity was 0.02. For a D-N of ≤0.5 scalar point longitudinal uniformity was 0.03, if longitudinal uniformity is calculated along the centreline of the road and pavement. Further work should investigate the underlying cause of the high correlation between low longitudinal uniformity and reassurance. It may be that pedestrians do not mind a non-uniform environment as long as the environment is legible. Lightness constancy, partially provided by uniform lighting (Lynes 1971) may not be necessary for reassurance in external environments. Further work could also investigate on which surface longitudinal uniformity matters most for example, horizontal or vertical surfaces or a combination of both. The correlation between the longitudinal uniformity of the whole environment including the middle-of-the-road was stronger than that of only the path ahead of the pedestrian. This shows that the appearance of the pedestrian's whole surroundings matter, not just where they are walking.

Worst or average condition?

The findings have so far suggested that reassurance may be generated by the extent of the lowest rather than the mean condition. Median illuminance was highly correlated to reassurance as this negates the extremes presented by measurements taken under lamp posts. It may be worth exploring the implications of giving designers the option to use median rather than mean horizontal illuminance as a means of allowing design flexibility as long as they do not plan extensive areas of low illuminances.

7.3.3. Light from the whole scene
Indirect illuminance

Indirect illuminance at eye level measuring how much reflected light enters the eye was found to be relevant to reassurance. The results suggest that for D-N values of less than 1 indirect illuminance should be 0.25 lux and for D-N values of less than half a scale point indirect illuminances should be 0.7 lux. Cuttle has proposed that perceived adequacy of illumination (Cuttle 2013) be introduced into the recommendations. This may be an appropriate approach to street lighting. If the smallest detectable differences between the perceived safety of residential environments can be found at low illuminances then the lighting conditions of the environments tested could be used to identify acceptable variations. For example, if a street is lit to P1, and another lit to P3 however with facade lighting on a couple of the buildings, then there may not be a perceivable difference between the acceptability of the streets. This is difficult to encapsulate in regulations as facade lighting is the decision of private owners rather

than the local authority. However if the buildings or spaces for example public squares and parks are owned by the local authority then how they are lit could be taken into consideration when choosing the most appropriate P class. This could potentially be expressed by a metric such as indirect illuminance. Further work should explore better methods of measurement.

7.3.4. Spatial features
Esc and vertical facades

Semi cylindrical illuminance in four directions in front of the survey filling in point was measured and plotted against day minus night safety ratings. The highest correlation was with the semi-cylindrical illuminance reading facing the road. As there is no reason for pedestrian reassurance to be affected by the amount of light that falls on them from the side of the road, then this could be a proxy for the amount of light which falls on the vertical surfaces adjacent to the pavement as shown in Figure 7.2.

Figure 7.2. Demonstrating how semi-cylindrical illuminances facing the road could be a proxy for vertical illuminance on the facades parallel to the pavement (primary pedestrian flow).

The reason for providing the option to use semi cylindrical illuminance in BS5489-1:2013 is facial recognition and recognition of intent. However the effect of lighting on reassurance was more highly correlated with Esc facing the road. The definition of boundaries may be more relevant to reassurance than being able to see the faces of oncoming pedestrians. This could be because people may be seen in silhouette against a light background (Figure 7.3) and being able to see a silhouette may be enough to make a judgement regarding what other people are doing in the environment and whether any evasive action needs to be taken. However it is easier to judge depth perception under direct illumination rather than by silhouette. Further work could explore the relevance of facades of different distances from the pavement to reassurance.

Lower illuminance on the horizontal plane and higher illuminance on the vertical plane.	Higher illuminance on the horizontal plane and lower illuminance on the vertical plane.

Figure 7.3. The difference in the effect of vertical and horizontal illumination. The people in the left-hand image also exist on the right-hand image however are less visible.

Vertical illuminance

Vertical illuminance measured at 1.5 m high about 2 m in front of the survey filling in point was correlated to the D-N safety rating ($p<0.05$). This supports the idea that the main objects of prominence and interest are vertically orientated, namely other people and building facades which define spatial boundaries. Maybe less light on a lighter surface within the pedestrian's line of sight is more effective in influencing their judgement of an adequately lit street than more light on a surface which is outside their line of sight (at close range), for example the pavement.

Trees

Trees are also vertical objects of prominence. Based on views from the survey filling in point, two of the leafiest streets (s5 and s8) were also those of lowest D-N safety rating in winter (Table 7.2). Further work could explore whether the effect of trees is due to (1) their foliage blocking street lighting, (2) low luminance of leaves or (3) connotations of the forest. It is interesting to note that in the summer there was no consistent effect of streets with trees (s5, s4, s8, s3, and s1) on safety ratings (Figures 6.37 and 6.38).

Implications

One of the advantages of using mean illuminance is that it is simple, easy to understand and can be generated by the push of a button using lighting software commonly used in practice. However, it could be argued that if mean illuminance can be easily generated, then so could most of the other metrics more sensitive to reassurance. Therefore, it may be worth considering that in cases where mean illuminance for whatever design reason, is lower than the recommended level, it could be substituted by another metric, as long as the design meets the minimum requirements for that. These could possibly be as highlighted in Table 6.23 section 6.13. Reassurance may not be the only motivation for street lighting recommendations however it could be argued that all other possible motivations (of safe movement, pleasantness, legibility and the ability to navigate the environment) are necessary for reassurance.
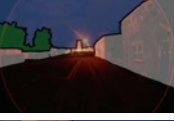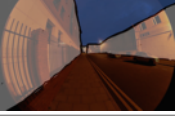
Approximate ratio of trees to sky:

Trees/ sky	Street		Observation	D-N safety ranking (1 means least effect of light and lowest D-N rating).
6:1	s8		More trees to sky	9
3:1	s5			7
2.5:1	s1,s4			6,3
2:1	s3			1
1:15	s2			5
1:20	s9			3
1:30	s7			8
0:1	s6		Less trees to sky	2

Table 7.2. Observation of streets with highest proportion of trees to sky in the view from survey filling in point.

7.3.5. Hiding places

People need enough street lighting to be aware of any danger that their environment might present. One explanation of the importance of the extent, illuminance and luminance of dark areas of the street environment in pedestrian reassurance could be that dark areas could create hiding places for criminals. Figure 7.4 shows that answers to the question "Are there places on the street where people who are up to no good could hide?" are not significantly correlated between day and night although there is a tendency to identify more hiding places at night which is to be expected given reduced visibility. This shows that the perception of spatial features changes between day and night, and the reason for this must be lighting.
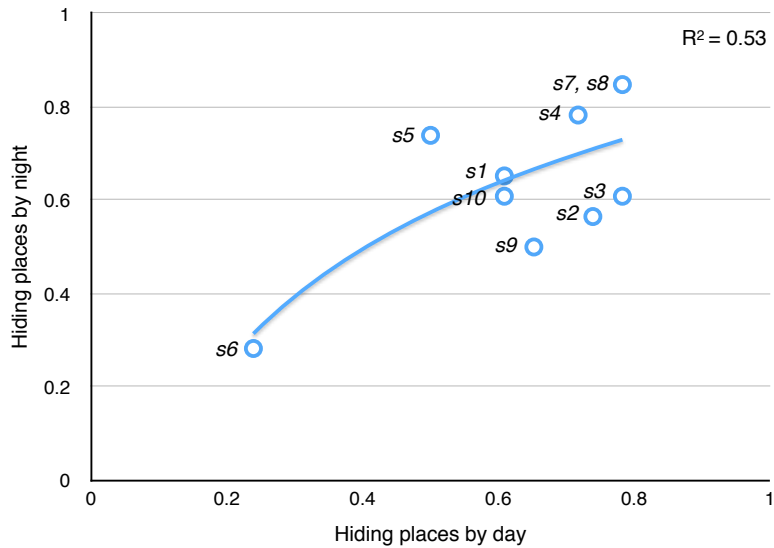
Figure 7.4. Correlation of hiding places by day and by night, using a linear trend line. 0 means no hiding places, 1 means presence of hiding places.

S7 and s8 were identified as having the most hiding places by day and by night, and s6 the least. S6 comprises mainly inaccessible vertical railings or blank facades. It is interesting to note that wearing low transmission glasses at night increased the perception of the presence of hiding places, however it reduced it during the day. Previous research has shown an increase in sense of security if a potential hiding place in an alley was lit (Leslie and Rodgers 1996). Figure 7.5 shows a non-significant correlation between hiding places by night and D-N safety ratings. This shows that the spatial features of the street as revealed by the street lighting should not be isolated from other factors.
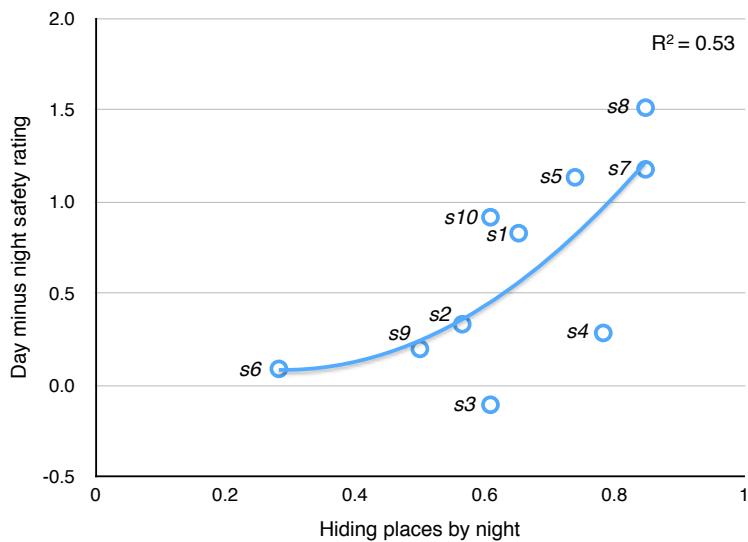
Figure 7.5. Correlation of day minus night safety rating with hiding places by by night, a logarithmic trendline. 0 means no hiding places, 1 means presence of hiding places.

All of the above (vertical facades, trees and hiding places) point to the relevance of further research into how spatial features interact with lighting and how this might affect reassurance.

The geometry of the street layout may be worth considering when planning street lighting installations as the pedestrian's ability to recognise spatial hierarchy may affect their reassurance. Areas of low illumination seem to have an effect on the human imagination. When Hopkinson asked subjects to rate the brightness of stimuli, part of the test was to present no stimuli. In this situation, participants were expected to give a rating of "zero" or "black" to very dark areas. Instead subjects occasionally gave values of minute fractions to non-existence stimuli. One subject commented, "I knew there must be something there even though I couldn't see it, so I guessed a small fraction" (Hopkinson 1957).

7.3.6. Effect of perceived access to help

The access to help question " do you think there are other people who would come to your assistance should you encounter trouble on this street?" was included as a means of gauging pedestrian's perception of informal surveillance, the importance of which has been raised in previous research (Jacobs 1961). It refers to support that pedestrians might receive from other users of the space should anything happen. Figure 6.16 in chapter 6 showed that the differences in perceived access to help between day minus night were very small and appeared to vary independently of day minus night access to help ratings. To check this, the correlation between D-N access to assistance and D-N safety was plotted. The correlation showed an upward trend (increasing D-N access to assistance with increasing D-N safety) however was weak (R^2=0.35). The correlation showed that in relatively quiet residential streets in Sheffield perceived access to help remains similar between day and night and perceptions of safety fluctuate independently.

7.3.7. Difference between types of residential area

It is difficult to generalise about the type of area because everybody has a different perception based on subjective impressions and experiences. Somebody who comes from one area of Sheffield may perceive another area to be rough. However people who live in that area, may perceive it to be safe. The anomalies are raised by the author's experience on St Philips Road. One resident was friendly and offered to be a participant in the research, whereas her neighbour spent two measurement sessions shouting derogatory comments from an upstairs window. Prejudices effect perceptions of areas and these are different for everybody, depending on how they were raised, what they have experienced, and their general approach to life. The field of psychology recognises that what we see can be confusing, however what we know soon clears things up.

Even if there is a disconnect between perceptions and reality, perceptions of safety exist and matter to the extent that they may negate the effect of lighting. Study 2 found that in environments being compared lighting had less of an effect on areas perceived to be significantly less safe during the day. The selected streets were in four distinct areas (Ecclesall; Broomhall; Broomfield and Netherthorpe) as described in chapter 5. When these groups are identified using different trend lines by area, in the plot of D-N safety ratings against median illuminances (Figure 7.6) it can be seen that the trend for decreasing D-N safety rating with increasing median illuminance is consistent between the four areas chosen for the study. This shows that regardless of the area the effect appears to be the same and contributes to validating the findings.
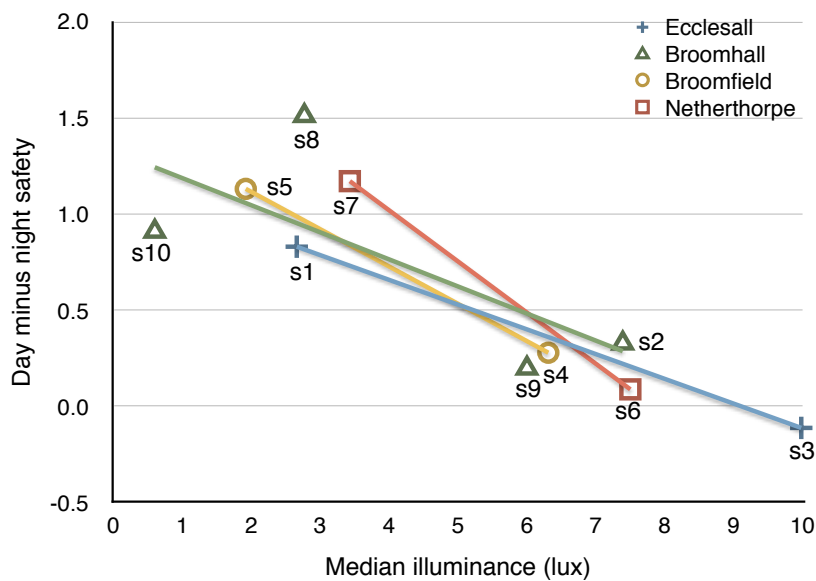
Figure 7.6. Day minus night safety by area and median illuminance

7.3.8. Effect of experience

Due to two unexpected incidents which took place during the experiments, the effect of recent experience on reassurance could be observed. It is unlikely that ethical approval for an experiment which deliberately scared participants would be given. However this inadvertently happened and indicates that immediate recent experience affects reassurance as group 2 responded to the surveys significantly differently than all other groups, except group 3.

Fear was discussed briefly in the review chapter and found to be an ill-defined term. The definition chosen to inform reassurance was "Awareness of the possibility of crime - Precautions sensible", however other types of fear may also be relevant. During the course of this work the author felt fear twice. This was expressed in increased heart rate, sick feeling and legs turning to jelly sensation. The first time was due to threat to personal safety which occurred during the attack which took place when taking pre survey measurements on Montgomery Terrace Road (adjacent to s7) and the second was when arriving on William Street with group 2. The reason for fear was firstly due to physical threat and secondly being outnumbered and lack of ability to control 15 participants and 9 other people on the street. No other occasion created fear, which reinforces the importance of lighting of an environment to reveal other people. As the environment itself is unlikely to present any immediate danger, the only threat is from other users of the space (Acuña-Rivera, Uzzell et al. 2011).

7.3.9. Effect of age

Group 3 answered the surveys significantly differently to all other groups except group 2. This could be due to increased perceived vulnerability of which reduced visual capability forms a part. When drawing conclusions from this study, the sample should be noted as the findings relate to a majority student population (81% of the sample). This is an important demographic of Sheffield however there are other social demographics to be considered. Further research should increase the sample of elderly people.

Use of pen torches

Completing a survey is a visual task not necessary when walking down a street at night, however it was a requirement of this experiment. Participants were asked not to use the pen torch unless absolutely necessary to see the survey sheet. As expected and as demonstrated by Figure 7.7, the older group group needed to use the pen torches more than the younger groups. This supports research that vision deteriorates with age (Owsley, Sekuler et al. 1983). It is interesting to note that even though the light conditions were very similar between student groups 1 and 2 (7:30 PM in winter) and group 4 (10:30 PM in the summer), more people in group 4 needed to use the pen torches. It is not known whether this is related to (1) the effect of the time of day (people may think they need more light later on), (2) the effect of increased foliage due to the time of year or (3) more people in the group having worse eyesight.
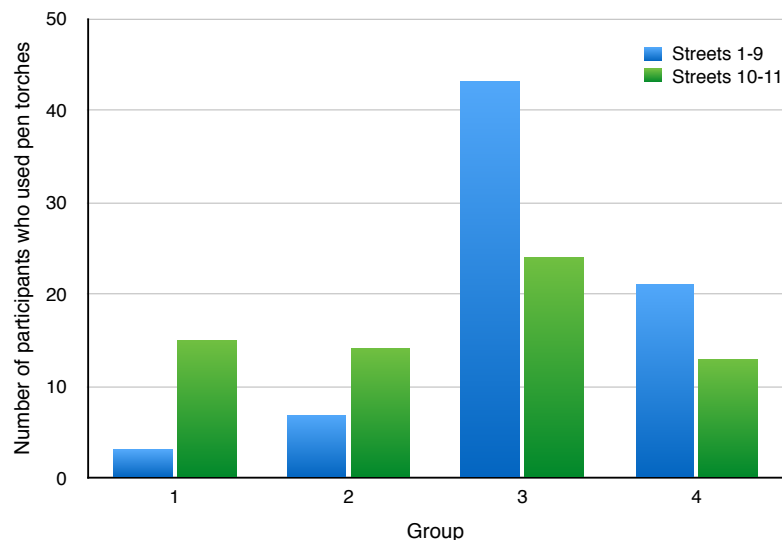
Figure 7.7. Number of participants who used pen torches to fill in surveys on the study streets after dark.

7.3.10. Effect of time of day

When the Day minus Night safety rating was analysed by group, there is no significant difference between group 4 and any other group except group 5 which gave a significantly lower D-N value ($p<0.05$). This demonstrates that time of day may have less of an effect than lighting conditions. When mean day and night safety ratings were analysed independently there were no significant effects between group 4 and the others, except that group 4 was significantly more reassured than group 3 during the day, and group 2 at night. This reinforces that time of day and year may have less of an effect than lighting conditions. The effect of the warmer weather in summer is unknown.

Group 4 was not significantly less reassured than any of the other groups on s3, s4, s5 during the day or at night, even though on all these streets tree foliage may have affected lighting conditions. Therefore, the fact that sunset has fallen had more of an effect than local conditions such as trees blocking street lights.

7.3.11. Importance of survey filling in location

Observation of the plots of longitudinal distance versus luminance (section 6.9.4 and Appendix D.3) show that there is no consistent effect on perceived safety of the location of the viewing point in a darker spot facing inconsistently increasing path luminance levels. The survey filling in points on streets s1,s2,s4,s7 and s8 face towards increasing path luminances, however their D-N safety score ranks are 5,4,3,8 and 9 respectively (highest rank means most reassuring). Streets s9 and s6 show decreasing path luminances immediately in front of the survey filling in point however are not perceived to be less safe than the others with increasing path illuminance straight ahead. Therefore these results do not support those of previous work which showed that participants judged the street to be less safe if standing in a dark spot looking towards increasing path illuminances (Haans and de Kort 2012). However the experimental conditions and method were different and the effect of this is unknown. On both streets s9 and s6 the opposite side of the street is brighter which demonstrates the importance of examining the luminance patterns of the whole street, rather than just the path ahead.

Are the extremes in the field of view?

The following Table 7.3 identifies whether the highest and lowest horizontal illuminance measurements appeared in the field of view from the filling in survey location and compares this with the safety ranking. This analysis differs from the previous section because it includes both sides of the street, rather than just the path ahead. It can be seen that the lowest measurement on the street appears in the field of view on the most reassuring streets and the highest measurement in the field of view on the least reassuring street. This shows that the location of the survey filling point may be significant in pedestrian's judgement of a street. Full plots along the street route can be found in Appendix D.3. Further work should examine the effect of the location of the survey filling in point on how a scene is rated. This could be done by asking participants to walk a route and then ask them to fill in surveys at different locations on the same street, to see if this affects the result.

Street	Ranking of (D-N safety rating)	Highest path luminance on street cd/m2	Is this in the field of view from survey filling in point?	Lowest path luminance on street cd/m2	Is this in the field of view from survey filling in point?	Upward or downward trend in light levels in first 30 metres of view?
8	1	1.73	Yes	0.02	Yes	Upward
7	2	2.75	No	0.04	Yes	Upward
5	3	1.15	Yes	0.01	Yes	Up then down
1	4	1.95	Yes	0.04	Yes	Upward
2	5	2.96	Yes	0.12	No	Upward
4	6	1.70	Yes	0.04	No	Down then up
9	7	1.46	No	0.15	Yes	Downward
6	8	2.03	Yes	0.14	Yes	Downward
3	9	1.54	Yes	0.16	Yes	Downward

Table 7.3. Presence of extremes of path measurements in the field of view from survey filling in point. Middle of road values are excluded here. Note that luminance measurements assume a pavement reflectance of 0.2.

7.4. Summary

The approach of both experiments has not been tested on the topic of residential streets at night time before. Therefore the results which show that pedestrians think that lighting matters (Study 1), and that this is also the case in real environments (Study 2) contribute to the body of knowledge in the field of the impact of street lighting on pedestrian reassurance in residential environments.

Luminance patterns of the whole surrounding matter to reassurance. This was expressed in a high correlation between the extent of areas of low luminance, lowest acceptable illuminances and longitudinal uniformity. The lighting of spatial features expressed in vertical illuminance matters as does the amount of light received by the eye from the whole scene. Spatial features such as hiding places have more of an effect at night when visibility is reduced, however the correlation between D-N safety ratings and hiding places by night was not significant indicating that other factors also matter. The effect of increasing D-N safety rating as median illuminance decreased was consistent within the four areas selected for Study 2.

Recent experience has an effect independent of lighting as expressed by behaviour of group 2. Age had an effect on both vision, as more elderly participants used pen torches and daytime safety ratings. Extended daylight hours in summer increased reassurance, demonstrating the effect of the time of fall of darkness. Methodological issues such as survey filling in location maybe worth further investigation. Overall, Study 1 adds to existing research in the field, identifying similar combinations of reasons and adds the category of the presence of threatening others for unreassuring areas. Study 2 adds to the Boyce et al. car park study demonstrating a similar pattern in a residential streets in Sheffield.

8. Conclusions

8.1. Limitations of the studies and suggestions for further work

The problem of the experiment training the observation is unavoidable (Waldram 1962). Inherent biases exist in both interview and survey techniques of data collection. Attempts were made to reduce bias whilst accepting that it is impossible to eliminate. The following limitations of the studies are identified:

Sample

Interviews identified no difference between the concerns of older and younger groups, however the older group responded to the survey questions significantly differently to the others during the day. Therefore the effect of lighting on this age group may be worth exploring further, particularly the possible effect of reduced visual capability on perceived vulnerability.

The elderly participant group was mainly recruited from the University of the Third Age, which may have contained people of a similar socio-economic demographic. The perceptions of the most vulnerable elderly people who were not capable of completing the on street surveys and therefore did not choose to participate in the study, are excluded from the findings. Students who participated in this study were from a broad range of cultural backgrounds. As origin was not treated as a variable this is not discussed in detail, however it could have had an effect. Therefore the findings may not be generalisable over other populations. Further work could explore a wider range of participants for example young people who are not students and extend the socio-demographic and number of older people.

Interviews

Given the natural tendency of participants to respond to an experimental setup in a way that they think might benefit the research cause, care was taken to design an interview method in which causes of bias were reduced. The subtle nuances of the mental processes between interviewer and interviewee are undeniable however also intangible. The effect of this is difficult to quantify and unknown. It may be worth asking external people who have no knowledge of the research to conduct the interviews.

Surveys

Poulton demonstrated that when participants complete surveys they subconsciously fit the stimuli to the scale given (Poulton 1982). Participants could have subconsciously ordered the streets in relation to each other and fit them to the 1 to 6 scale of the surveys. The street order was randomised to counter the effect of this, however the effect of the close proximity of streets to each other is unknown. Also, despite randomisation of the street order within the sub areas, it was not possible to randomise the order of all streets visited due to the time constraint of the experiment. Therefore there may be bias as a result of order effect which is impossible to measure. Further work should fully randomise the order in which streets are visited, which would require more time for the experiment.

Group dynamics

Group 2 looked to the author for guidance when encountering groups of four or more men on the streets. The author found that by talking to the group it was easy to influence their mood and calm down the participants who expressed more panic than others. Study 2 could be criticised for the use of groups, as walking on the streets in a group of fifteen people is not a typical pedestrian experience. The group dynamics, circumstances on the streets and the author's reaction to these circumstances could all influence how the surveys are completed. As people tend not to walk in large groups, further work could ask them to walk alone. Better still, an epidemiological study of behaviour on a larger scale could observe pedestrian's about their everyday business. No research to date has examined how much lighting if any, could influence patterns of movement. Further work should explore whether and the extent to which lighting can influence behaviour.

Low transmission glasses

Reassurance is an affective response and emotions such as amusement caused by walking around after dark wearing low transmission glasses could influence this response. The effect of the novelty factor of wearing low transmission glasses is unknown, whereas the effect on illumination received by the eye is known.

Statistics

Much emphasis is placed on statistical significance however it is important to be wary of small differences even if significant because statistical significance does not necessarily mean that the small difference matters on a practical level in the real world. On the other hand, it may be mistakenly thought that there is no real world importance because the statistical difference is so small. For example, if lighting is shown to make no difference to an area which has a bad reputation, this does not mean that the area should not be re lit.

Being statistically significant does not necessarily mean that an effect/difference is also large enough for it to matter in the real world. In contrast, an effect/difference that is not statistically significant may still be large/noticeable enough and have consequences that people care about. Further work such as the studies presented by this thesis should continue to balance qualitative and quantitative approaches to get the bottom of what matters to people in their environment.

Stationary observer

Pedestrians do not usually stand stationary in the middle of the pavement. Further work could address the participant as an object in motion rather than a stationary observer, which is closer to the pedestrian experience. This could be achieved by asking them to walk a route to a location and upon arrival ask them about their recently completed route, from memory.

D-N safety rating

Much emphasis is placed on the day minus night safety rating, however further work should ascertain what D-N safety rating is desirable to pedestrians. Further work is required to determine the acceptable D-N safety ratings before translating the findings into lighting recommendations. The question of whether a D-N safety rating of zero is a sensible aim of

lighting practice should be asked. Other measures of reassurance should be explored for example, could a decrease in reassurance be measured by an increase in walking speed.

Further work could compare behaviour on short streets and long streets to get a sense of whether the problem is the amount of time it would take to walk a certain distance in areas of low luminance. The reason time may be the issue is because anecdotally it was reported that if people are not reassured in an environment they increase their walking speed. If participants walk faster than they spend less time in darker areas. Being able to run reinforces the knowledge that they can escape. Existing research has measured how gait velocity and step length variability changes as illuminance is lowered (Figueiro, Plitnick et al. 2011). It would be interesting to apply this approach to external environments.

Time of day and year
The effect of time of day and the year could be explored more fully. For example by surveying participants at sites at 10:30 PM in winter and compare this to the results obtained for 10:30pm in the summer. Also, the effect of dusk could be explored further, as no effect was found on two streets which were visited in dusk in Study 2.

Familiarity
The interviews of study 1 addressed familiar environments. Participants were mostly unfamiliar with the environments of study 2. Further work should examine the effect of lighting on familiar environments and explore circumstances in which people would use unfamiliar environments.

Different environments
Different light sources and different distributions in different street geometries make it difficult to isolate the effect of each. It may be that at higher illuminances one thing matters, whereas at lower illuminances something else matters. A limitation of the study was that it was impossible to examine spectral effects because different lamp types appeared on the same and different streets.

The effect of the broader context could be explored further by addressing each of the following issues:

(1) The effect of seeing landmark buildings (such as the Arts Tower) in the distance on judgement of spatial context/orientation has not been investigated. The impact of the complexity of background luminance patterns on the visual saliency of landmarks has been proved in lighting research (Davoudian 2009). The impact of the visual saliency of landmarks in aiding orientation which may affect reassurance may be worth further research.

(2) Examination of busy and quiet streets separately, to determine if lighting requirements are different depending on street usage. For example on a quiet street, pedestrians may expect less light than on a busy street.

(3) Reassurance may also be affected by visual constancy precepts (Table 2.3) not discussed in this thesis, each of which may be worth investigation.

(4) Lighting other than street lighting matters, for example, lights on in windows might indicate the presence of occupied houses.

(5) Further work could also explore the threshold of acceptable dark patch distances on streets of varying spatial features such as width, spacing, building heights, to test whether dislike of low luminance areas is related to the sense of enclosure brought by darkness which may also be affected by contrast and a combination of vertical and horizontal illumination.

Application of findings

In BS 5489-3, the average and minimum illuminance levels are specified resulting in implied overall uniformity of 0.2. However, a less uniform environment may be acceptable. It may be that for an environment to be reassuring, it needs to look adequately lit and this may be achieved by many means other than and including horizontal illuminance. There may be a place in the standards for the use of other metrics for example indirect illuminance, however further research is necessary to established how robust these measurements are and whether they are better than mean and minimum illuminances currently specified in BS5489-1:2013. In order to adopt anything other than the status quo it has to be proved that any other proposal works and is better. This needs to be simple and testable and requires further research.

Further work is required into the application of the findings because the implications of small differences have a large impact on cost, given that the majority of the UK population live on residential streets. The work has tested a new metric (indirect illuminance) and found that surfaces other than the horizontal may matter, however how these might be applied requires further investigation.

8.2. Contribution

In Sheffield and other major cities, LED luminaires with sharp cut-off angles are being installed, designed to meet the horizontal plane criteria by optimisation of many small light sources and reflectors which direct luminous flux towards the pavement. Older luminaires such as those housing low pressure sodium lamps were long and of low luminance and spilled light into their surroundings. This spill light may have had a role in defining the boundaries of the environment. Therefore this thesis which has pointed to the importance of luminance patterns of the whole environment and surfaces other than the horizontal is relevant to street lighting decisions which are being made now.

To the author's knowledge this is the first piece of work which places lighting in the broad context of what matters to pedestrian reassurance in residential environments whilst thoroughly examining the lighting conditions of the selected streets. It is also the first piece of work which considers the effect of time of year on pedestrian reassurance. The contributions are summarised by Figure 7.8.
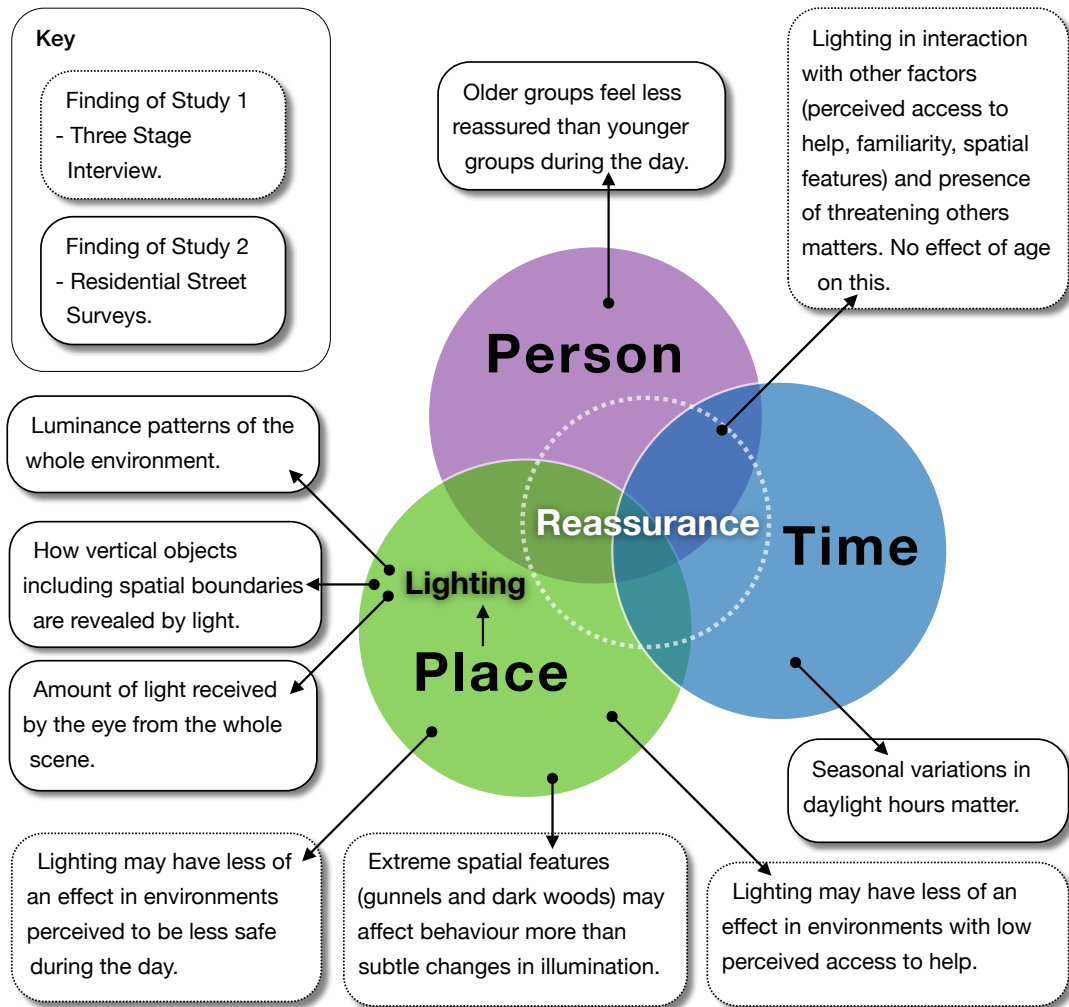
Figure 7.8. What matters to pedestrian reassurance in residential areas? Contributions based on person/place/time diagram (Figure 2.1).

8.3. Conclusion

Study 1 - Three Stage Interview pointed to the possibility of photometric measures alone being poor predictors of reassurance in some situations as subjective judgements of safety depend on factors other than illuminance levels. It was found that lighting in interaction with other factors such as spatial features, access to help, familiarity and the presence of threatening others affects reassurance. Discrimination tasks pointed to a preference for a lighter residential scene over a darker version of the same image. However more or less light in an image did not effect participant's behaviour when asked whether they would use the residential environments shown in an unfamiliar area after dark.

The findings of Study 1 were partially corroborated by Study 2 - Residential Street Surveys, which found that lighting had less of an effect on reassurance if the area was perceived to be less safe during the day or had low perceived access to help. A thorough examination of lighting conditions found that the lighting characteristics relevant to pedestrian reassurance are: (1) luminance patterns of the whole environment which includes the levels and extent of low luminance areas also encompassed in the median and longitudinal uniformity values, (2) how vertical objects including spatial boundaries are revealed by light expressed in vertical illumination (vertical luminance or illuminance and semi cylindrical illuminance facing the road) and (3) the amount of light received by the eye from the whole scene. Study 1 found that people think lighting matters and study two reaffirmed that it does. However, neither study presents lighting as a solution if an area is perceived to be unsafe during the day. This thesis has pointed to a range of minimum acceptable conditions for pedestrian reassurance. This is a judgement of values and might be different to good practice.

Appendices

Appendix A

A.1. Participant's variations of photograph task

Although the instructions were clear, not all participants kept to the guidelines. Exceptional cases and how these were dealt with are listed in the Table A1. The small number of instances in which participants did not follow the task shows that the method was robust. As each example of deviance from the expected outcome was mitigated, they are not considered important.

Example	Action	Response	Number of instances
1	Participant identified more than two reassured or not reassured streets.	Participants were asked to identify the extremes and discuss those. For example their most reassured streets out of their reassured selection.	1
2	Participant did not take photographs of reassured streets.	Participant was asked to recall two streets from memory.	1
3	Participant took more than two photographs of each street.	Participant was asked to select two photographs which they felt best described what they wanted to say about the street, and these photographs were used in the discussion.	7
4	Participant could not remember which photograph was in which area.	Participants were given unlimited time to sort out the photographs into reassured and not reassured places, if they still could not remember then these photographs were not discussed.	2
5	Photographs came out black or unidentifiable.	Participants were asked to recall characteristics of the street from memory.	2

Table A1. Variance from photo task and response.

A.2. Ethics approval and application

The
University
Of
Sheffield.

School
Of
Architecture.

Jemima Unwin
School of Architecture
University of Sheffield

Judith Torrington

School of Architecture
The Arts Tower
Western Bank
Sheffield
S10 2TN

Thursday, 16 June 2011

Telephone: +44 (0) 114 2220346
Fax: +44 (0) 114 279826
Email: j.m.torrington@sheffield.ac.uk

Dear Jemima

PROJECT TITLE: The effect of street lighting on reassurance in pedestrians

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 16/06/2011 the above-named project was unconditionally **approved** on ethics grounds, on the basis that you will adhere to the following document that you submitted for ethics review:

- University research ethics application form (rev A 10.06.2011)
- Participant information sheets
- Participant consent forms

If during the course of the project you need to deviate significantly from the above-approved document please inform me since written approval will be required. Please also inform me should you decide to terminate the project prematurely.

Yours sincerely

Judy Torrington
Ethics Administrator

THE QUEEN'S
ANNIVERSARY PRIZES
FOR HIGHER AND FURTHER EDUCATION

2007

University Research Ethics Application Form

Cover Sheet

I confirm that in my judgment, due to the project's nature, the use of a method to inform prospective participants about the project (e.g. 'Information Sheet' / 'Covering Letter' / 'Pre-Written Script'):	
Is relevant:	**Is <u>not</u> relevant:**
✓ (if relevant then this should be enclosed)	

I confirm that in my judgment, due to the project's nature, the use of a 'Consent Form':	
Is relevant:	**Is <u>not</u> relevant:**
✓ (if relevant then this should be enclosed)	

Is this is a 'generic' application (i.e. does it cover more than project that is sufficiently similar)?	
Yes:	**No:**
	✓

1

Jemima Unwin - The effect of street lighting on reassurance in pedestrians. 10.06.2011 rev. A.

226

University Research Ethics Application Form

Part A

A1. **Title of Research Project:**
What is the effect of street lighting on reassurance in pedestrians?
This is part of the MERLIN (Mesopically Enhanced Road Lighting: Improving Night- vision) project.
Note: This application form is for the first test in this project and includes a pilot study.

A2. **Contact person** (normally the Principal Investigator, in the case of staff-led research projects, or the student in the case of supervised-postgraduate researcher projects):
Title: - First Name/Initials: **Jemima** Last Name: **Unwin**

Post: **PhD Student** Department: **Architecture**

Email: **jemima.unwin@sheffield.ac.uk** Telephone: **07912 560 821**

A2.1. **Is this a postgraduate researcher project?** Yes
If yes, please provide the Supervisor's contact details:
Dr Steve Fotios, steve.fotios@sheffield.ac.uk, Telephone: ext. 20371

A2.2. **Other key investigators/co-applicants** (within/outside University), where applicable:

Please list all (add more rows if necessary)

Title	Full Name	Post	Responsibility in project	Organisation	Department
Dr	Chris Cheal	Research Associate	To provide advice.	University of Sheffield	Architecture

A3. **Proposed Project Duration:**
Start date: May 2011 End date: May 2012

A4. **Mark 'X' in one or more of the following boxes if your research:**

	involves testing a medicinal product *
	involves investigating a medical device *
	involves additional radiation above that required for clinical care *
	involves taking new samples of human biological material (e.g. blood, tissue) *
	involves children or young people aged under 18 years
	involves using samples of human biological material collected before for another purpose
	involves only identifiable personal data with no direct contact with participants
X	involves only anonymised or aggregated data
	involves prisoners or others in custodial care (e.g. young offenders)
	involves adults with mental incapacity or mental illness
	has the primary aim of being educational (e.g. student research, a project necessary for a postgraduate degree or diploma, other than an MD or PhD)

1

Jemima Unwin - The effect of street lighting on reassurance in pedestrians. 10.06.2011 rev. A.

227

University Research Ethics Application Form

A5.   **Briefly summarise the project's aims, objectives and methodology?**
(this must be in language comprehensible to a lay person)

Whether a human makes a decision to walk down a street or not, depends on a phenomenal range of factors, which range from internal emotional drivers such as experience to external environmental factors such as if there is obvious evidence of vandalism. The aim of this project is to place the effect of lighting on reassurance in pedestrians in the context of other factors which influence spatial behaviour.
This phase of the project aims to let people tell us which streets they feel safe to walk down at night and which streets they don't, so that lighting and spatial qualities of these areas can be assessed and measured. This open ended approach helps to avoid bias, as the participants will not be be told that the study is about lighting. The results will be used to inform the rest of the project.

Methodology

Candidates will be asked to take photographs or provide brief descriptions of streets that they feel comfortable to walk down and those that they do not. This will be followed up by an interview in which the photographs or descriptions are used as prompts for a structured discussion about the environments and why they were selected.
Candidates will be approached by e-mail and a follow up phone call. The e-mail will set the scene in the following way:

"Are there some parts of your neighbourhood where you are happy to walk at night and others you choose to avoid? If so, we'd like you tell us about these areas by taking photos of them or describing them (on the description sheet attached to the information sheet), and then let us interview you about why you selected these areas.
The reason is that we are doing research into the different residential areas of Sheffield and how people feel in them. Over the next 2 weeks we would like you to think about the different areas in your neighbourhood that you have walked through at night, and also the areas that you avoid. Once you have remembered examples of
a) Streets where you are happy to walk alone at night
b) Streets that you purposefully choose not to walk through at night or would prefer to avoid
please go to those areas and take photographs or describe them if you don't want to go there.
It does not matter whether you take photos during the day or night.
If there are no areas that you avoid, or none that you walk through, please state this and don't continue with the study.
If you need a camera, let us know and a disposable camera will be provided. Otherwise please e-mail photos taken with your own camera or phone to:
jemima.unwin@sheffield.ac.uk.
You may choose as many or as few streets as you wish, and please take at least 5 photographs of each of the streets that you have identified.
During a follow up interview taking no longer than 30 minutes we will discuss the locations that you have chosen. We will contact you after two weeks to arrange a suitable interview date.
Please let us know if you have any visual condition which affects your sight, not including short or long sightedness which can be corrected by wearing glasses or corrective lenses."

2

Jemima Unwin - The effect of street lighting on reassurance in pedestrians. 10.06.2011 rev. A.

228

A6. **What is the potential for physical and/or psychological harm / distress to participants?**

Participants will choose whether to take photos during the day or night, and if they feel uncomfortable taking photographs then they are not obliged, they will instead be invited to identify the area on a physical map or a computer screen using 'google street view' at the interview. Therefore any potentially uncomfortable situations are mitigated by giving the option not to do it. They are asked to identify areas in their neighbourhood that they are familiar with.

Interviews will take place in a meeting room in the University or if this is not possible a convenient location of the participant's choice. Interviews will take place with the door open and in working hours, if possible. The participant information sheet makes it clear that the participant can stop the procedure at any time.

Once the participants are known, a schedule (of times, venues, participant contact details) will be issued on a list to the rest of the research team.

The work will not place participants in a dependent situation and will not involve deception or covert observation.

A7. **Does your research raise any issues of personal safety for you or other researchers involved in the project and, if yes, explain how these issues will be managed?** (especially if taking place outside working hours or off University premises)

When visiting streets at night following the receipt of photos from the participants the researcher will be accompanied by one other person in places which are perceived to be unsafe. No related issues of personal safety for the researcher are anticipated for the interview stage.

A8. **How will the potential participants in the project be (i) identified, (ii) approached and (iii) recruited?**

The minimum participant age will be 18 years. The other main criterion is generally healthy eyesight. The research does not target people considered to be particularly vulnerable. Healthy eyesight means that participants should not be visually impaired. Visually impaired does not include those whose sight problems can be corrected by glasses or contact lenses. Participants will be approached through email canvassing and word-of-mouth. A significant proportion of participants are likely to be recruited from within the University. The test procedure and time commitment will be explained to each participant before they are recruited.

A9. **Will informed consent be obtained from the participants?**

YES ✓   NO ☐

If informed consent or consent is not to be obtained please explain why. Further guidance is at: www.shef.ac.uk/researchoffice/gov_ethics_grp/ethics/er/guidance.html

A9.1. This question is only applicable if you are planning to obtain informed consent:
How do you plan to obtain informed consent? (i.e. the proposed process?):
Informed consent will be recorded on the participant consent form (included with this application). On signing the form, the participant will have the opportunity to ask questions.

A10. **What measures will be put in place to ensure confidentiality of personal data, where appropriate?**
The personal data collected will include age, gender, use of corrective lenses, and whether or not the participant has normal colour vision. Each individual's data will be incorporated into the average results for one of three groups ('younger, local', 'younger

3

Jemima Unwin - The effect of street lighting on reassurance in pedestrians. 10.06.2011 rev. A.

229

not local' and 'older') that make up the study sample (approximately 60 people). No personal data will be circulated to third parties or appear in reports.

A11. **Will financial / in kind payments (other than reasonable expenses and compensation for time) be offered to participants?** (Indicate how much and on what basis this has been decided)
Incentive payments will be offered to participants as compensation for their time and to cover local travel expenses. An incentive will not be offered for participants in the pilot study.

<div align="right">YES ☐   NO ☑</div>

A12. **Will the research involve the production of recorded media such as audio and/ or video recordings?**

<div align="right">YES ☑   NO ☐</div>

Only audio recordings will be made of interviews.

A12.1. This question is only applicable if you are planning to produce recorded media: **How will you ensure that there is a clear agreement with participants as to how these recorded media may be stored, used and (if appropriate) destroyed?**

Interviews will be recorded and then copied into a private itunes library stored on one hard drive using software such as 'italk sync'. The files will not identify people by name, they will instead use a random ID number. Once the interviews have been transcribed they will be erased from the itunes library & therefore the hard drive. This procedure will be described to the participant and if they are not happy with it then the interview will not be recorded.

4

Jemima Unwin - The effect of street lighting on reassurance in pedestrians. 10.06.2011 rev. A.

230

University Research Ethics Application Form

Part B – The Signed Declaration

What is the effect of street lighting on reassurance in pedestrians?

I confirm my responsibility to deliver the research project in accordance with the University of Sheffield's policies and procedures, which include the University's '*Financial Regulations*', '*Good Research Practice Standards'* and the '*Ethics Policy for Research Involving Human Participants, Data and Tissue'* (Ethics Policy) and, where externally funded, with the terms and conditions of the research funder.

In signing this research ethics application form I am also confirming that:

- The form is accurate to the best of my knowledge and belief.

- The project will abide by the University's Ethics Policy.

- There is no potential material interest that may, or may appear to, impair the independence and objectivity of researchers conducting this project.

- Subject to the research being approved, I undertake to adhere to the project protocol without unagreed deviation and to comply with any conditions set out in the letter from the University ethics reviewers notifying me of this.

- I undertake to inform the ethics reviewers of significant changes to the protocol (by contacting my academic department's Ethics Administrator in the first instance).

- I am aware of my responsibility to be up to date and comply with the requirements of the law and relevant guidelines relating to security and confidentiality of personal data, including the need to register when necessary with the appropriate Data Protection Officer (within the University the Data Protection Officer is based in CiCS).

- I understand that the project, including research records and data, may be subject to inspection for audit purposes, if required in future.

- I understand that personal data about me as a researcher in this form will be held by those involved in the ethics review procedure (e.g. the Ethics Administrator and/or ethics reviewers) and that this will be managed according to Data Protection Act principles.

- If this is an application for a 'generic' project all the individual projects that fit under the generic project are compatible with this application.

Name of the Principal Investigator (or the name of the Supervisor if this is a postgraduate researcher project):
Dr Steve Fotios

If this is a postgraduate researcher project insert the student's name here:
Jemima Unwin

Signature of Principal Investigator (or the Supervisor):

Date: … 10th June 2011

Email the completed application form and provide a signed, hard copy of 'Part B' to the Ethics Administrator (also enclose, if relevant, other documents).

1

Jemima Unwin - The effect of street lighting on reassurance in pedestrians. 10.06.2011 rev. A.

231

Participant Consent Form

(personal information will be kept strictly confidential)

Perception of Streets in Sheffield

(An investigation of streets where people are happy to walk alone at night and those where they are not).

Please tick box

1. I have read the information sheet for the above study and have had the chance to ask questions.

☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason.

☐

3. Please indicate your age group:

18-25	45-54	65-74
25-34	55-59	75-84
35-44	60-64	85+

4. Do you have any visual condition which affects your sight, not including short or long sightedness which can be corrected by wearing glasses or corrective lenses?

☐
Yes, please give details.

Details, if applicable:

☐
No.

....

4. Your signature will certify that you have voluntarily decided to participate in this study.

Thank you.

....

Name of Participant   Date   Signature

....

Researcher   Date   Signature

Date: 10/06/11 Name of Applicant: Jemima Unwin

Research Project Information Sheet

Perception of Streets in Sheffield

(An investigation of streets where people are happy to walk alone at night and those where they are not).

1. What is the project's purpose?

This is the first stage of a three year project which will investigate what affects reassurance in pedestrians when walking in their local area at night time. This work will contribute to recommending optimum design criteria for residential streetscapes.

2. What will I have to do if I take part?

You will be asked to take photographs or provide descriptions of:

a) Streets where you are happy to walk alone at night

b) Streets that you purposefully choose not to walk through at night or would prefer to avoid

It is up to you whether you take photos **or** provide a brief description (on the following sheet) of the streets. Photographs can be taken during the day or night.

This will be followed up by a 30 minute interview in which the photographs or descriptions will be used as prompts for a structured discussion about why these environments were selected. There will be a cash payment to compensate for your time.

3. What are the possible disadvantages and risks of taking part?

Taking part in this research is entirely voluntary. If you decide to take part you will be asked to sign a consent form. You can still withdraw at any time without giving a reason.

If you don't want to take photos for any reason you can instead describe the street and point it out on a map which we will provide at the interview.

4. Who has ethically reviewed the project?

This project has been ethically approved via the School of Architecture's ethics review procedure. The University's Research Ethics Committee monitors the application and delivery of the University's Ethics Review Procedure across the University.

If you are unhappy with the way you have been treated, or with anything that has happened during or following your participation, then please contact Dr. Steve Fotios (Tel. 0114 2220371). If you feel your complaint has not been dealt with satisfactorily then please contact the University's Registrar and Secretary (Tel. 0114 2221104).

Descriptions of streets

a) Streets where you are happy to walk alone at night

b) Streets that you purposefully choose not to walk through at night or would prefer to avoid

A.3. Pilot study personality surveys

Four personality surveys were tested in the pilot studies. These were two surveys after Van der Wurff, the Penn State Worry Questionnaire and the Intolerance of Uncertainty Scale (Figures A1-5).

How would you feel in such a situation?

Situation	Description	Completely safe		-		very unsafe
Doorbell	One evening you're at home on your own. It's late. The doorbell rings, but you're not expecting anyone.	1	2	3	4	5
The car	One evening you go to put the dustbin out. A short way up the street you see two men walking around a parked car. When they see you looking at them, they begin to walk towards you.	1	2	3	4	5
To a party	You've been invited to a party in neighborhood you don't really know. Early that evening you set out by bus. When you get off you still have a long way to walk. Suddenly you notice that you've lost your way. A group of youths is following you and begins to make unpleasant remarks at you.	1	2	3	4	5
The bus stop	One afternoon you're standing at the bus stop nearest home, when a group of 15 to 16-year-old boys comes along. They begin kicking the bus stop and daubing graffiti on the bus shelter.	1	2	3	4	5
The telephone	You're going out one evening. You're ready and just about to leave when the telephone rings. You answer it, giving your name. But at the other end you hear only irregular breathing. You ask who's there. They hang up.	1	2	3	4	5
The cafe	You're traveling through a town where you've never been before. You have to ring home to say you'll be late getting back. Because you can't find a telephone box, you go into a café to ring from there. It turns out to be where a group of football hooligans meet.	1	2	3	4	5

Question.	Yes	No
Do you think that people who are up to no good are likely to fix especially on you & your possessions?		
Do you think that there are people who are jealous of you?		
Do you think that you're capable of chasing off a possible assailant?		
Do you generally steer clear of rows?		
Do you generally trust strangers?		
Do you distrust particular people in your surroundings?		
If you're on your way somewhere, do you ever imagine that someone could obstruct your path?		
If you have to go somewhere, do you watch out that you take a safe route?		

Figure A1. Scenario and personality survey after van der Wurff, Staalduinen et al. 1989.

The Penn State Worry Questionnaire (PSWQ)

Instructions: Rate each of the following statements on a scale of 1 ("not at all typical of me") to 5 ("very typical of me"). Please do not leave any items blank.

		Not at all typical of me				Very typical of me
1.	If I do not have enough time to do everything, I do not worry about it.	1	2	3	4	5
2.	My worries overwhelm me.	1	2	3	4	5
3.	I do not tend to worry about things.	1	2	3	4	5
4.	Many situations make me worry.	1	2	3	4	5
5.	I know I should not worry about things, but I just cannot help it.	1	2	3	4	5
6.	When I am under pressure I worry a lot.	1	2	3	4	5
7.	I am always worrying about something.	1	2	3	4	5
8.	I find it easy to dismiss worrisome thoughts.	1	2	3	4	5
9.	As soon as I finish one task, I start to worry about everything else I have to do.	1	2	3	4	5
10.	I never worry about anything.	1	2	3	4	5
11.	When there is nothing more I can do about a concern, I do not worry about it any more.	1	2	3	4	5
12.	I have been a worrier all my life.	1	2	3	4	5
13.	I notice that I have been worrying about things.	1	2	3	4	5
14.	Once I start worrying, I cannot stop.	1	2	3	4	5
15.	I worry all the time.	1	2	3	4	5
16.	I worry about projects until they are all done.	1	2	3	4	5

Figure A2. The Penn State Worry questionnaire (Meyer, Miller et al. 1990).

IUS

You will find below a series of statements which describe how people may react to the uncertainties of life. Please use the scale below to describe to what extent each item is characteristic of you. Please circle a number (1 to 5) that describes you best.

	Not at all characteristic of me		Somewhat characteristic of me		Entirely characteristic of me

1. Uncertainty stops me from
   having a firm opinion. ....1................ ....2.......... ....3.......... ....4.......... ....5...........

2. Being uncertain means that a
   person is disorganized. ....1................ ....2.......... ....3.......... ....4.......... ....5...........

3. Uncertainty makes life
   intolerable. ....1................ ....2.......... ....3.......... ....4.......... ....5...........

4. It's unfair not having any
   guarantees in life. ....1................ ....2.......... ....3.......... ....4.......... ....5...........

5. My mind can't be relaxed if I
   don't know what will happen
   tomorrow. ....1................ ....2.......... ....3.......... ....4.......... ....5...........

6. Uncertainty makes me uneasy,
   anxious, or stressed. ....1................ ....2.......... ....3.......... ....4.......... ....5...........

7. Unforeseen events upset me
   greatly. ....1................ ....2.......... ....3.......... ....4.......... ....5...........

8. It frustrates me not having all
   the information I need. ....1................ ....2.......... ....3.......... ....4.......... ....5...........

9. Uncertainty keeps me from
   living a full life. ....1................ ....2.......... ....3.......... ....4.......... ....5...........

10. One should always look ahead
    so as to avoid surprises. ....1................ ....2.......... ....3.......... ....4.......... ....5...........

Figure A3. The Intolerance of Uncertainty Scale Part 1.

	Not at all characteristic of me	Somewhat characteristic of me	Entirely characteristic of me

11. A small unforeseen event can spoil everything, even with the best of planning. ....1.....................2.....................3.....................4.....................5............

12. When it's time to act, uncertainty paralyses me. ....1.....................2.....................3.....................4.....................5............

13. Being uncertain means that I am not first rate. ....1.....................2.....................3.....................4.....................5............

14. When I am uncertain, I can't go forward. ....1.....................2.....................3.....................4.....................5............

15. When I am uncertain I can't function very well. ....1.....................2.....................3.....................4.....................5............

16. Unlike me, others always seem to know where they are going with their lives. ....1.....................2.....................3.....................4.....................5............

17. Uncertainty makes me vulnerable, unhappy, or sad. ....1.....................2.....................3.....................4.....................5............

18. I always want to know what the future has in store for me. ....1.....................2.....................3.....................4.....................5............

19. I can't stand being taken by surprise. ....1.....................2.....................3.....................4.....................5............

20. The smallest doubt can stop me from acting. ....1.....................2.....................3.....................4.....................5............

21. I should be able to organize everything in advance. ....1.....................2.....................3.....................4.....................5............

22. Being uncertain means that I lack confidence. ....1.....................2.....................3.....................4.....................5............

Figure A4. The Intolerance of Uncertainty Scale Part 2.

	Not at all characteristic of me	Somewhat characteristic of me	Entirely characteristic of me

23. I think it's unfair that other people seem sure about their future. ....1..................2..................3..................4..................5............

24. Uncertainty keeps me from sleeping soundly. ....1..................2..................3..................4..................5............

25. I must get away from all uncertain situations. ....1..................2..................3..................4..................5............

26. The ambiguities in life stress me.....1..................2..................3..................4..................5............

27. I can't stand being undecided about my future. ....1..................2..................3..................4..................5............

Figure A5. The Intolerance of Uncertainty Scale Part 3.

A.4. Pilot study transcripts

Interview 1

Can you start by telling me why you're happy to walk down photo one?

because it's a light and airy space, there seems to be paving and it seems to be a place where I wouldn't be concerned that there was no escape route if I felt threatened. it's near a couple of supermarkets, it's a wide road, its well used and I don't think I would feel unduly insecure in that area.

If you just turn to photo 5 ... and why are you happy to walk down that street.?

Again I'm familiar with this street because it's my own street, I do sometimes walk alone in this area at night, especially when I go to the shops, and I again feel that familiarity has reduced any fear or uncertainty or lack of security and safety in this area and again it's a wide easily accessible area where I feel should there be a need to escape for any reason though threat, or possible threat, I wouldn't have a problem with that as in a narrow unlit passage of some sort.

okay thanks, now look at these photos where you weren't so happy to walk down the streets, if you just go to photo 12 can you tell me why you wouldn't be so happy to walk down that street

well, although there was lighting apparent here it's a narrow area, has a big fence on one side, there are hedges and undergrowth, if I were to see for example youths at the end of this area walking towards me, I think I feel that the possible threat of confrontation would make me want to avoid even contemplating walking down this area

Is that a residential area, I'm not sure?

the backstreet behind some… I think it's a leisure Center on one side and a railway and a roadway on the other

ok.. and would do you walk down that street during the day?

yes I do walk down the street during the day

but you wouldn't be so happy during the night?

No no

ok, if you just go to photo 16.. and can you tell me why you're not happy to walk down the street?

Well it's not so much the street, but at the top of the street there's a gunnel. I meant to photograph the gunnel that goes into the woodland.. again it is a confined area, there's just about enough room for two pedestrians to pass each other in that area, it's a quiet residential street, I'm not sure what the lighting situation is at the very end of the street however I do see a light here and security lights on the houses but it leads into a woodland and I just would not contemplate walking up there at night time in case there's the threat of being accosted or approached in some way

if you go to photo 15 and what is it this about that street that makes you....

well again, evident in the photograph, there are a couple of unsavory looking youths. I'm not quite sure what they were doing when I was taking the photo but they looked to be up to no good, looking for something that they might be able to steal or that kind of thing. Again it's a narrow area and although there are a couple of... there's one light at each end of the area, it's the confinement that I wouldn't be happy with again should anyone seek to accost me coming towards me or chasing me there'd be no escape.

even though at the end of the gunnel, you might be able to escape?

Yes at the end of the gunnel there's a roadway but it's not a short distance and its perhaps between 50 and 100 yards, and again if these two youths in the photo would've been walking towards me at nighttime, I wouldn't have felt happy at all.

does it make any difference that they're facing away from you now?

no

So it's just their presence?

no it's the fact that that kind of person is in that sort of an area and I happened in to catch them there, photograph them, at the time I was there

and would you walk down that street during the day?

yes, yes I do walk down that street during the day and I don't feel threatened even with these youths there, and I thought they might be up to no good, it didn't particularly worry me during daylight hours

if you go photo 8 - why wouldn't you be so happy to walk down that street?

Well again, is that the back of Tesco and there's woodland and a river on one side, and the rear of

the store on the other er and again I don't see much evidence of lighting er and again it's narrow, and it's long, and er there wouldn't be an easy route of escape should there need to be one

ok thanks a lot. Are there any points that we haven't talked about, just look at the other photos to remind you if there's anything that we haven't kind of discussed that would make you happier to walk down some streets than others?

it's basically dark, dingy, possibly unsavory areas that I tend to avoid. places that were poorly lit, places that were that might have characters that would make me feel threatened, the sort of things that I've said already really and anything that's confined, and has restricted access and has restricted access or restricted escape routes.

and do you ever get those feelings in a solely residential street, because a lot of these are alleys down the back of warehouses for example. would you ever get the feeling of something being unsavory if it's a street, residential?

I think I would certainly in certain areas where there was a dominant ethnic group perhaps which I wasn't part of, so maybe Afro-Caribbean areas where I might stand out or perhaps majority Asian areas, may be areas where even youths of my own ethnic origin were around on bikes or skateboards or that sort of thing, again I perhaps wouldn't feel happy being in areas like that again because I'm aware of items in the media on the news, where perhaps when they have confronted inappropriate behaviors by youths, have suffered sometimes the ultimate sacrifice and been murdered by people that might ..that were in such an area

and have you ever experienced anything yourself along those lines?

pause.. only to the extent that when I've seen someone with perhaps an aggressive looking dog at night time, walking down the street towards me, I think I've perhaps crossed over the road. just to avoid any danger

I do that too

I think I can't recall when I've placed myself in a situation where there have been inappropriately behaved youths or adults because I tend to adopt a sensible approach to life and tend to avoid such areas such as outside pubs and clubs and bars in the evening or areas where people congregate and situations turn nasty

and when you say that you're a bit worried in certain areas, are you actually worried, or do you just think that something could happen? Do you actually feel worry. or do you think it's a possibility and do what you can to avoid that possibility?

I adopt a low risk strategy and avoid areas in the first place if I have to be in an area that I'm unfamiliar with or where I suspect there might be a higher risk, i think I consider what may happen but a lot of it could be imagined, or worst-case scenario rather than reality, so I don't think I particularly feel overly worried, I just feel aware of the way things may develop, change, to make me feel threatened or concerned.

just out of curiosity, Hutcliffe Wood is behind this isn't it? So it doesn't bother you the fact that there's a big woodland behind it?

but that's the street I was talking about, about there are supermarkets on both sides, I would be concerned about walking up through the woodland at nighttime but this isn't the woodland

Interview 2

Okay so if you look at photograph 1, can you just tell me a bit about why you're happy to walk down the street?

no particular reason except that I live in the street so I really know very well that street and don't have any problems with that I've been walking there for two years, the last two years there have been no incidents at all I feel safe in that street. The light I think is fine, and yes that's the main reason

okay great and what about photo 2?

I just live in front that one and although it's not that... it can be dark sometimes but I mean I just live in front of the road so I don't have any problem with that I know the area basically so

and what about photo 8? Just turn to photo 8 this street

okay oh

these are still the streets that you're happy to walk down

yeah?

yes

yes, I've been walking from that street as well for the previous four years for one or other reasons .. crossing going to the Arts Tower, from the Arts Tower, a couple of my friends used to live in that area so even though I've been walking at late hours 2 AM, 3 AM, I don't have any problem with that although, it can be a bit lonely during the night but it's just because I feel safe because I've been there before so many times

ok cool, and also

same with number 7

241

and if we just go to photo 11 this street can you tell me a bit about why you're happy to walk down this street?

er, it's always with traffic, always cars going down going up er even though it can be a bit late sometimes, it's close to the IC so I don't have any problem with that as well so mainly because there is always something going on

yes

and there is plenty of lights as well

and then the last three I want to ask you about are 20, 23, 26... so this one and this one, we do it one by one, if it's the same reason you can just tell me the same you don't have to repeat if you don't want

yeah basically I've been there before it's within the university campus area so I know very well the area so I don't have any particular reason why not to go in those particular streets or.. I feel safe

and then 23

again I've been there so many times during the day during the afternoon, night, I haven't got any problem with that I it can be a lonely during late hours, again, it's, there are some student accommodations around that area so I will then guess something is going to happen so it's quite, the light is quite strong during the night so I don't have any problem with that

so the last one out of the street's you're happy to walk down is 26

er, of course this is a particular road that I've been using for a while, most of my friends when we are going out used to meet in that pub in the corner that pub the Cavendish so it's closer for me to walk down there and I haven't got any problems, there is an accommodation in this corner as well so even though it's late sometimes I feel safe so yes, it's a particular route that I use quite often so..

ok great, moving onto the streets that you're not so happy to walk down can you just tell me a bit about why you're not happy to walk down the street for example number 30

er.. probably as can be seen in the pictures it's a bit dark in some of the areas it's also quite lonely there is no people around, there are no cars as well, there is basically nothing you are just on your own when you walk and in addition to that I had a small incident in that area so I need to be more careful in that particular region that's basically the main reasons

and then in street 32

oh again the same, not much light, not many people around, no cars, there is no exits perhaps, it is just like a closed street so there is no reason why should I go there so

would you walk down there during the day or is it only the night when you avoid it?

er during the day yes perhaps but er yes perhaps during the day it would be fine because you have a much more wide range of vision of looking at different details

yes, and then the last one is 33.. how come you're not so happy to walk down that street?

er Although I'm familiar with the area er I don't really know is just a particular impression that I have that it's not safe because it's again not that wide street it's a bit dark in some areas and next to those streets there are some other streets with more light and more people around so I prefer to go to for those streets rather to er go in that street

so relative to the others.. this is darker?

yeah, relative in comparison to the others and also, so yeah, there is more people around sometimes even there it can be a bit late erm, yeah, that's the particular reasons I mostly look after

yes, and would you walk down that one during the day?

er I think I don't have any problem walking down some particular streets but during the night I double think sometimes, yeah exactly I think why should I go for that street when there is this other street next to it with more people or light or whatever..

okay that's it.. recording off then on again..

okay so tell me about the cultural thing again

yeah so this is a cultural thing, even though back in Mexico even though you're not expecting anyone your friends can pop in your place at any time without giving you any call, or any reason, so if someone rings you are never scary, it can be your neighbor, your friends, someone relative, that's fine, where here is completely different, I freak out sometimes when...

really?

well not in scary terms, it's just when someone rings the door and I'm not expecting anyone it's like oh who is this? oh I'm not even in a presentable way if a friend pops in now so things like that basically that's ..

Interview 3

especially at night?

Yes at night, we're only talking about night time

I don't feel safe for example in this street because it's a bit dark, and also these streets for example, this one also, they are really dark and there is no one in this area, and I don't feel so safe because of that and also in these streets not this one

(not 2 but 3 & 4)

there are some people they are selling something or they ask you about some sexual things. one time one woman asked me

if it's a red light district down there, maybe?

Yes I think so, maybe before but I'm not sure

for example in the street it's very crowded even late at night and the street lighting is enough and this one is also, I feel safe, Ecclesal Road (6), and this one is Division street (5), this one is, I forgot the street name it's in front of engineering, department of engineering (7). I feel safe also I choose that way when I go back to home I choose that way. This is West Street (8) also it's safe.

what's the main reason for choosing this street or what are the mixture of reasons? (engineering building one photo 7)

the main reason is lighting, for example the street especially the street while I was living in Edward Street and when I go and coming back from Edward Street I used that way because it's more light, there is more light and there are some people also you feel more safe

And these streets that you are not so happy to walk down at night, would you walk down them during the day?

yes daytime I use them but at night time I don't use them. I try to not use them. And this road is also very interesting (2) it's between Division Street and West Street where I feel so safe, so happy, when I was walking, but in this street I don't feel.. because it's also dark and it's also dirty. This street is dirty, and also mostly drunk people, they are peeing there. Really, it's wierd, because I live in front of.. This is in front of West 1 and I saw people there

Do you live in West one?

Yeah

so this is your immediate neighborhood?

It's more close to go to for example Tesco express from that street, but I don't use them, in daytime for example I don't use them because it's dirty as well

So this one you don't use during the day but the others you might use during the day?

yeah

would you? Do you use those during the day?

yes I might, I should use in daytime but at nighttime.. and also in that street there was some bad things to my friends, one drunk people once asked money from them, they didn't give, they had a fight something like that (photo 1)

so in photo 1 your friends have had incidents?

and also this is one of the main roads in Sheffield but people don't find it safe.

these and these streets (3 &4) they are not main roads but.... also the other thing is that the buildings are empty in this area and it's like a ghost Street, a ghost town, but this one is in the middle of the city, it's in the city center but because as I explained

I was just wondering if you had a purely residential street, because these areas are kind of abandoned warehouses and back alleys, (or 2,3 & 4 are) I'm just wondering if looking at a typical residential street like this one (pointing to Crookesmoor street) for example here where it's little houses, are there any reasons why you would choose not to walk down those streets particularly?

you mean residential streets?

Yes typical residential streets in Sheffield

Also I don't use, for example I don't want to use this road (Crookesmoor Road) because at nighttime also it's very silenced, silent, street lighting is maybe better than from these streets (than 3 & 4) .. but mostly because of the other people, not because of the lighting but because of the people I think, I am not happy to walk down in that street, because there are many drunk people, poor people, and also the other people which I mentioned in that street

yeah, so in these streets where you are happier to walk down, they are busier, but with normal people not prostitutes?

yeah

But I think the main problem is people, and then after that the lighting, but if the lighting is enough, I think these people can't stay and use that street

yeah, and also do things like the width of the street, the trees or not, does that have any effect or not, or don't you care?

Trees? may be I don't prefer trees. Okay it's nice to be green but at night time maybe you don't feel very well

I'm just wondering

maybe there are some birds also on the trees

on/off

So in West 1, you're not surprised if somebody comes

yeah, because I feel more safe in that building, because there are two doors and you have to have a fobb, or somebody should open that, but if I live in that street (Crookesmoor) I should be surprised or, I don't feel very safe maybe, so according to where I live I should fill it in

yes according to where you live now. do you now live in a residential street or West one?

West 1

Interview 4

okay so first of all in general terms what made you choose the streets that you are happy to walk down against the streets you are not happy to walk down, starting off generally?

I think perhaps it's to do with... I think where there are dark corners where I think people might hide or escape if anything happens

so..

so corners where I feel a bit unsafe, open space and there's not many people around. generally I feel safe is just a normal residential area with some dark corners or dead ends, dead ends on the street

okay so if we then go into the specifics, could you tell me this about these specific streets for example photo 1?

I think I feel a bit unsafe, I think it's because, maybe because of the area, I knew some friends living in that area before and I heard some stories, not stories, but people's experiences and I generally I feel a bit unsafe there and it's dark

did they have some incidents?

yes that's the main reason otherwise it looks like just a normal residential area, and because these are the streets I've been before it's close to resi so I'm a bit more familiar with the area

and what about for example this one photo 5 Meadow St.?

alright again, that's because of the area I don't feel safe walking there when it's dark, usually there are some ladies there so I feel a bit unsafe. I feel quite uncomfortable walking there so I tend to avoid that

and would you walk in for example in Filey St. photo 3 during the day?

Yes I would feel comfortable walking there during the day.

And what about this one Mushroom Lane photo 6, would you walk there during the day?

definitely yes I walk during the day quite a lot, in the evening I don't feel comfortable because its got a big wall and a park next to it & I feel like there's nobody around to ask for help if I need it

so would you say these are all quite quiet areas?

yes, I think also the path, it's quite flat and I feel like it's quite easy to hide and is just a very big road so not many people around

that's photo 8, so if we then compare that to streets that you are more happy to walk down, so in general terms what it is about these that make you more happy to walk down?

I think it's also familiarity I think, I'm familiar with the area and I know, I just feel I would be safe actually. I don't really feel that there's going to be people hiding and is near the University often it's got other people around, other students so I think that might be also a reason

Are any of these residential streets or are they all kind of... is that residential?

no, this is near the information Commons. I didn't take residential because I thought they would be very similar, I was thinking to take one near my house and then due to, I feel safe because I'm familiar with the area

-recording skipped-

Street ... usually got other people around as well.

Which street's that?

it's Western Bank

I recognize that now that is photo 2 & 3 & 4

and this is Mappin Street

photo 5, 6

this is also Ecclesall Road where I also feel quite safe

244

photo 8 and that's also Ecclesall road Photo 11 so if we go back to the photos where you feel less safe is there anything specific about for example Meadow Street, was that the one with the ladies?

yes, and it's quite dark

and I think generally although there's some students housing a bit further up, generally I think they are factories, offices, so it's empty during the night so I don't feel safe walking there

so out of these photos the residential ones are these two?

yes and Filey street is also residential that is also residential...

so 1,2,3, & 9 are residential

that's kind of residential but this is a big open space, it's like a park on the right hand side and this side is like a care home kind of place

so that's photo 9 - so even though it's open space it doesn't feel safe?

Because I think people can run away very easily that's why I feel generally... because at night normally there's no people there, it's difficult to ask for help if I need. I think that's generally why I feel unsafe, I think people, it's easy for people to run away if there is anything

& these residential streets, did I ask you about photograph 2 already? was there anything specific about this one?

This is the same area, these three are the same area (1,2,3,) and I thought I'd take some typical residential where I don't feel comfortable. Generally I feel comfortable walking in a residential area actually. It's just because of the reputation maybe and what I've heard. And also in one of the pictures you can see there's dead ends and bollards, not many cars can come from here

so the fact that the car can't go on the road?

There are not many people around apart from the residents, but generally residential areas are alright.

Ok, that's it, thank you very much. So, if I just quickly show you these images... could you tell me what you think about whether you would walk down these streets or not? So would you feel comfortable to walk down that street?

erm Yes I think (B)

What about this one?

No, what's down the other side?

It's just residential areas, an alley between two residential areas.

erm no not particularly. Because we have a gunnel near by as well and I feel a bit strange in the night.

and why is that?

I don't know, let me think, people can be hiding behind, I think maybe it's due to the fact that I'm familiar with the area

so here you're unfamiliar?

Yes, just by looking at it I don't know what's around the next corner.

and what about that one?

I thought it's the same one as the first one? Yes it would be fine.

And what about this one?

It feels very similar. I think again I don't know what's around the other corner. I think that one is more open. I think I can see a bit further away. Not comfortable with this one.

okay thanks a lot, here's the next questionnaire....

Another point was made later about if something happens near home you can just run back.

Interview 5

-Comments made while sorting out photographs.-

 "This one was on Bocking Lane, no probably not happy there, but happy there I think that's what I had in mind because it was a bit darker… and that one is happy, I took this thinking it was a bad area but then I thought not, happy to walk down here. Not happy. This is just a residential street, which was okay I think. This one is happy. This is Abbey Lane, happy this not happy, that one is okay this is a preference if I had to walk around alone at night. I don't normally walk around alone at night, but if I had to. This is further down Abbey Lane. This is Folds Lane. That's too open and exposed. That's all fine."

okay so first of all in general terms can you tell me why you're happy to walk down these streets in your own words, what are the main things?

oh because it's a main road, all of them or just one?

Just in general, to start with we'll talk generally then I'll ask you about specific photos.

well because all the roads are wide, and they've all got buildings there, and it's open and well lit you know, there are traffic lights there, you know

245

the traffic lights, it's open, wide, and residential and you feel safe.

because there are houses there and then there's the street lights, it's not dark and dingy, I wouldn't have a problem walking down that if I had to walk to that neighbourhood to see someone or meet someone, I would walk down there because it is well lit, there's a light there, there are houses here, and if you get into trouble or somebody tries to mug you, you can just run into someone's house.

so that's photo 4, so what about for example photo 2?

well these two are taken in the same neighbourhood, at the top of Bocking Lane, the first junction to the right where the village green, just before there, this street is just round the corner from this one and they're both equally okay I think. I don't have any problems with either neighbourhood.

And what about for example this one photo 7?

I said it was happy, well it's fine again, it's residential, open and if you get into trouble you can get assistance from people. That's what you hope for.

Any other reasons? if you think of any other reasons later you can just tell me later.

And there are also nice people around in this neighbourhood. They are friendly it is not a rough neighbourhood, so you have the feeling of feeling secure and safe and I don't think you would find trouble in the area that's why I took the photographs in those places where I felt safe walking up and down there day or night I don't think I'd have any problems. There are people of good character here. And if you needed help or assistance it's there to be got. And I like the traffic lights too it gives you safety to cross the road - photo 5- and photo 8 also and photo 9. You can cross the road safely and not worry about being knocked down by a car. And there's help to be had. I liked it. And it feels safe and well organised, the roads, just well organised

okay so we've covered photographs 1 to 12. so you think you talked about all the issues for the streets you're happy to walk down

yes I hope so

so if we go to the streets you're not so happy to walk down, here they are, so in general terms what makes you happy to walk down these streets than the others?

well can I talk about specific photos?

Just generally then we'll hone in on specific photos, so in general terms why are you choosing these?

It's just dark, I chose them all because the forest is there, there's lots of forest. Although this one doesn't have as much, these two are dark .alleyways (19,14) and I think you could come across trouble late at night there. You feel trapped walking down those alleyways at nighttime. This one is behind Woodseats library, I'd feel trapped I wouldn't feel safe going down there at 12 o'clock at night. It's dark and its dingy and I'd have a sense of feeling trapped and claustrophobic and if I came into harm's way I wouldn't have a place to run to basically

would you walk down those alleyways in photo 19 and 14 during the day?

Yes I would go down 19 during the day because it's just behind the back of the library I like taking that shortcut, during the day. It's just a road but it comes to a dead end at the library and then there's this dark forest here which I don't like the idea of being there. There is a house opposite but it feels too trapped, it's a no through road and I just feel like how can I get out. This one, I saw a lady walk there (14) I saw her walk down there but I wasn't keen to even go down there during the day. it's only a short alleyway but I just thought why she going down there? For her it's a shortcut but for me I'd find another way to get to my street.

so what about for example photos 16 & 20 which do have houses on, which do have a possible place of refuge if you needed it, what is it about those streets?

okay16 and 20, although I put Bocking Lane on the other pile as okay, this part I didn't like because it's further up and it's also dark here, and not very well lit, maybe I'd feel half and half about that photo. Half happy and half not. I'm not certain about it.

On 20 is it a public park behind Or is it a garden?

No, it's somebody's driveway. It goes up but it feels a bit secluded and isolated up there. And this road (16) is where St Chad's Church is and it's dark. Although I think they have lights at night on the road I've noticed them, it's just a bit dark. Maybe I would walk down there that night again may be half and half. it could be either way.

And what about photo 13?

This photo I took on Woodseats, I don't know if it's a no through road, it's just one of the side streets on Woodseats there is a jewellers at the top, I just took it because it's like, I don't know I

just didn't feel happy about it why maybe it's these buildings, there's nowhere to go to and it's just a bit

yes back-to-back terraces

it's the back of the house so you can't go in can you if you need help. And also they'll probably lock you out, it was just a bit of a rough area I thought there were just a few odd characters knocking around on the street and again a forest, is not really an issue, I don't like it, I just thought, it just felt rough you know the word to describe it is a bit rough.

Yes yes possibly yes. If I had an errand to run there, there are some shops on this side, factory shop, but not at night time it's a bit rough is the word to describe it.

this is by Beauchief Abbey, no I didn't like it, I love that walk during the day, it's very scenic and safe, it's by the golf course so if you walk down there at night, if you're with someone it would be okay, but if you're by yourself I wouldn't like it because there's a golf course there it's very open and exposed. Forest area, it's enclosed

Yes it's enclosed on that side and too open on the other side, and too exposed on that side so, I don't have reason to be going down that street at night anyway because there's no residential houses, no one to visit, it's just a church at the end of the way, at the end of the alleyway and if I was there I'd have to be there for a very specific reason. If I was just taking a shortcut I would avoid it, because it's too open here and exposed here it's just too much forest I don't know. I just feel like the feeling that if you're walking there someone could just see you quite easily and grab you and you could get mugged even on Abbey Lane, I'm sure you could get mugged late at night If there were youths there or some dodgy people it's just not safe at night time I don't think, during the day is fine because there's all these people playing golf on it, loads of people coming and going, it seems quite a friendly neighbourhood, but at night I'm sure people would close their doors and not be willing to help its just exposed and not the place to be

this one is at the bottom of Abbey Lane, there's a park further up that I liked but again, it is a similar problem to 17 who would walk down there that night? On that side of the road?

no, I don't know I think I said the cars were going too fast, and it's not really pedestrian friendly, even though you can walk on this side, there's an open part there, there is no way of running somewhere if you get into trouble, there's no way you can access someone's property it's all closed off and it's too exposed, it's just a normal road I suppose it's not that bad is just this forest area at the bottom which I didn't like particularly

I didn't like that street, that's the bottom of Abbey Lane, why? because there's lots of forest there, at night time and it doesn't make for safe walking as a pedestrian, at nighttime to walk down that road. You've got all the fast cars coming up here and it's impossible to cross the road at night time with cars coming and going. And you can always have the odd character, lurking in the bushes and I don't see why I would walk on that side of the road, on the right side it's a bit more residential though the houses are high up, on the hill so they have gates all locked, so it's not a place to walk down really at nighttime. It's a bit more safer on that side. because the houses are there and, there's more coming and going on this side of the road, than on the side where the forest is.

Yes I'd walked down this side of the road not that side, I'd walk on the side where there is no forest

Well it's open, residential, it's a friendly neighbourhood, there are safe places to cross the road at the traffic lights in picture 8, and picture five it is safe to cross the road, it's nice here there's a big junction here, it's safe the roads are wide, and if you come across trouble you can just run to someone's house and it's quite well lit, there's streetlights like there's a light

Where are they?

Just assume they're in a kind of average neighbourhood

No. well the first one no

why not?

because it's a forest and a narrow alleyway I would not go down there full stop, it's just dark, narrow alleyway with hedgerows either side, tall trees and you could be trapped there and that's what happened to someone and she ended up getting murdered

really?

The yellow Brick Road murder that Chinese girl got murdered walking down a road like this in Derbyshire in March, she was walking home from a Thornton's chocolate factory, she was walking down a road just exactly like this, not hedgerows but trees either side of her, she was very short only 4 foot 11, and someone just came and grabbed her out of the bushes and strangled her.

it is true it happened in Derbyshire

how did you find out about that?

It was on the news in March, in the papers, I think it was in the Chinese news.

So you read about that in China?

Yes, but she was short, very short only 4 foot 11, that's very short and she didn't have a chance, who would go down a street like that?

Okay so that's D, would you walk down here during the day?

No

okay thanks next one is B

did you take these pictures in Sheffield?

yes

is that not Hutcliffe Wood Road?

Yes

at night? Yes I'd be fine, it's fine it's okay I like it, I don't like that bit that's just where the church is, isn't it?

You don't like what bit?

This hedge row here but it's fine

you would walk there at night?

Yes I don't see why not

what about this one?

No, I don't like it, it's the same picture as D

yes

I don't like it even if there is a lamp there at the end I wouldn't go there

okay what about that one?

A - it's the same photo!

I know, there is a difference though, so you can still tell me if you'd like to walk there or not

arrr the other one had more lights in it. I didn't notice the difference, erm

you want to have have another look?

Why not? I'd still walk down it. Actually this one I prefer because this one is brighter than this one.

first of all you thought that one was darker

did I?

You said the other one had more lights in it

arr but now I'm looking at it, at the brightness, is just this light is a lot brighter than this one, but either way it is a bit dingy and dark but still residential street so it's still not a problem to cross there. I don't see why I wouldn't go up there at night time. yes that's fine

okay well thanks a lot for your time

Interview 6

Sorting out which photos were happy and which were not happy - Didn't remember taking photos

These aren't my photos, not up to now, that one is, I remember that one, they look different, it's because I took them from where I go past, and not ... I don't remember taking that one, but that looks familiar

did anybody else have your camera?

That's Kennedy Road, that's the little gunnel down towards Archer Road, this is Holmhirst Road, that one is Crosby Road, this is a gunnel goes up from Marshall Road, oh yes that's Marshall Road and that's Marshall Road, that's one way and the other way, it's two ways, that Kennedy Road again I think, I don't remember taking two of those, oh it's a lovely bush there, yes that's the one up to Woodseats Road.

Don't look at the other side that's just scrap.

but I don't recognise these, not that one, not that one, there is a gunnel there and I don't remember that

maybe they got them mixed up in the photo shop

are you sure they're not some of your father's? I've never seen that.

so none of these are yours?

These are mine,

so can you put them in piles that you are happy to walk down and those that you are not?

I thought I only took 11 but there's more than 11 here. Well that's all right, that's Crosby Road, well I don't mind any of them, but I haven't been down there but I wouldn't like to, you know it's a gunnel

okay so let's put that in another pile

it's just the gunnels that are a nuisance, these two, I don't go down them but they are gunnels, the other roads are all right because there's always plenty of cars and people, you know they are broad, they are all right

okay so these are all alright,

it's just the gunnels

okay so basically you've taken, I'm just going to number the photographs, so that when we talk about them we know what were talking about, so I'll just number of these first, because while I'm recording it I just want to say the photo that we are talking about

well you ought to put the Kennedy Road ones together

1, 2, 3,

besides I don't walk you see I go on the scooter

well the scooter is fine as well it can be which streets you are happy to go with the scooter down and which ones you are not

I don't know whether the scooter would go down the gunnel actually, I suppose they would with a squeeze, it's just that the others are quite reasonable, and they are well lit, but the gunnels aren't you see.

okay so first of all, if we, can you just tell me, I'm just going to lay all these out so that you can see them all, because the point is that it triggers your memory, I'll lay them out so that you can see them all, so first of all in general terms, can you tell me why you are happy to walk down the streets, just generally?

Well they are used, you know, there's always cars parked on the side of the road, and you know they're not intimidating, they are well lit, they've got, not that I'm out, except at night, when the nights draw in, you know the lights are on, but at the moment it's summer, and I'm not out late, that late. They are all perfectly all right, I don't walk

down that one I just took the picture because it was off a road I was on,

okay so that's photo eight, so specifically, looking at photo three, is there anything specifically about that street that makes you happy to walk down it?

Well that's leading to the main road that one, so there's always plenty of people about

and what about for example photo 4

that's Kennedy Road, there's a main road at this end of that one, I think that's it, they are all fine because they are wide, you know they are not narrow, you know it's narrow ones that you've got to be careful on, I mean this is my own road, that's my house there (photo 5)She's

anything else that makes these comfortable streets to walk down, or go on the scooter down?

No, fine, I just have to watch the curbs, because they have to be you know dropped to be able to...

if you had to list the, kind of the most important factors about them, what would you list them as, you know these streets that you're happy to walk down, if you are going to summarise everything you've just said

well because they are not narrow and they are wide, and they've got cars parked on each side, so you know there's plenty of people there in the houses

okay so thanks a lot, let's go onto the streets that you're not so happy to walk down, I might just put those on the floor in case we want to compare them. Okay so photos 11 and 12, can you tell me why you are not so happy to walk down those streets?

Well they are gunnels, not really streets and there's no lighting and they are narrow

and photo 11, would you go down there on the scooter during the day?

Well I've got no need to because it leads up to where I don't want to go, and going on this road here you see, and then past it at the bottom, and I go past the top of that one when I go

so on photo 12 you don't need to go down there during the day?

No, I don't need to go down at all, it's just that I took them because they were there

okay great thanks a lot is there anything else about the streets?

No I feel very fortunate living in a nice area like this, it's well lit

so now I'm going to quickly show you some more photos, so would you be happy to go down that street?

No it's too dark and there's plenty of... it is too high, the foliage at the top, you'd feel closed in, it could be dangerous

and what about this one?

Well that's not too bad (A) there's plenty of lighting, and houses, it's when there's no houses

and what about this one?

Isn't that the same as that one?

Yes, there's a slight difference though

well it seems reasonable, it's well lit

and what about, this is the last one now (D)

no, I don't like that one at all, no it's too narrow and somebody could jump out at you there, with all that stuff to hide behind, no it's dangerous that one

okay well many thanks, that's it, and now can you just fill in a couple of surveys for me?

13 - 18 mins filling in questionnaires

"I don't worry at all, I'm not a worrier"

"I don't worry about anything"

Interview 7

they are quite light these pictures, it was kind of getting dark

so these are the photos that you said you are happy to walk down, and these are the photos that you said you weren't happy to walk down, and these were "iffy", if I forced you to put the "iffy" into happy or not happy which one would it be?

Well probably happy but, if I have to

so they are going over there, so to start with, in general terms, can you tell me why you're not so happy to walk down those streets, in fact I'm going to quickly just numbers the photos

bear in mind that these are night time shots actually, I took these early evening time so the photos are a lot lighter than the visibility actually was.

Yes I think it's because the camera optimises, it doesn't matter, for all the questions, we're assuming that you're walking in this area after dark

okay

so in general terms, if you just look at all the photos what makes you happy to walk down the streets, and not so happy to walk down those streets in photos one and two, just generally rather than specifically, to start with

what makes me happy to walk down?

Yes, there were two questions, to take photos of streets that you're happy to walk down, and those that you are not happy to walk down, these were the ones you were happy to walk down, and these are the ones you're not so happy to walk down, so I just want to know in general terms, why?

Well, one reason is that this is quite familiar, because it's not far from home, right, there are parked cars, they kind of indicate people's presence even when you don't see people, is it that picture you are asking?

Just generally, that was photo 5,

so generally I would say that that parked cars on the street indicate people's presence, even though I don't see them, it is quite a wide road, so you feel danger coming from the road, or the woods or places where nobody stays, there are no such places here, there is a street, now the street where cars are actually coming and going is a bit further away, when I walk, you would be walking on the pavement, so in fact the pavement is actually quite far from the road and close to the houses, which is a kind of escape route, you imagine it to be a kind of escape route, houses and front gardens, because you can always hop over or something, okay (photo 3) that would be the same here, are you recording this?

Yes

okay now number three, I think those were, in fact let's just say the others first, because those were the less obvious. Shall we do 6?

Yes that's fine

okay, these were the ones I was happy about, or reasonably happy about, erm, well this road again

so that's photo 7

I think it has a lot to do with familiarity, you feel you know... there are streetlights which always help, I can't remember in the previous one were there any street lights? Well there is probably, but.. well the visible street lights, I know this road I know that there is lots of comings and goings and somehow I think at the time I took the picture I can't remember it looks quite deserted but infact I didn't get that impression when I was walking there. Infact, in a sense traffic and comings and goings give you a sense of security even though danger comes from the same place as well, it's

250

weird. So it basically depends how you.. I don't know… the fact that I know people around here for example, that also helps

do you know people who live there?

Yes, I don't associate that place with danger even though it could be. I can imagine.(7)

So what about photo six?

Now I think actually I wonder if I made a mistake there, I don't think I'd be happy to walk down there in the evening

okay that's fine, I'll put a little cross there so we know

yes cross that out because I think that's an example of where I wouldn't be, not in the evening, because I do find it unsafe these hedges, and shrubs over both sides when it's dark. That house is quite set back a bit I don't think they can quite see out onto the street because of the tall hedges. So really actually between here, it doesn't feel safe at night, so no I don't know how I did that, it was a mistake

it doesn't matter

and would you walk there during the day?

Down there? Yes, I think so because, simply because really you can't actually, there is traffic there during the day, with people coming and going, and there are golfers behind during the day, you can count that there are people there during the day, you can't be snatched and taken over, because there will be people over on those shrubbery areas during the day, but obviously not at night, so at night I think it becomes a danger zone, potentially that is, but again it depends how late at night you are talking about

say midnight

then I wouldn't be happy to sort of wonder about there definitely,

and what about these two photos 8 &10?

yes I think that was er, did I not talk about that? No wait a minute which one was it

I think it was before you covered...

there aren't that many that I said I was unhappy to walk down, I think it was that one and 2

these are the ones you are happy to walk down

that's right, I think so and this is where I wasn't quite happy I can say why

okay so what was it about those two streets 8 & 10?

well I think it's the same street but different parts of it

it's the same as this one isn't it photo 5? That's the same car.

Sorry yes that's the same photo, I think it's because I have a very good view when I walk down here, any time, even at night, of what is happening around me. There are no big trees in between the cars and the pavement I can see if anybody pulled off for example. my main concern of course is always the cars, rather than visibility, but then there are streetlights there are as well so that helps. But also if anybody stopped and got out of the car I have a lot of space there to manoeuvre I think, that's the most important thing about it, I think it's also, the main road is lit quite well, this side isn't, so I am in the darker area and they are lit up, but it's not that dark on the other hand that you can't see, so you almost kind of feel, not hidden, but you know there's a more sheltered aspect to it I think.

so you're in a darker area, and they're in an lighter area, which gives you good surveillance?

Yes that's right I can survey, I liked to sort of survey a situation.

okay very good, if we go onto the streets that you're not so happy to walk down

now it's the same road but a different part and it actually gets obviously, there are a lot more there are trees only on the right-hand side from this point, that is shrubbery and trees, obviously I wouldn't walk on that side here, also the houses are a lot higher up on the hillside, they can not see you and you cannot go to them. You just don't know what lurks behind the shrubs you know or whatever. Having said that the visibility is quite good again. I think here , I don't see the, danger from the road here it's more like if I walked… there are two pavements here which is not obvious but there there is the other pavement, on that side, on that side it's pretty obvious, why is this you don't want to be walking

so what are the obvious things?

Well there are the trees, and the shrubs and trees beyond and no buildings for quite a large distance, so it's obviously, you can just disappear there quite easily. Here, and also on this side on the other hand there are no shrubberies as close to the pavement as much as that, that is pretty close, but here whatever happens these are just houses behind but there is a danger element that they are high up, although these are gardens joining the pavement, they are pretty inaccessible even to their owners I think, you know so it's that sort of thing, it's becoming more country-ish.

and what about photo 2?

251

Now that's interesting because I was walking there at 10 o'clock at night, and I felt, and then suddenly I felt unsafe, I think it was later actually, it was a lot later and I thought it wasn't, I thought it was about 9:30, when in fact it was about 11 o'clock. And I was suddenly aware that all the lights were switched off in the houses. Because there were no lights coming from the houses, or hardly any, and the street lights are fairly dim, and there are the big trees, suddenly I did feel a bit isolated that I was on my own. So what comes from the houses for example the lighting is quite important. Also there is no traffic on this road actually, and the pavement is close to the road so if a car comes it's pretty near you and the houses are, if you go late at night, people are asleep there so in fact you are pretty exposed even though it is a built up area.

but during the day?

During the day I'm fine there. I actually experienced being a bit not quite happy at about 11 o'clock.(photo 2)

Okay, so if we just lay out all the photos, are there any we haven't talked about? So for example this one photo 4.

yes we haven't talked about that have we?

No

yes, safe during the day, I think late at night, this doesn't look like an unsafe place to be I think, even at night because it is well lit up, but it is more like because I know that it attracts undesirable teenagers coming down from the estate and hanging around, and you don't know where they hang around, they could be hanging around down there because I know the place basically, and down there as well, I know they can hang out. and for some reason because I heard from the house, drunks and lots of noise occasionally, late at night, I don't know where these people are coming from but I do hear that. I just kind of associates that with being unsafe. Although these shops… it becomes quite a desolate deserted area once the Co-op shuts, and all these shops are closed, I don't know how many of these houses are actually occupied, they are rented above the shops and you feel that they are more remote from you, further removed from you than if they kind of lived down there as well. So actually, beyond that there's a cemetery and I don't know, it's kind of, but I think that would happen kind of late night, Co-op doesn't shut until 10, so it's different up till then. It's after that, which I would say that, people actually robbed that cash machine a few times, or tried to rob it, not rob it but they put some kind of device on it which read the numbers, the debit card numbers ..so

Has anything ever happened to you, in these areas that you are not so happy?

I just saw kids messing about quite a lot, they set fire to a bin once, in front of the restaurant, so I know that there are activities can go on there that you don't want to bump into basically, although it is quite rare. Otherwise, although it's a well lit area late at night, the lighting doesn't come into it that much (neither +ive nor -ive so ignored), as much as you know the history of the place. So if this place was somewhere actually quite unknown to me, I might think it's safer. I don't know I'm not sure. I was unsure about that one it's strange

okay so that was photo 4, what about photo 3, hat's the only one we haven't covered now

photo 3 now that is that's just one of the side streets here, I think, this photo is quite light here, I think that if it was darker as it was darker I would just say that similar rules apply to this one (2)

is that the same street?

No it's not actually, but, I said I was happy about this one, although yes, it's not quite as remote. I was unsure about these two photos, because so much depends on the circumstances, I think it's very circumstantial, so generally speaking I think even at night, unless it is very late, again it's strange that because trees have a sense, although they are comforting during the day, they do become kind of, not like people, but sort of because you can't see them properly, they block visibility, basically, they become a hazard basically. I think where there are trees at night, although I love trees, it's kind of you don't know who is there behind it ever, so in that sense, I think the same applies there, although this is more than open road then that one for some reason. I would say that most of the time I would be happy here, but not very late at night in which case I don't like being anywhere basically, because I don't think anywhere feels safe, because there is no movement on these roads. And the movement stops here as well very late, In which case you feel more vulnerable

but on those you're okay?

Yes, well for a short time, again if I had to walk from say, marched down between 10 and three o'clock in the morning, I would be looking very carefully, so okay it is relative, if I have to choose, then I would have to say that's one of the safer options

okay well thank you very much

did that help?

Very much

252

do people have different opinions, or are they all saying the same thing?

it's very similar, but with a different slant, everybody puts things in slightly different words which is interesting because people say things in a different way, so now I'm going to show you some photos and I want you to tell me if you are happy to walk down these streets or not and just give some general comments

at night?

Yes at night on your own

photo A at night on my own?

Yes

no

why not?

It's just somehow, why not let me just think, late at night, I think it's just a residential street, and when I know that people went to bed, for me it becomes unsafe basically. I know it's a well lit, there is a bend as well, bends are a bit of a problem because you don't know what's round the corner. I like to see ahead that's why I like the straight road, straight down, you can see every direction, here I can't.

Okay what about there?

obviously that's a no-no, even though rationally I can imagine it's probably quite safe, but, I don't think anybody in their right mind would be waiting there for you, because actually the trouble zones are more where there are actually people. But you don't associate them, also they kind of like help. So people of both the problem and the opposite. This is completely just psychological. This is really, it's claustrophobic to start with, and then it's dark on top of it.

okay what about this one?

Okay let's just see, that's B, no, that's just the same I think as the previous/first one, as the first one, it looks a bit darker even, but I would say that the same rules apply is just that it looks residential, it's people have probably gone to bed or are going to bed, put their telly on and draw their curtains, by the way in the summer time things feel safer, because people are up later I think, (B) and again it's not a straight road, I might be okay to just walk on a stretch of it, but once you get the bends and trees and what not,

and what about this one, photos C?

Well no, simply because you cannot see ahead, or left or right basically, you can't, there's no way that you can weigh up what is there. even though there is some light at the end, it is not sufficient to

feel safe, not in control basically. Essentially I like to think that I'm in control, I can be in control if I have problems in a situation, there is no absolutely safe place. But if you think that you can exercise some degree of control, if things go pear shaped, then you will think you are okay. So and here obviously you can't.

Okay so here there's a couple of surveys to fill in

this is right hard work

23.30 talking whilst filling in surveys

it does depend on the lock system on your doors, if you can look out and check who it is you feel a bit better about it, but if there is no way of checking then you think it's very unsafe

well assume it's where you live now

that's hard that one because in the back of my mind, it's most likely to be the neighbour I think, so I'll put there 3

Interview 8

okay, so these are the streets you're happy to walk down,

at night obviously you can't see much

tell me why you're happy to walk down the streets, in fact first of all generally before we start looking at the photos, what makes you happy to walk down some streets and not other streets, after dark?

I think the size of the street is important for me, and dodgy people coming along, obviously you don't know if it's dodgy people but you can see the, if you go in the street where you are not happy and then there's somebody walking behind you, you are not happy much more

 yes

so first of all, I might be happy by my own, what else apart from light? I think the light, of course it's important, and also if it's a street, if there are houses which look tidy or untidy, if you see the houses are a bit rusty you are not really happy, also if maybe dogs barking everywhere or, people shouting, I wouldn't be very happy. Again, if it's too quiet you are also not really sure what's going on, so of course the light is one of the important

okay, anything else?

No

So now, if we look at your night time photos, obviously I don't know where the streets are, and I can't tell, yours were the darkest, but anyway, was there anything specifically about these streets, which makes you happy to walk down

253

them, the photos are there as a trigger, and as you talk I'm going to to say the photo number, even though I know they are all dark

the first street that I did (photo one) because I think there is three streets that I am happy about, not all of them yeah?

They didn't develop half of them because they were completely black, so, this is what they developed

I can't really see which street it is now well if you just remember them, like 1, 2, 3, as long as you talk about the streets it doesn't really matter about which photo

because there were 2, 3 streets. One is very big, the main street, with cars so it makes me, if there are cars obviously going its more secure and they are wide and very bright at night. So I'm happy I've been walking there, it's very like during day, the cars coming, sometimes people might pass, and it's very bright. Three main issues.

and there were another two streets, one of them had a dead-end,so, and also probably familiarity in the streets is also important. If I know where I am, I know what to expect.

did you say that there was no dead end, or that there was a dead end?

It was a dead end and I was also happy

so you are happy with the dead-end?

It's just you know houses and it's very bright and the houses look okay so I'm happy to go there, all the streets, & even though you can see there is some cars still parked, you can see them, I don't know how much information you can get

I know they were really really dark, that's one problem was identified with the disposable cameras is that you don't know what you're taking so maybe we'll ask people to do in the day, because obviously you can't see it on the screen

yes I can do it during the day, because it's just very close

anyway, there's one street where you were, which was a dead-end, but a kind of safe dead-end, and there was one street that was a wide big busy road

it's not that very busy

and what was the third one? Did you do a third one?

The third one was very similar to the dead-end but it was just going through

okay

so it's just very similar they are very similar but it's going through, not a dead-end

okay so were they residential, only residential streets? Was the first one residential?

First no, first is also residential but it's the main road so the cars are going there

were there any shops or not?

Yes there were some shops

so semi-residential

yes there were shops, and pubs

okay cool so now are going to move onto photos that you were not so happy… these came out nicely

yes these were during the day obviously

so for example, photo 10 why wouldn't you be happy to walk down that street?

No I wouldn't be happy

why wouldn't you be happy?

Because on this side there is a park here, and this is a wall, and at night there is not many people around, and the police usually comes

oh right

so this is just behind the pub, I don't really want to go there because you might meet somebody there, and probably because the lighting is not enough here people go to do something weird or whatever, so they might, it's a bit unsafe at night, these are all of the same street

yes those 2 and there were some more as well. What about photo 8?

this is actually, I don't know if you could consider it as a street, but still people walk there , obviously a walking path and there is lots of vegetation and trees around, it's very dark during the day, and sometimes I'm not really, I'm not scared that I'm not happy to go by, but this is a very short cut to another place, so that's why, I don't remember to walk there at night, and what I would like to say about the lighting. I don't think that they cover enough, the whole, so if you have this light here, you walk, there is another one, but there are some bits of dark

okay so dark patches?

Yes dark patches, this is a little bit more scary, probably, that is what I remember about light. And also, if there is no residential residences very close, this is just a hill down, so there are not really people if something happened …

254

and what about this one photo 12?

This is the same as that,

So this is the same places photo 10?

yes it's a bit further,

okay so that's just the end there?

Yes this is just representation of this street. here is more scary because the park is just around the corner, especially at night it's dangerous, and it's not really nice, there's a feeling of I don't know

Are any of these new areas? For example photo 18 is that a different area to these?

now, this is the same, because there are only two unhappy streets, and this (18) is the beginning of the first place and you see this is, yes, no, from another view, this is the street from the other side, you see it's very dark here, this was just,…, I think it was the afternoon, so there's not much light, so you don't really see the other one, these lights it's scary and there is a field on the other side, and there's no people

so there's no people?

People start here around the corner, there are some garages, not yet, residential

okay so this is the same as that

yes this is the same place, this light, this light, next one and another one, because it is very dark, trees, it gets much more darker and there is no sky view

and 13 & 14 are the same as 10 &9 aren't they?

yes they are from the same place, there's just a wall on this side, probably is the same type of lights everywhere,

okay great thanks a lot, can I give you a couple of quick surveys? If you are in a rush you can take them with you...And can you just tell me if you would be happy to walk down that street or not?

at night?

Yes at night

very difficult ... yes

why?

because it is quite wide, and there are people there, and cars, it's houses, they look tidy

okay, that one (C)

not really

why not?

It's quite narrow, and I cannot see, I see there is a car, erm.. maybe it's okay, it's quite light, so probably yes

so that's a yes?

Yes

so what were the main reasons for yes?

It's quite bright

and what about D?

No not really, not at all.

and why not?

It's very dark and I can't see what is at the end, it's nice here but I can't see what is at the end

and what about the last one (A)? Are you happy to walk down that street?

 it's the same as before?

Yes

it's a bit darker, I think so it's a bit darker, it makes me feeling a bit scary,

so would you walk down there?

no

No, sorry I have to ask you the obvious, why would you not want to walk down there if it's a definite no?

It's dark, I think it's a bit darker than before,

ok anything else?

Less, no people, because before there were people but now there is no people. It's difficult to say probably still yes.

So you still would...

yes I still would go, it's still quite light, it is a bit big, I can still see what's on the other side so yes

Interview 9

okay so first of all in general terms, before we look at the photos what is it generally that makes you happy to walk down some streets?

But I might be biased because I already…

it's okay you can be biased

you mean at night or in general?

All the questions are about night

so okay, I will be happy if it is a bit crowded, that makes you feel safer and I don't know maybe to

be a bit wide as well, not just a narrow one, of course need some light

and what about streets that you're not so happy to walk down? First of all in general terms, what is it about them?

They were quite dark and not many people around when I'm walking down there, so I would choose the one parallel which has a bit more of these. Basically things like that.

a bit more what sorry?

Like a bit more people around, and also maybe about being common, using there common

By "common", you mean using it often?

yes, I know that street

so you're familiar?

Yes

Okay cool, so first of all if we start with the streets that you're not so happy to walk down, whichever photo we talk about, I'm going to say the number so that it picks up on the recording. So, for example, this one photo 13 what is it about that street that made you take the photo, as the street that you're not so happy to walk down?

well actually I already had a robbery in that one, so that's why I'm not going night any more, but the problem was it was snowing and there was too much ice on the floor so we were not really able to go away from the guy, so it was angled also, it just created some problems

So the pavement was angled? So it was on a slop, so you were slipping down?

yes that was the situation for that

and also it's quite a huge street so many cars are passing around and you are just not really able to cross really easily when you need to go away from someone. So that was the basic reason I guess.

okay thank you so how about this one photo 19?

In that one there were just around many dodgy people, so that's just actual the street that I'm walking every day while going to my house... so at night while going back it's really a bit scary sometimes and it's because there's a bus stop around there and there's also many people and its, I just crossed the road and walked from the middle

so you walk on the opposite side of the road to the people?

Yes I do that and not going near the wall, just a more safer way, being away from that

so when you said crowded you meant crowded with the right type of people?

Yes, not those ones.

so what about this one photo 10, church street?

I think that is the one which is generally quiet around, and while taking the pictures I actually realised that there is a camera in there, but I didn't know it earlier, but even if there's a camera I'm not using that road, I'm using that one instead, as in the parallel one. I think because it's generally empty normally so that's why I'm not using this one, I'm not happy with that

anything else about that one?

No just like that

.... so we've done all the streets now, so looking generally at the photos is there anything we haven't talked about on any of the photos that you can think of?

no I guess that's fine

okay thank you so, sorry one more question which I forgot to ask, do you walk down Hanover Street during the day?

Is it that one?

Yes that one and that one

do you walk down these streets during the day? Because we are talking about night now, at night you're not so happy, but what about during the day?

Yes I would probably walk, during the day, you have enough light to walk, from there and there's some trees and green stuff, it looks really nice during the day

and what about Church street during the day?

I actually don't know why I don't really like that street but during the day I'm using parallel, in here and at night time I'm using parallel in here,

So you don't walk down there during the day?

it's not really nice for pedestrians, maybe because there are trams passing around, and you are not able to cross from anywhere you want.. I don't know, I don't use this one even during the day

ok so that was photo 10, so what about Waingate? Do you use that during the day?

Yes but it's because I have to use, that's the only way to access my place

256

okay thank you, so now if we moved to the streets were happy to walk down, so what is it about West Street, so that's photos 1, 2, 3?

That's the one that I'm really familiar with using everyday, there are many places, socialising places around so generally it feels crowded with many people around. And actually this is the same, Fargate (photo 6 and 7), it's a really similar reason but, at night it's also… I think there's something about lighting in that one but I'm not really sure what it is, it feels a bit safe walking through there and it's also a really large area like you can go round there and there are no cars

so it has enough light?

Yes

or good light?

Yes, like enough light, enough light to go from there at night, so basically similar with West Street

and so with Mappin Street, (photo 4 & 5) I think it's because there are too many University and student accommodations in that one, that's why it feels safe to me to walk through there

Recording stopped... switched back on again for specific photo descriptions

are you happy you're not happy to walk down photos C

I think I will probably be happy to walk through there because the beginning, like starting and ending point of it is, seems quite bright, so it's just a short distance in between so yes I will probably be happy walking in there

okay and what about photo A?

yes I guess there are many houses around here right? So, and yes I would also be happy walking there, even if it is empty in the photo right now it feels like safe to walk from there because people are living inside and it won't be any problem probably

okay, and what about that one photo D?

that one seems frightening because you cannot see where it goes, I mean if I know where this going then it might change, but just looking at this picture I can say I will not be happy walking through there

okay and what about this one photo B?

Yes I think that's similar, with the previous one, again like with houses around, nothing dangerous will happen so yes I can see what's going on in the street as well, the lights, I will be happy

okay thank you very much

Interview 10

Does walking on the street at night generate any feelings in you?

sometimes, but since I've been living in London not so much, it doesn't really generate many feelings because I tend to always walk in areas that are, I know them very well, so I don't have too many fears about walking down them

and what about you? Does walking on the street at night generate any feelings in you?

Walking on the streets?

At night, yes

I don't have any idea.

okay that's fine, I'm just going to make notes

I think you have to prepare more as well, if you're going out, you have to prepare, if you have to stay out late at night. I don't know if that comes under feelings though.

Are there any areas that you're happy to walk-in than others?

Yes, some areas, I would always try and go for areas that have some shops, or I know will be busier than quiet areas and probably places that are well lit as well

could you give me a couple more reasons why some areas you're slightly happier in?

being familiar with it, if you know that route. You don't want to look like you're lost at night I think. It's better if you know the route rather than having to always look at a map or something when it's nighttime. That's one thing, that you're familiar with it, another is that it's busy and that might be because there's shops or houses overlook that area. And then to do with if it's dark or not dark. but also, if it's to do with roads, if a road is a really busy fast road, that might also put you off walking down it because you want to go somewhere where the traffic, at least where you need to crossover, it's going to be safer. So, places to cross.

So when you say "not look lost", can you tell me a bit more about that?

If you're in an unfamiliar place, there is the risk that you might look vulnerable and you might be a target of an attack. so if somebody knows that you're out of place and you don't know the surroundings then I think that would make you more vulnerable to attack. As well as getting cold or something, if you always look a bit worried.

And do you think any other people could feel any different to you?

257

When I'm walking at night? Do you think other people, I don't understand the question.

Do you think other people could feel any different to you?

Different in what situation?

in this setting. if you're talking about familiarity, or choosing busy areas but not too busy areas

Do you mean they might assess how I'm feeling?

Do you think other people might feel more vulnerable than you?

oh right

if if you can't understand the question it's probably not a good question, so let's leave it

are you getting at other people's reasons for choosing one area over another?

Yes

asking me what I think other people's reasons are? Well they might just automatically go for bright, lit areas, whereas I think it's more about what might be overlooking that area. Another thing to mention, is that I do prefer sticking in areas that have got underground, rather than have got just train stations or car parks, because I think at the underground there is usually people working at night so if you do get into any danger or you want to leave that area, you can easily go there, where some of the trains are unmanned.

yes, okay so now I'm going to show you some pictures, and... (I'm just checking I haven't missed anything),

if I show you these pictures, can you tell me if they, also I'm going to write this down as we go along, so that I know which picture we're talking about, so can you tell me if the pictures generate any feelings in you or not?

1a -

because it's a beautiful lane, and there are plenty of trees around, I think it would be pleasant to walk down it, a sort of feeling of reassurance. is what feelings do you get, looking at that does it generate any feelings?

Quiet and peace

Ok, so number 2b

A word that comes to mind is cosiness, because the houses are very neat and co-ordinated and so it's quite a pleasant feeling again. It seems to be a cosy nice area.

like hometown, like my hometown, like a village

Ok so 4a

the darkness of that alley, although it makes me curious to see what's beyond, you also do have a little bit of a feeling of, might be, not danger, but just feel a bit awkward. but also because there's light beyond there there is also a bit of intrigue and excitement so I've got mixed feelings with that one.

secret, I want to go to have a look

Ok, so what about 3B?

a little bit eerie and quite kind of romantic and I don't know what the other word is

can you tell me a bit more about the eeriness?

I think it's the long shadows, so it makes it feel like it's not lit purposefully, there's some other light and it's not intended to be lit. It's a bit like moonlight as well, so there's something appealing about it, it's not all negative

This one, 2a

it's very artificially lit so it looks quite bland, to me it gives me a feeling of that desolate suburbia where there's nothing much very interesting

kind of friendly

and what is it about that is friendly?

Feeling it's easy to match the place,

to what sorry?

It's easy, just something very matched

merged?

Matched

so you mean, it's how you expect it to be? With no surprises. like this matches that and this matches the pavement. It is coherent?

It's just very familiar

and what about this one 3a?

It looks like some light has disturbed the scene, so is there some very strong light in it? It reminds me of searchlights, it makes me feel a bit uneasy because it looks like they need to search for something with really bright light. it is quite artificial.

Yes.

Make someone think they could go straight and find something.

interested in the dark world did you say?

Next one 4b

Because it's getting darker towards the end, it doesn't encourage you to go there. I would feel a bit scared to go down there.

hmmm

and the last one 1b

lonely, it's alone, lonely

yes, lonely, I quite like the warm colours because I think it's... the light is only from the traffic, I don't have any strong feelings about it

okay, so now if I whizz through these, can you tell me if you would walk there alone after dark, just on a quick.

Ok, ok..

I'm going to do two columns one is yes you would, the other is no you wouldn't

 it depends on what's on the other side, if somebody's going to meet me there, then I would

- last task, can you... maybe I should just show you pair by pair,

 Which one do you prefer?

1a " that one is really nice"

Now can you just rank them all In order of which one you prefer? Which ones do feel more reassured in?

Is it just on reassurance?

Yes, which want to feel more reassured on?

21.40.- general discussion about interview

it's more like recently I haven't had any fears, however if I am going somewhere new, then it would apply.

22.30 Bo sorting out photos

did you create the lighting those ones?

it's just a higher exposure, yes,

O your camera you just set it with the different, that's funny.... it's like your eye could see it, cameras are a bit like eyes aren't they? Which one would be naturally see it as though?

Neither. That's why using images is a bit artificial.

yeah

but it's an easy way of getting answers

is that one with a flash though?

Yes, with & without flash

so you have added light to it?

yes, and and also with you I added the colours, before I just idid black and white. You were commenting about colour, that's another decision I have to make.

 But if you use black and white it could be really different from how you experience things.

Comments made afterwards:

- colour of the light is noticeable in the photos
- familiarity in own areas therefore no negative feelings unless asked about them
- houses which don't have the lights on in them make the area feel deserted
- how artificial the photos look – bright green
- people soon realised that photos of the same places
- bring torches into it somehow to make it look more natural

Interview 11

So, first of all I'm going to ask you some general questions, and then we're going to go through some photos

ok perfect

there is no right or wrong answer, you can say what you want and we are encouraging you to talk about your feelings as much as possible, and I'm going to make notes in case I want to ask anything back to you that you've said to me

that looks like loads of questions but I'm not going to ask you all that it's going to be 20 minutes max

perfect

so does walking on the street alone at night generate any feelings in you?

yes, at the beginning here in Sheffield I felt like insecure, first of all, but after some weeks now I feel comfortable walking on the street but there is a strange sensation just because it's very dark and insecurity, that's how I feel

so when you say "strange sensation" is that in an area that you know, or in an area that you don't know?

It's in an area that I know, everyday I walk in that street but it's too dark and I'm not very familiar with dark spaces, with walking alone so that's why I feel insecure. At the beginning I felt this strong, but now I'm feeling better

Well (hesitating)

you don't have to say yes, if there are no areas that you avoid that's fine

there are some areas that I avoid

and can you tell me a bit about those areas?

There are some areas that are very solitary or alone with not many people, not too much light, I try to avoid that area I don't like spaces without people and without light

yes

are there any more reasons apart from being unfamiliar, not busy and what else did you say, without light, can you think of their couple more reasons? Why some areas are...

I think another reason is when I walked long distance, maybe in short distances it's okay if I walk in some areas that I don't like, but if I walk long distances, or the street is too long, that's when I prefer to avoid... let me think if there's another thing, also if the traffic is going with a lot of speed, very fast, also two streets situation, also I prefer to avoid them.

what is it about "fast"? What is the actual issue?

Because when I have to cross some street, sometimes I have to look around me, not only on one side, on the four sides of the street and I don't like to have that feeling of insecurity. If I get distracted, it's very easy because I still don't understand very well the right and the left, it's different for me, that's also why when I'm walking on the street I prefer to avoid these streets with cars around very fast

can you tell me a bit about the streets where you do walk alone at the dark? So the streets that are fine? are there any characteristics of those streets? Can you think of a couple of things about those streets?

just a description of those streets?

Yes

well one of them, in both sides there are these football lands

football pitchw

and there are a lot of trees in both sides of the street, and they are not very wide

they are wide or they are not wide?

They are not wide, and what else can I say, there are no houses, they are open areas, they are part of the installation of the University, there are not many houses so there is not much light

so these are the areas where you do walk, but you feel insecure?

Yes, in fact also one day I walked in Weston Park at night but I couldn't see anything in front of me I did it just once, because I didn't know. I never walk in that area because it's impossible to see anything.

Ok, right, So now I'm going to show you some pictures, can you just let me know if, same way that you're talking about your feelings, if these pictures generate any feelings in you, so I'll just show you them one by one, I'm going to say the number so it goes on the recording, and just tell me what you would feel about that street, so 1B is the first one

okay, 1B, it seems like it's not in the city, so well what do I feel about this

if you don't feel anything that's fine

yes nothing special in reality

and would you walk there alone after dark?

Yes I think

so what about that one 2a?

it looks nice, again I would like to walk here on this street, it looks a nice environment in an area with lots of houses and front gardens and a lot of things to see, it's a safe area

so you would walk in that one what about that one

it's too dark I can't see what exactly is in here, it's a park but I don't like to walk in this area, is too dark and it's a park

which number was that one?

3B

so that's a no

and what about this one (4a), any feelings? And then would you walk there?

I think it's nice, the only thing I'm not able to, it seems to be too long and there is vegetation in both sides, at the end of the vegetation it seems too dark, I think it feels secure, everything, I don't feel anything negative in this space

so is that a yes or no, would you walk?

Yes I would

so no, what about that one ?

I think that yes I would walk in this space. But it's a little bit strange that in these areas, I'm not very familiar when there is not a lot of people, but it's very common so at the beginning, looking at the picture I ask why is there no people, I don't like to see, but the space looks good

yes, so is that (2b)? Is that a tick?

Yes

so what about this one?

I would not walk in this one because I can not see what is at the end of the road so no I would not walk in this

okay

it looks insecure

3a

also in this space I would not walk in this area after dark. Because there is a lot of vegetation I don't have an open vision of what is going to happen, after daylight I would not walk in this one

and then the last one (1a)

ah yes, sure, I would walk in this one, yes

and what is it about it that makes you feel okay with it?

I think there are houses, its open space, not narrow spaces, there is enough light also here. and I can see at the end of the road if it's still with light and if it's still open.

okay cool thank you

I have stuck some down in my book and I want you to choose, if you had to choose which one to walk on tell me which one it would be

okay

it's a forced choice

3a choice difficult, last one - they are very similar it's very difficult.

what is it about 2b off the top of your head?

2b?

Sorry

What is it about it, what you like more about that one than the other one if anything?

I don't know it either looks like this is a park, in here there is nothing in here may be and in this one here I feel like I'm in the middle of the city, any

area with a lot of houses whereas here it seems that I'm walking from an open space to the city, and here there are many elements that make me feel like I'm in the middle of a neighbourhood

okay great so the last thing to do is to get all these pictures I'll mix them all up, put them in a ranking order. So the one that you would most likely walk down, to the least likely,

ok

yes, just spread them all out, and I'm going to write down your order

ok

Thank you, that's it. How are my questions, are they ok?

Yes, the only thing is that, I think maybe, my questions are too short

answers

sorry my answers are very short, and I don't know if you need more information may be at the beginning

I find it difficult because, like I interviewed my dad, and he was saying to me "stop asking the same thing" because I wanted to get more information so I just repeated all the time and he got put off, say they want to keep repeating with people "tell me again" and you just told me that you feel insecure because of XYZ. it's tricky to me to know when to stop, so do you think I could have asked more? Or would it have got annoying? If I keep just telling you whatever is on the list? Does walking on the street that might generate any feeling in you? Or can you tell me something about them?

For example, every time you show one picture maybe I think you don't have to ask the question again, just to make sure in the beginning

ok yes yes

also maybe I would like to know how many, so "I'm going to show you 10 pictures"

good idea yes

pictures about your environment, I don't know

and please tell me three things for example, and then I'm going to have it more clear in my head, in my mind to say ok, what do you feel, or what do you think or, what do you feel and why do you feel in that way? Or what do you feel and are there any elements that make you feel in that way? If you make clearer at the beginning, then you can keep going and show the picture, 1a, here you have picture 2b, and if you notice that the person

261

is not following correct instructions maybe you can say again the instructions, maybe

is going to be interesting when I start asking elderly people who are a bit deaf as well

yes well maybe say this interview is going to have three part, part one

yes spell it out

well you told me

yes okay, brilliant

yes I don't know

yeah I don't know if it's obvious, people telling me is obvious and not going to walk.. it could just be my family being rude they go obviously I'm not going to walk down here and obviously I'm not going to walk here but here obviously it's fine, but then it's the in between one's that are tricky

yes you have to compare two of the pictures yes, I feel like I'm not sure which one and also I don't know if there is something in different cultures as well for students from different places for sometimes the perception is also different

yes well Habid was interesting, because I interviewed him for the first pilot study and he said that in Mexico if somebody knocks on his door it's a good thing whereas here if somebody knocks he freaks out, because friends aren't knocking on other people's door, I guess they are phoning or something

yes for me also at the beginning with my friends we didn't want to walk alone because we feel insecure

even in a group of people?

Yes walking with three or two, walking in the street alone, I didn't feel secure but after some, well after one or two weeks I told her maybe it's because as we come from Mexico we are all of the time in the city like aware of the people, it's not common to walk alone

yes so it's because you're from a city

 but then with time I feel better I can go, I can leave here and go home at 10 10.30 walking alone on the street and now I feel like everything is going to be okay it's just the sensation that I bring from Mexico, it's very very strange to find a street where you can walk alone and everything is going to be right, it's difficult to think different

so basically in Mexico if there's no people there it's dodgy?

Yes, it's dangerous, at night with no people even if it's with a lot of light but there are no people it's dangerous. I can't walk in a street like that.

whereas here it probably means everyone's gone to bed

most of the times there are a lot of people in a lot of streets and for example in here, in the first week when I was walking in the city centre, I was walking around West Street but then I turned left, and I was walking on some street that was empty on the day, and for me it was like... I don't want to walk here and it was in the morning, daylight but just to see there was nobody in there, I prefer to walk just in the West Street. That was my first impression in the first week. The first time that I walk around Sheffield.

and the street near where you live by the football pitches, are you okay with that now? or are you sometimes a bit like ...

No it's okay, also because sometimes there are football games and there are players in there, and I can hear the sounds that there is people in there, it's okay but at the beginning all this was under construction so there were not a lot of sounds in there and not many people and that was also strange for me

Interview 12

what are the questions about?

I'm going to ask you about how you perceive different streets in Sheffield, so, first of all I'm going to ask you about the streets, secondly I'm going to show you some pictures and ask you some questions, and then I'm going to ask you to sort out eight photos for me

okay

so 20 minutes max and I'm going to just make notes and if it's okay with you, can I record it on my phone?

Sure

thank you

okay so the first question is, does walking on the streets at night alone generate any feelings in you?

hmmm, you mean any of the streets?

Yes, the residential streets around your neighbourhood

er, it depends, if it is somewhere near around, if it's in the city area then it's a bit safer but if it's a bit secluded area on some outskirts of the city then it doesn't feel that safe. In terms of lighting?

yeah, so particularly residential areas that are around the city, a bit of outskirts?Like Hillsborough or would you say Ecclessall road or something like that?

uh huh

In a residential neighbourhood, most of those streets would be quite safe and quite okay to walk at night but very few of them would have a strange feeling when walking because of certainly some issues on the street and things like that

and can you give me an example of some of those issues?

Like a few neighbourhoods in the city would not be that safe in terms of people, in terms of… yes I think most of the time it's the people living in those areas and some neighbourhoods would be quite good, like quite quiet, it feels safe because of good residential areas, so it's more towards the safety issues of you being attacked or anything like that. Me, if I'm talking in terms of being a student, students walking at night from the Information Commons, to somewhere where they are staying, I think students would not be feeling that safe because if he's carrying valuable things with him and of course not be that safe, if someone was walking or something like that

so, one reason is people in the area, can you give me a couple more reasons if there are any?

erm A couple more reasons apart from people,mm no I don't think there's anything else apart from people because I think only the risk of walking at night if anybody's feeling unsafe is just some people around, or some people might be drunk, but apart from that I don't think anything else would be an issue

okay, so can you tell me something about the streets that you don't walk in alone after dark. Are there any streets that you deliberately avoid?

Hmm, In Sheffield there are a few streets like I think Broomhill, not Broomhill sorry Broomhall Street just on Netherthorpe, er, that would be one because a few of my friends have bad experiences walking on the street, because probably it's the locality and then Ashton Road where there's this big Tesco, I don't know the name of the street but I think it's a renowned area where all the industry had been shut down, it's quite a weird area to walk at night I think, there are a few student accommodations there and people walking there would not feel safe if somebody is approaching you at around midnight

or something so yes, that would be one area and if any other area that I want to say, was erm, somewhere near the Botanical Gardens because also that area at night is a bit I won't say unsafe, somebody walking at night would have some kind of fear in his mind when he is approaching someone at night, these areas would be a bit, because I had some experiences,

so can you tell me a bit about those experiences?

Yes, my friends who were staying in the Broomhall area, I think it was one of the girls who has been mugged

really?

yes at around midnight. I wouldn't say it's an issue with everybody but it would not also be an issue walking alone at night, so maybe she was walking around midnight and then she was mugged, by a few people, probably for money, cash, laptop whatever it is, though it has been told to her that she should not go alone at this time. But also being a student you cannot be going outside at this point. And myself, I experienced when I was in that area that I just told you near the big Tesco, walking around the workshops, there were a few of these call girls which stand there

what were they?

call girls, these are these prostitutes

okay

I was staying in that area and I was walking there, I was a student walking at around midnight or so and probably they were drunk or so and they used to harass you by asking you for a few things, and they were not one or two but they were three or four and probably they had some guys as well, so it becomes like a group of people who come and trouble you without any reasons, so I feel like that would be one of the experiences that I had quite not good. Yes I think these were the more harsh ones.

Is that Tesco in North Sheffield is it that way?

Yes the big Tesco opposite to the tram stop

oh so that way

yes, I think it's Penistone Road

okay I'll look it up on the map

okay, and what about the streets where you do walk alone, after dark, so the streets where you're comfortable?

Erm

Can you just describe them to me?

The streets that I walk you mean?

yes the street that you are not concerned about, or you feel reassured when you walk there

I think those would be the University Road, I think this road, and probably anywhere near the city centre, probably also West Street would be okay because there are a lot of people there during the night and it wouldn't be much of an issue. Also the streets near the railway station because there are people walking around at that time, erm, streets where I'm walking alone,

can you think of any reasons, maybe two more reasons why apart from being busy, is there anything else about the streets that comes to mind. If not, it's fine. Is there anything else you can think of apart from busyness, That makes you think oh that's okay.

mmmm, anything else, you mean like walking alone?

I think there wouldn't be anything else other than that, it differs from time to time and place to place, because even on a busy street there might be some problems with someone, and also on the bad streets there might not be any problems with someone

yes

so it also depends on how. But as for me, I haven't had any such issues or problems I would face or do nothing about on a busy street

okay great

so now I'm going to show you some pictures, I'm going to show you these pictures one by one, so there's eight pictures altogether, and I want you to tell me if you would or would not walk there alone at night, and then given me three quick reasons, just looking at the photo, why you are answering yes or no

ok

so there's eight photos altogether, so first of all that one 1A

You mean if I would walk on these and if I would why?

or, if you would not, then why would you not?

Okay erm, I think I would not walk on this alone at night,

no?

is not that secure area, there is a road down there, and here there is a tree Avenue which you know if you are walking alone probably looking at it it looks like there is a big road and there is no

sense of security, maybe there is housing on one side, but it's not that comfortable walking on this one at this time because there are trees lined up and probably you feel like somebody is following you or something and yes..

okay

so what about this one?

Oh my god is that a street?

Yes is the pavement next to a street, the road is on the right

wow I think I would definitely not walk on this one though because the thing is it looks too dark, I mean I don't know if it's the photograph

yes it is dark

I think it's too dark first of all and if I'm alone I'm scared if I'll be mugged or something. Of course I'm not able to see anything clearly if I'm walking.

so that was 3B, what about 2A?

well yes, I would walk on this one, it looks like it's a bit of a residential area around and also it's good lit on the road, and because on this one there was less trees in the shadows on the pavement, but on this one and it looks like it has good light enough, yes I would not have a fear of walking on this one

okay so that's 2A, what about that one 4B?

wow, where is this?

It's in a residential area

really?

And it's got houses on both sides behind hedges

it looks like you're in the Peak District somewhere

oh god yes, if I was to walk here at night, I would stand here and think twice if I should walk there or not and at the end I would make my mind yes to walk if there is a residential area around, if it's safe depending on the area,

but what about if you didn't know the area, if you are new to the area?

if I was new to the area and I wanted to walk midnight, still I would walk, but still looking at the dark,but if I knew where I am going, then I would walk, but if I don't know what is going to be there ahead then I wouldn't, just knowing that this road leads to somewhere, I would walk, but if I don't know where I am going then I would definitely not go in this area because it looks a bit dark on the other side

In an unfamiliar area I wouldn't choose it

okay, so what about this one 4A?

hmmm, yes I think I would walk on this one, because, again, I'm in a familiar... and if I'm looking for somewhere to go, somewhere it leads to, I can see on the other side there is something, road or some residential areas or some, at least there is light on the other side, so I would take this road at least to go somewhere but it looks a bit dark on this side but at least I know where I am going and there is some sense of someplace on the other side

ok so the next one is 1B

well, I would think three or four times before I would walk on this one at night, probably I wouldn't because again the thing is it's a bit dark and it's kind of not very secure on either side and I mean it doesn't give me that feeling of scariness

ok, so there's two more to go, one is this one 3A

hmm, is this a park?

It's a wood

hmm, well how do you have this light here? I'm just asking.

It's from the flash

otherwise it would be like this?

Yes

well erm, if I don't know where I'm going I would not take this road

ok, and the main reasons are? Can you just give me the main reasons?

The main reasons are that it's a wood, and probably there would be something probably a fox or wolf or something it would come, there are no people around and of course I would be scared if I'm going because it's not lit enough. if it's dark then I wouldn't choose this path to walk, probably I would choose the main road rather than this one

okay and then the last one is this one 2B

was it the same as the one we saw previously?

Yes it slightly darker

well if this is the condition, if the lights are so bad, I think I would walk on this one because it leased it showing me the past where I am, where I have to go, although it has a bit dark light than the previous photograph however definitely I would go

because again it looks like an area where there is something on either side. Though there is a light but it's less, yes I would take this road if I'm walking, the path looks a bit dark but still

Ok thank you very much

I told you what I felt

yes that's great, I wanted to know exactly what you feel and there is no right and wrong answer

yeah, so, for the next four sheets I've got a forced choice here, that if you had to choose a route to get you to the same place, which route would you take?

17.50 - 18.20. Forced choices.

I should have probably asked you for reasons sorry, can you just quickly give me your main quick reasons

erm - walking on the street would lead me towards a better position because there are some streetlights along the road and it would let me get to the direction whereas in this one, there is no light which is being followed by the path

so that was 2B, yep and then (3A),

yes I can see some lights which followed by the path, and here there is no light which can follow me so that would be one

(1A) again for the same reason here, though it looks like a big area and it's not safe but at least it's lit well than this one so at least I know I'm walking in a place where I can see something

(2A) I think here it's the same because it's a road and there are some streetlights, which follow the roads, and I would take that one rather than going through the woods, maybe it's in a neighbourhood area but still I would prefer to walk by this one rather than this one because it gets dark in somewhere and I would not feel safe walking alone on a main street

ok thank you, and the last thing to do is to quickly put these in order of preference from best to worst and I'm going to write them down

how do you think my questioning is? is it okay or did you feel...

yes it's quite good because I clearly understand what you are asking for but I still didn't get what the interview is related to but I could guess what it could be related to

What did you guess?

erm, Like when you asked how would it feel when it's safe to walk and then from the photographs it showed earlier some roads which are quite well lit

and some which are not and then how could somebody feel walking in that place at the worst time. so I think that would make a difference, how good the street is presented somebody to walk. if it's the same street, if it's good in light probably somebody will feel more comfortable to walk in it, on the street although it's not safe, but at least it will be more comfortable for somebody to walk rather than the same street not lit good but though there is neighbourhood around but still somebody would not feel comfortable to walk so I presume it would be that way

Yes

so I'm trying to work out, you know, if you have a nice wide street, or a narrow street, or a good area or a bad area or a well lit area or a dark area, like in all these things how important is light? Is it important at all?

Yes I think that's one of the most important because when if you have a choice of, even if you don't have a choice of walking through any other street and you have only one choice of walking through this street and after all it happens to be a dodgy street then the second preference would come to how well it is lit and if you can find your way through that street or not

yes,

if you could not then I think it would be more complicated to go through there or uncomfortable, but if it's a well lit then at least you would think at least I can find my way around

yes, you can see where you're going

okay thank you that's great, I now need to go and transcribe it

so you have to put it into an Excel sheet and see how it works

yeah and see how many times, what you talk about most

if I comply with the other persons as well

yes, everybody's doing versions of the same

Interview 13

Does walking on the street at night alone generate any feelings in you?

yes it does

so could you tell me a bit about those feelings?

Especially feeling of fear, uncertainty, you know safety, yes

and are these associated with certain areas, these feelings?

er, congested areas, small passages er lighting, low lighting maybe, yes, secluded areas

so do you walk out alone after dark?

Not quite often, I try to avoid it actually,

but when you do can you tell me a bit about the streets that you do walk on?

er, well I live on a main street, actually it's this one,

oh right

so this is where I walk mainly, I don't know how to describe it, but it's a large street relatively, so it's open, it's lit and there is a lot of movement on it so it's much I think, safer, I think for me

and can you tell me a bit about the streets that you avoid? If you avoid any streets

well...

are there some areas that you specifically...

it's not like I have to avoid streets you know because I mainly walk from home to school and that's on the main street, I don't have to use any kind of maybe you know, smaller streets, or, but if I had to, I probably would avoid very small streets with probably no lighting or yes small small streets

okay, in your mind, can you specifically think of a street that you choose to avoid? Or are there none, do you just kind of walk on the main road to and from the school?

specifically in Sheffield or in general?

In general

Avoid yes?

if there are none, it's fine

yes I just I think mentioned small streets, unlit streets where there is some seclusion, not too much traffic people or vehicles yes

okay, thanks a lot now I'm going to show you some pictures

okay

in fact I might do that bit last, so, if you had a route to go somewhere and you had to choose

between photo 4a and 2b , and these both took you to the same place, which route would you choose?

I would take 2a

it gives me an opportunity to fly between these two

are there any more reasons that you would choose 2a?

4b is more of a narrow passage, it's also I think inability to see what's ahead, there's a little bit of darkness there, and this is I think, the lighting is good, the space is good and I think I would prefer that yes

okay, so the next one, if you had to choose between those two which one would you choose?

1a

Okay and what are the basic reasons?

Lighting

any others?

That's it

okay next one? There's four of them altogether.

these are the only options I have yes?

yes, those are the only options

3A, it's more open, the lighting is not that good, but it's open

and the last one?

erm, I'd say both are fine, but the fact that 1B is a straight line, I think is a better option than 2b, which you know has some curve on it, then you might not know what to expect after the curve

ok, thank you that's it for those

so now can you put the streets in your order of preference?

For walking at night?

Yes

okay

Sorting out photos into order 7:05-8.30

and now I'm going to do another forced choice like we did in the book, but you don't have to give me reasons, just quickly tell me which one you would prefer

ok

okay so the last thing, is I want you to quickly tell me, in an unfamiliar area ie. you don't know it, can you tell me whether you would, or would not walk down the streets, and write the photo numbers there, and which ones apply to your reasons for your choice

for each photo?

yes, and then that's it, there's eight

okay

15:38 - 22:19 (including explaining that he can tick as many or as few as he wants).

thanks a lot, that it, how did you find the whole interviewing process? Was I okay or not?

Yes it's all right, it's straightforward

when you say "feelings of fear", can you tell me a bit more about that kind of thought process?

Fear?

yes

er, you know, reading stories about people being attacked in the street

oh, I see

whether it's day or night, I think especially, it even happens during the day, in daylight, it can easily happen at night in the dark you know, so I believe it helps to have some, you know, light so you can see, so yes, it's just about stories of people being attacked and trying to be vigilant and ready for whatever can happen

yes okay thank you it's very helpful

I'm paranoid about that actually

yes, has anything ever happened to you?

No, fortunately no, but I've seen too many stories.

And you're in the category who would be attacked, younger males, younger males get attacked more than elderly females who worry the most.

oh, yes, I've walked home this year, twice already, the past two or three nights I've been walking at 10, 10pm/11, walking so it's not a good feeling. When I take the bus but sometimes

do you live in Crookes?

Walkley. So it's about 15-20 minutes walking

so that's

it's not bad, it's a good distance as long as it's safe, yes, so it's about lighting? I remember, it was about using the streets or…

it's about the perception of streets in Sheffield, and the whole point of the study is to find out what makes people reassured or not to walk down a street, at night.

Okay

and out of all the feelings they have, how much does lighting effect those feelings, if at all. Because a lot of people are saying, you know, if

it's a dodgy area therefore even if it's bright it's not safe.

yes, some areas

so we're just trying to find out what's the lowest levels..

whether it's bright or not you might want to avoid this one

yes

there's nowhere to run

268

A.5. Pilot study analysis

The following sections describe and discuss three methods of analysis which were not used in the main test: Hierarchical cluster analysis, site luminance measurements for luminance maps and personality survey comparison.

Hierarchical cluster analysis

Hierarchical cluster analysis groups words on the basis of their frequency alone. It was tested because it has been used in previous lighting research (Zhang and Julian 2011) as a means of making associations between words used to describe the scenes.

Procedure

The following actions were completed in order to prepare the transcripts for hierarchical cluster analysis.

- The frequency of all words used in all interviews were abstracted from the transcripts using the programming software Python 2.7.

- The words were removed using Microsoft Word so that the word frequency only remained.

- Frequencies of the words were reimported into Python 2.7 to perform the hierarchical cluster analysis.

- Cluster analysis was imported into the software Numbers where the diagram output was be created.

Result

Figure A6 shows the output of the initial hierarchical cluster analysis of all words in all nine interviews. As there were so many words (approximately 1000), the output was difficult to manage and not meaningful because words such as "that", "there", and "and", were clustered together however this did not tell the author anything useful.
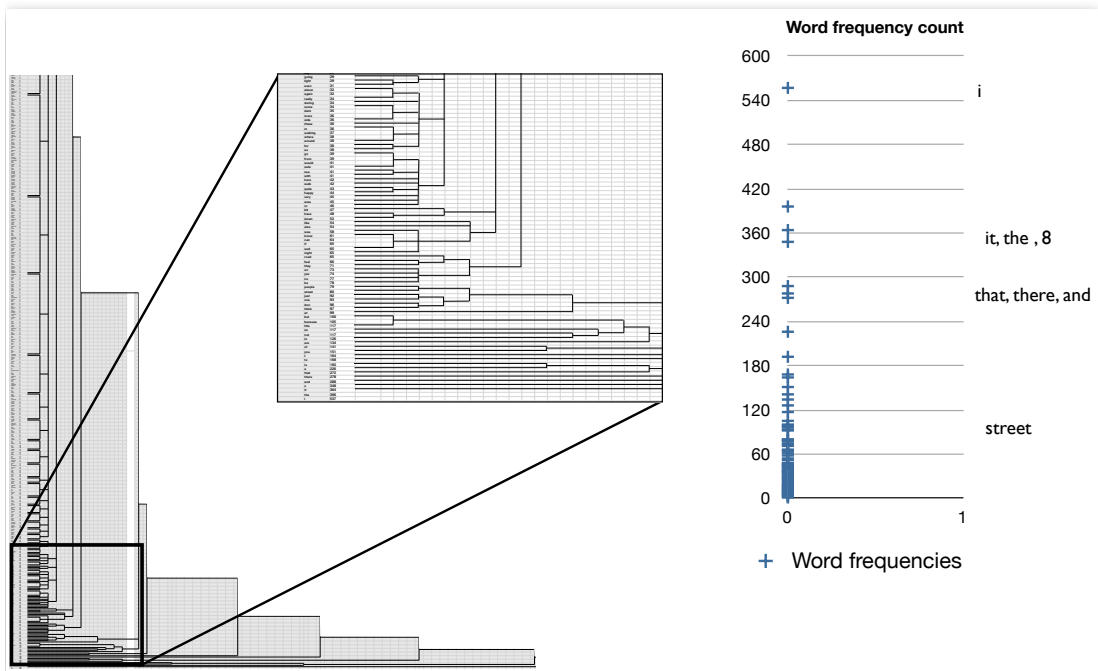
Figure A6. Graphical output of hierarchical cluster analysis of all words.

Therefore a second hierarchical cluster analysis was performed following the removal of filler words from the dataset. "Filler" words were defined as being words which had no meaning on their own such as "the, get, say, an, at, it". Most of these words had a frequency of over 80 occurrences. The reduction of words results in a more manageable diagram (Figure A7). The top two clusters could be used to demonstrate that of equal importance of association are the words streets/people and feel/night/road. The next two most important clusters are made of the words area/happy/walk/safe/see and walking/side/dark. None of these associations are surprising given the topic of the interview. Hierarchical cluster analysis was also carried out on individual interviews however there was no benefit in this because of the limited number of words used in one interview meant that words mostly fell into the same cluster formed of a word frequency of one.
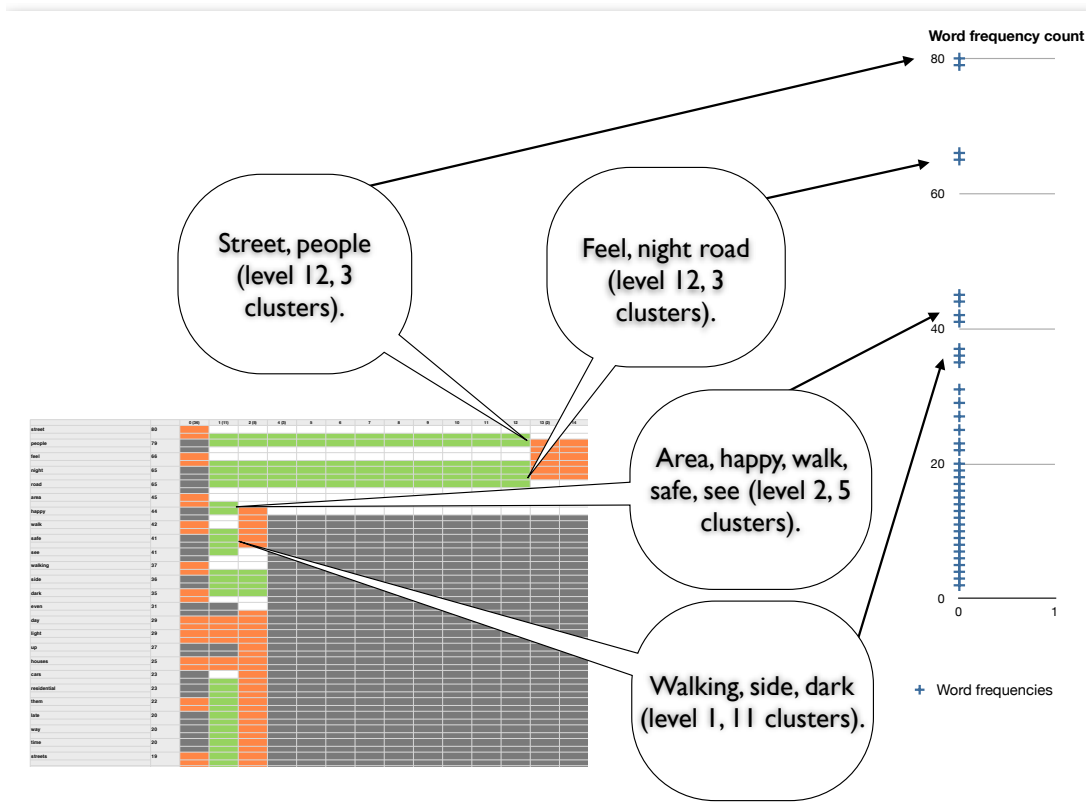
Figure A7. Hierarchical cluster analysis of all words excluding filler words.

Learning outcome

Hierarchical cluster analysis was an attempt to quantify words used by participants, so that quantitative analysis could be performed. However words are assimilated to form meaning and if this is not recognised, then the point of using interview transcripts to investigate the root effect on reassurance, is missed. The frequency of words used to describe a certain place might make more sense, however there were not enough words on a place by place basis to form the word frequency clusters. Hierarchical cluster analysis was completed on a predetermined wordlist, deliberately avoided during the interview pilot studies. When this method was applied to the whole interview transcript it did not work.

Site visits and measurements and test of luminance mapping software

Two sites were visited and photometric measurements taken so that photographs could be imported into luminance mapping software to test the feasibility of the process.

Procedure

An example of a place which one participant found reassuring, and another which they did not find reassuring were visited for the purpose of measuring illuminance (Figures A8 and A9) and luminance (Figure A10). Illuminance was measured in between and under lamp posts, and luminance was measured at a range of points which approximately represented the lowest highest and mid range points in the scene. The equipment used is listed in Appendix C.8. A method of using grey, white and black card on the floor was used because the known reflectances could be used to help calibrate the rest of the image. The measurements and photographs were imported into the luminance mapping software called "WebHDR" developed by the University of Leicester.

Figure A8. Night time illuminance Site 1 - Not reassured.

272

0.7 lux
0.4 lux
0.7 lux
1.8 lux
1.2 lux
2.4 lux

10.4 lux
2.7 lux
18.7 lux

19.5 lux
4.5 lux
27.7 lux

Figure A9. Night time illuminance Site 2 - Reassured.

0.045 cd/m²   304 cd/m²

0.144 cd/m²   0.255 cd/m²   0.580 cd/m²

1. Not reassured

0.035 cd/m²   60 cd/m²   69 cd/m²

0.015 cd/m²   0.055 cd/m²   0.186 cd/m²

2. Reassured

Figure A10. Night-time luminance measurements.

273

Result

Lower illuminance and luminance levels were measured on the street where the participant was more reassured. Results such as this will contribute to the discussion of the importance of factors other than the lighting. Figure A11 is an example of the output from the software WebHDR. The software was inflexible and did not allow the scales between the sites to be matched and therefore no comparison could be drawn in this case.
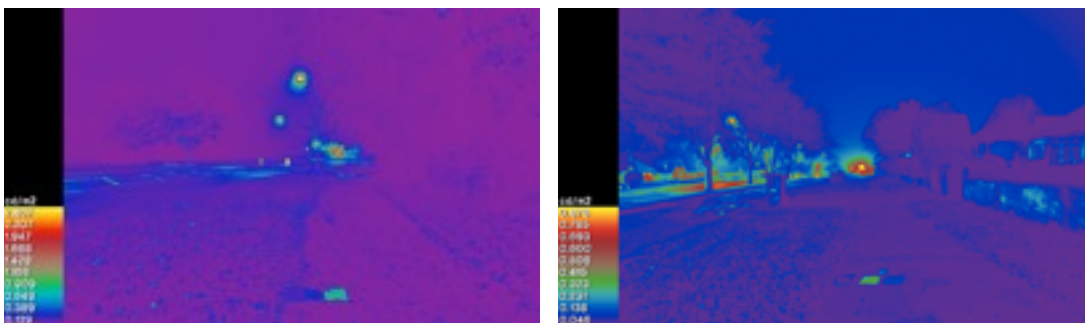
Figure A11. Luminance maps of two sites mentioned by interviewees during pilot study 1 interviews.

Learning outcomes

- The measurements took one person two hours per site, giving a good indication of the amount of work involved in taking measurements. Visiting all four sites identified by each of the 53 participants would have taken at least six months work, assuming approximately 4 hours was possible per day after dark, which would have not been possible in the summer. Therefore photometric measurements did not form part of Study 1.

- Luminance mapping was not possible due to limitations of camera performance and software functionality at low light levels.

As webHDR did not work reliably in the pilot study, ImageLUM software obtained from Peter Raynham at UCL was tested.

ImageLUM

Photographs of each street were converted to bitmaps which were imported into ImageLUM software which plots a grid of numbers by calibrating the pixels to luminance measurements taken on the streets. ImageLUM software exports the numbers into a CSV file which can then be opened using Microsoft Excel or iWork Numbers to create a luminance map. The image sizes were reduced to ensure the pixels of the JPEG matched the pixels of the ASUS laptop screen.

Problems meant that this analysis was not continued further:

- Lens flare meant that areas of the photograph were washed in light patches which did not exist in reality.

- Dark points in the scene are not recognised by the software. Therefore photographs of two different exposures were used to create the bitmaps (Windows 24 bit) which were

transformed into .csv files by ImageLUM, which could then be imported into .numbers. Two exposures per street was not enogh. In order to create an accurate luminance map, multiple exposures would have to be taken and the sites revisited. Creating luminance maps of multiple exposure photographs is time-consuming and ImageLUM software is not always able to resolve the image at low light levels.

- The more luminance points, the better as it allows the software to process the data more accurately. However many of the values on the streets were below 0.05 cd/m^2, and the patches which were higher than this were small in the scene and therefore fit in one measurement of the luminance meter viewfinder circle. Therefore there were not enough light areas on a street to measure.

- Editing the maps is necessary to remove bright points created by luminaries.

Personality surveys comparison

The original purpose of the personality survey was to ascertain whether the existing anxiety levels effects how people perceive places. Three personalities surveys were tested in the pilot studies and the results compared. The first two were surveys used by Van der Wurff which tested (1) participants feelings of power, attractivity, their feelings towards other people in the environment and the extent to which space is perceived as being criminalisable and (2) their reactions to imaginary scenarios (Wurff, Staalduinen et al. 1989). The third was the Penn State Worry Questionnaire (PSWQ), a standard questionnaire used in psychology to give an indication of levels of anxiety (Meyer, Miller et al. 1990). A fourth survey (IOU scale) was tested on two participants who had trouble understanding what the questions meant. It was also time consuming to complete therefore it was decided at an early stage that this would not be used. The aim was to compare the results of the surveys and to determine which survey, if any might be the most appropriate in the main test.

Procedure

The scenario and PSWQ scales were transformed from 1 to 5 to 0 to 1, for example 4 became 0.75 and 2 became 0.25, to create increments within the range of the personality survey. Mean values were then calculated from all participants responses to the three personality surveys, so that the results could be compared.

Result

The results are summarised in Figure A12 and demonstrate how levels of worry depend very much on the format of the survey. This demonstrates how difficult personality is to quantify or measure. The graph shows a tendency towards a lower score from the PSWQ, and a higher score from either of the other two surveys however there is no consistent effect of the type of survey between participants.
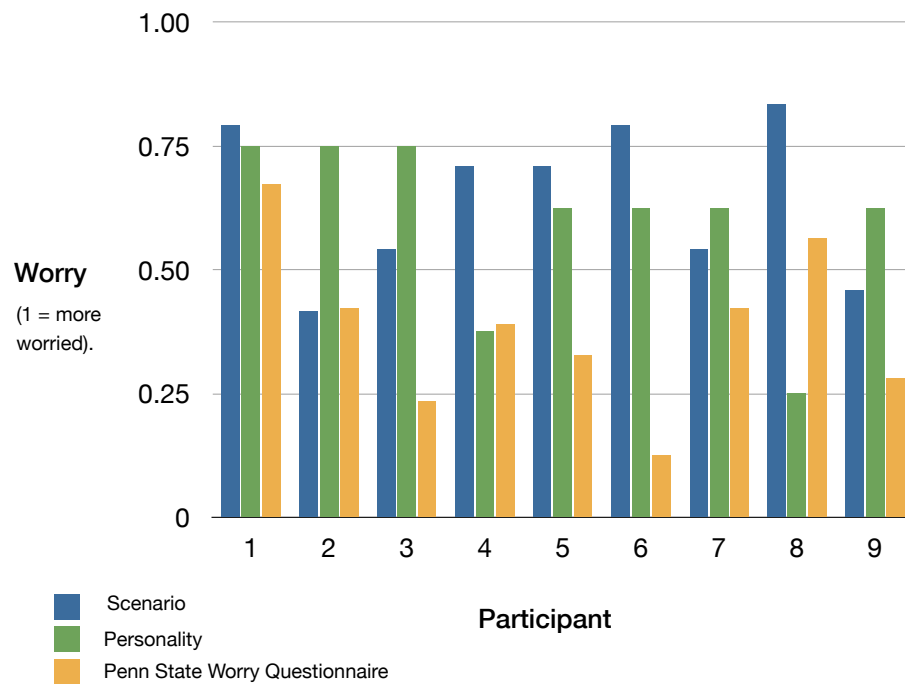
Figure A12. Worry survey comparison.

Learning outcome

Quantitative data was not collected systematically in the pilot studies as the format of surveys and questioning changed frequently in order to find an optimum for the main test. Therefore this could not be correlated with the results of the personality surveys. The shortest personality survey relevant to behaviour on a street was selected in case it would be useful and because the information did not take long to collect. If the personality survey was the main part of study 1 it would be planned in more detail. However this is a subsidiary part of the study, which has been included in case it helps to explain participants responses to questions. The learning outcome was to reduce the emphasis on personality surveys because personality is difficult to measure, and the topic is not the main concern of the thesis.

Appendix B
B.1. Interview transcripts
Interview 1

Does walking on the streets alone after dark generate any feelings in you?

Yes I'd prefer not to leave very simply. If i have to go out at night it generally has got to be purposeful. Going to the bus stop, or perhaps going down to the shop, but on whole, we are trying to avoid going out at night, unless we are going out in the car.

And what are the reasons for those feelings that make it only a purposeful trip?

I would say, ten years ago, when I ****finished I didn't have the same sense of apprehensions that I have now. and Now that I am eighty, when I was seventy it didn't bother me too much. I didn't like hanging around bus stops, but these days I would feel much more insecure.

Why is that?

For fear of being attacked basically. Or not attacked, but sort of neglected. When people don't notice that another person is there. They are kind of treated as street furniture. You know, as a splash on the pavement. They dont really look, so may just hastle you quite unaware that they are hastling you...There is no fear. There is also, an inbuilt fear where I live, that council youth could be around to cause trouble. There is a very definite fear about that. So, in general we don't go out at night unless there is a very real reason for it. We go out for a meal, we might go the theatre, it has got to be that sort of thing. I would hesitate to sign up for a university course of course now because now for fear of for ten weeks running risks, whereas ten years ago I wouldn't have bothered about that.

So, is that a change in you, or a change in society? Do yo think?

There is a change in society I think, older people are disregarded, and, don't think they necessarily harmed, but there is perception of being harmed..I think particularly if we go out at the weekends, into Broomhill, into town, West Street, always there is a gathering of youth around. They maybe just having a good time, but it's the fear that sooner or later they could turn on you. There is this fear of things not turning out right.And we ***don't sort of generation that seeks help from the police, but we realize that police can inter less some time.

So when you do go out, on a purposeful trip, are there any characteristics of the streets where you do walk? How would you describe the streets where you do walk?

That's a tricky one. Lets take Car Bank Lane which is the one which nearest to where I live. It's badly paved, its not got houses going down to, so there is a kind of length of quality, it's overshadowed by trees, so there is a sense of feeling, of neglect that you may get trapped. That's the worst feeling. The other one, which I pointed out to you, was Hanging Water Road, when it crosses above Bingham? Park, I have discussed this with my****woman, she thought that was a very dangerous one, physically very dangerous because cars can speed, cars can rushing down the hill, from either side. They meet down the bottom where the portar is. *********I think not necessarily over looking for pedestrians. And there is a crossing, I don't know whether I have photographed it, there is a crossing point just below White.... Road, this is on Hanging Water Road, you have to get from one side of Hanging Water Road, to the other side of Hanging Water Road down by the allotments. This is a very dangerous point, there is no pedestrian crossing. There is nothing to warn drivers that you are going to do that. So even in the daytime it is dangerous. But at night even more so.

And why at night is it more dangerous?

It has not got particularly good street lighting. And I think drivers are less likely to notice you. It's *****a bad spot just wish the highway authority could do something about it improving the pedestrian risk.

Are there any, do you look out for characteristics on streets which you do walk on? Say, you confident to take one route or another. Are there any general characteristics?

General characteristics, I think obviously street lighting has got to come into it, so that you could be seen.. The other thing is, is I think that if you're walking in well-to-do area, you have got professional people with big houses, nice gardens there is a feeling of security. In the winter the security lights are going off, and it makes you think it is a well turned out and conscious area whereas if you went down some back streets - poorly lit, you weren't so sure about houses, you think twice about it. So, yes, houses are important, lighting is important, and I have been trying to think about trees..and sometime trees can threaten you, in a psychological sense, in that feeling that they are sinister. And I think it goes back to childhood fears of trees and what trees mean to you at night.

And what is it about trees that evokes feelings that they are being sinister?

Well they are sinister because if you hark back perhaps subconsciously, perhaps subconsciously, there is a fear of sort of thieves and witches and creepy crawlies, you associate all those fairy tale stories - it's all done very subconsciously, but this is what I think. You know, trees have got lots of character..

So if you had to summarize three main factors, just in general terms, (we'll go to your specific place in a minute) what would they be?

I think darkness is an obvious thing, but the fear of darkness and isolation is the main thing, so illumination is important. If I go ****at night,*********Space, I think, if you feel trapped because you are on a narrow street, you have no means of escape, so with the road, I think with the **** road as long as you don't have two traffic lanes it is important. And, I think well kept adjacent gardens where you can run in, it may not be secure but there is this feeling that you can rush into someones garden and hide in the garden by the front of the house. They are all fears, and they are all very subjective, but I think I should get out of it..in a sense you return to childhood, we don't want to admit that, but I think there is some childishness in older people..

Is that to do with nostalgia or what's that to do with do you think?

Well, when I was a teenager in my twenties I used to really enjoy going out at night, going out walking or going out on the bike, being out all night with friends. The night had a real sense of adventure about it. But when you are in your seventies and eighties adventure is the last thing you want

Now we are going onto your photos and we are going to talk about the streets where you weren't so confident first

So this one is Hanging Water Road,

Yes, I took those photographs, obviously they are very near to each other. From the road here you can't see it. Across that fence, there is a very troublesome patch because you try to get across Hanging Water Road, but there is no means of controlling the traffic

Yes, this is Hanging Water Road

Yes, that's Hanging Water Road, it becomes Highfield Road a bit higher up. And this is the top of Bingham Park. Yes, I think this is a dangerous area both day and night. But I certainly wouldn't

want to try crossing the road and going down here. And also I think the pavements are narrow. so if the pavements are inadequate ***wouldn't inclined to go.

Are there any times where you have walked there?

At night? Talking about at night?

Well either actually

Oh, during the day, yes, I mean it's a *****area, because we can go down the park or walk up through the wood as we do frequently. We brace ourselves for this hazard spot. - Look out very carefully for cars. But once you get across to where that bin is, then you're going all the way up to Forge Dams. It's a secret walk. It's a sad thing that people are encouraged to walk up to Bingham Park from here following the stream there carry on right up to Portar Valley but it's a dangerous street.

Your three main characteristics which make you feel not confident what would they be?

Lack of adequate lighting, feeling of trees holding menace for you at night, the need for space. Here you are trapped by traffic. The narrowness of the lane, approximates danger.

Go onto your next confident are which was Car Bank Lane. Its a very badly maintained trackway. This road has subsided, which is a serious problem in this area the council patched up the tracks that does not help confidence, the rain and mud ,collects at the bottom, so people don't like walking there because of the thick mud. There is just a rail and the drop its narrow .. trees here, its a kind of outlaws paradise. Its a heavily used place, people going to Tesco, but it is very neglected by the council. They have contacted Nick Clegg about it. If it freezes than you have really got a problem.

So, it is debris from the hill, water, spatial features of the drop and slopes?

Its a badly drained area. So in their neglectful attitude the council gives old people great many problems. I don't think they think of the need of older people sufficiently.

Its problem with public sector

Any other reasons?

There was talk that youth gathered round people, they come up in the dark, we have had trouble down there. We have had an occasion ten days a few days ago, we don't lock the front door of our

flats at night. Quarter to twelve at night we looked in the service cupboard and there was an asian youth smoking and drinking out of a bottle. We called the police and they knew him. He is a regular for sleeping out roughly. that was a danger for us if he dropped the cigarette.

So The first door down the bottom is open

We never had a problem before. This young man harmless enough

Have you ever been down there at night

Yes, if i have to walk to the bus stop i walk up there.

Can you see where you are going?

Yes, most of the way it is not very far only takes three minutes to walk along this track and then you come up to the lane it where vehicles. can travel. It is pretty well lit.

How well lit is this?

This is not very well lit. Its a lamp and there, and until we complained the council were inclined to neglect the lights. They redressed that one. But altogether it's not a happy way. It could be very pleasant. used to be pack horse trail

ok, is this Fulwood Road.

If i had to go along down there at night I don't think i would feel great fear. Its well lit, the lamp stand is down here, I would not worry too much walking down there, the road is wide, it is pretty well paved, well lit you are near to the church which gives a sense of peace,they are nice respectable houses nearby. There is no reason to fear. they only

Final one, We go onto the final road Clarendon road..

Clarendon road is one of the most sought after, high quality residential area in the city. It is wide it is a private road, so does not catch a great deal of traffic. People are moneyed and respectable, keep the road in a good trim and because of that anybody walking down there could feel relatively safe.

Are there any other qualities of this street apart from it being a nice area

It's well lit, but also the adjecent houses are well lit the front door ways, the windows are well lit , there is a feeling that i am ok there. there is feeling of security. But i think that bec. it is private well cared for road adds to your confidence.

Interview 2

can you tell me generally about the streets where you do walk at night?

I don't have a car, because it got wiped off the road by a white van and i tend to hire these days. So I walk between here and the city, walk as far as Firth park, Northern General Hosp.,Tinsley, city boundary Walkley, Crooks, Fulwood

Do these places have any particular characteristics?

a lot of those walks are linear walks at the valley bottom, usually they are poorly lit. try to avoid main roads bec. of traffic. so usually reasonably quite. Little London Road

So these areas you usually do walk?

Yes, I walk through Ecclesall Woods, and the Cemetery (i often walk through the cemetery)

Can you tell me something about the streets you don't walk on after dark?

....Possibly one or two on the Manor, because the Manor has changed significantly ...many houses have gone and there are wide open spaces where houses once were. Walk around Sharrow, there are very few..

What are the other characteristics of the Manor?

It's poorly lit, its dark large open spaces. It has a long reputation. I think reputation counts for a lot in this city.. North of the city, there are areas The NortherN General that have a dreadful reputation. around Firth Park....but that's one of the reasons why i chose Abbey Lane - Abbey Lane has a dreadful reputation.

Abbey Lane?

Yes. You should talk to an inspector at Woodseats Police station to learn a thing or two. I have lived here since 65 of and on and I know a lot about the district ...where I would walk

I would avoid places like Bramall Lane in Hillsborough on match evenings for instance.. I would avoid where there are large crowds I would walk..through Meats?.End, which is a former industrial area (still so)Tinsley,

Are they good areas or bad areas or both

Tinsley, is mixed and just behind Darnall, is mixed as well

279

I have visited residential homes in these areas, residential homes where the communities are....not necessarily where you'd like to be but i was thinking of..S.. in Darnall which is as rough are as you could get, it has changed significantly through the last few years, it has become lot more safe ..has become an ethnic community....chinese community

There aren't no-go areas in the city as far as i am concerned...there areas I have questions about...

I have walked through rougher areas in Glasgow, South Wales, in London without any great.compulsion of fear

Ok, lets see your photos

Can you identify them and talk about the negatives and positives..

Two negatives are the first two sets, which are Little London and Abbey Lane,

and the second is Hutcliffe Wood and Folds Lane

We are going to talk about the positive one first

Hutcliffe Wood and Folds Lane.

Folds Lane - What it is about that street that makes you feel confident to walk alone in the dark?

I know these roads very well, know huge number of residents, it's reasonably lit, lots of the houses on Folds Lane are light, bright light reflective. Its not a busy road, you are not likely to meet pedestrians after dark but the ones you do meet are usually one you know. Its on my main route to the Cricket Club its one I use regularly its familiar, so i don't think about danger.

So Hutcliffe Wood road?

Much the same really. I know the residents, have more traffic so there are slightly more setback, even the wood end of the road, with trees and streetlight, I walk there about twenty to thirty times a week. I know every sound I am likely to hear in the woods whether in Summer or Autumn or Winter. You do hear some strange things in the woods but they are foxes crying..cats,

Moving onto the streets where you'd prefer to avoid....

certainly,..Abbey Lane is one of them. Abbey Lane is very specific, it does have a very poor reputation, for a residential place it has more mugging than you'd expect..because the carriageway and the actual lighting is well over to

one side to the footpath.....on the west side of the road..Because the service road and the verges in between is not lit at all, and hasn't been since 1960. The service road is where the trams used to run. The problem is with Abbey lane that the carriage way is perfectly well lit, but the pathways have been forgotton about. Lots of the house are quite low down below the actual footpath. That' right from Beauchief cross roads where the old post office used to be overt the railway bridge, all the way through almost up to the school. The only well lit section is Hutcliffe Wood roundabout. the rest of it is in virtual darkness.

- Except at the bottom just before the bridge if you go down there is a high pressure zone...?

Yes. there is, thats the only area.

I Didn't know about the muggings there.

Yes, it is a problem. Particularly there is the school at one end and of course Abbey Lane that tends to be less lit bec. the school is further forward and the carriage way is slightly closer and there is less wide verges, but if you think about between Hutcliffe Wood and cemetery there is a huge wide area in darkness.

Next - Little London road

You'd probably say it's not residential, bec. there are no longer houses there, it was a major residential area - it connects to the community i walk in regularly .light industry......it's dark after five o'clock. There is virtually nobody there at all. Its typical of many Sheffield light industrial areas, the older ones, poorly lit, its not a major route for traffic, there was a stage when it was taken over by street girls,.but moved that away.. Some of the changes that have been made down there .....that's one of the major walk to the city....

So you do walk along it

I do walk....but if it's particularly late i walk on Abbeydale road instead - better lit, more traffic, more people ..will take another five to ten minutes longer.

Next bit - showing your photos

Can you put these five photos in order of preference. Which one do you prefer..

Rating it 1-5 how would rate these photos?

most prefered to least preferred imag...

Show you photos in pairs, you have to imagine these are in unfamiliar area....tell me which one would you prefer to walk down the left or the

right? sometimes differences are very small, in which case i would like you to pick one................

We are going to start with photo number 2. Tell me if you would or would not walk down that street alone after dark.

Do you thing there is anything important we havent talked about in terms of perception of safety?

It's very subjective, i walk to places where i know many friends would not dream of doing and i would be very disappointed if they would..... i am large bloke, relatively heavy and i walk in a positive manner. After 40 years in football field you do tend to become somewhat fearless. In this city thinsg have hugely improved. when i was a boy lots of the city was gas lit. Now its electric, Lighting, illumination standards have changed significantly. There is not as much crime, i think street crime is greatly exaggerated .....Abbey lane ...Ecclesall wood you'd think would be a prime area...The incidents of major street crime, rape, is very minimal in this city. Perhaps people are more street wise......Light reflection is interesting one...when you've got light buildings ...tend to be happier....interesting to see towerblock if they repainted in light colours......perceptions can change because of weather, if you have a dark vision about the way your day has gone…

Interview 3

So does walking on the streets alone after dark generate any feeling of fear in you

It depends where I am. As a general rule walking around my local my neighbourhood or walking in the city center, in most of the city center i feel fine i think partly bec. i am quite tall and i walk a lot, i don't seem myself as someone vulnerable presenting a target, but there are certain areas where i would, for example if i go to a concert in the city center walking down the Moor can make me feel quite apprehensive. Its the big empty space and dark corners whereas if i walk with a friend i am ok. Generally I feel quite confident.

If you had list a few characteristics of areas you might avoid, what would they be?

I guess, inadequately lit, deserted, not residential, where there is that feeling that you might get mugged or whatever. Whereas if you go down on a residential street there is that feeling that there are people nearby, that would deter people to mug

What about the streets you feel confident. how would summarize its characteristics?

That there are houses, lived in, streets are well lit where you don't have dark areas where someone might be lurking. One of the photographs i have done is the lower end of Chipping House Road, there is also a section that runs between Abbey Dale road and Crescent road which i used to find a bit anxiety provoking - there are lots of mature trees which i love during day time, it meant there are not many streetlamps the combination of both meant that i would get off the bus on Abbeydale road and walk up Chipping House road and feel quite anxious on that bit. But they have taken some big trees and replaced them with small ones and it feels a lot safer.

Your photos

Positive photos first

Arundel road - illustrates earlier point- there are houses, there are trees but they are not too dense, the feeling is that there are houses nearby, if anything happened you could yell, help would be at hand

Any chararcteristics?

Very familiar, walk here day in day out, lived here for 26 years, nothing bad happened. But in Chipping House rd my daughter was once stopped when she was in her teens not nice memory

another positive - similar reasons - Montgomery road - same thing, at night well lit, there is a bus route, area is for families and students, people invest in the area, nice area

Napier street

If i l walked back home from Ecclesall road in the evening i might walk back this way- Pomona, Summerfield Street, general cemetery, empty land - its not residential, empty in the evening, empty side, fear people jumping out at you, nobody around to call for assistance

Have you walked down here alone in the dark before?

No, if i was walking back from Ecclesall road, i might walk up Sotherfield street, it is busy, but i wouldn't walk dow this rather dark, deserted place.

So the relation of the area around it is less preferable.

Yes,

next one - Chipping House Road

281

lower end of chipping house rd - alley way makes me feel apprehensive - you got houses on one side, but industrial unit the other side, and then you got the alley way - so it's somewhere dark where somebody might be lurking

So the presence of this one is enough to counter the presence of those houses....

I would feel less apprehensive walking down here than walking Napier street because there are houses on one side, and i would be careful to walk dow on this side of the road.

So we have the presence of the alley, and what other characteristics of that street?

it seems a bit unfamiliar / reassuring - i walk down during the day some time - it hasn't got the same familiarity as Montgomery road

Have you walked down there alone after n the dark ever?

It is very unlikely that i would ever need to go down there at night - whereas Napier Street is potentially on the way back from Ecclesall road where i might go and meet friends. If i went....... (various roads mentioned) it would be during the day and not in the evening. the issues doesn't come up.

Would you say that you always feel reassured in residential areas? or are there residential areas where you would't feel reassured?

..there could be two extremes: one where is very long drive ways... house were far behind high edges, or where there is a kind of neighbourhood which is transient, nobody would be bothered and therefore you wouldn't be sure of what reception you'd get, or even anybody would respond if you were in need of help.

Next, five photos to put in order of preference- assuming you're walking alone in the street after dark in an unfamiliar residential area.

rank 1-5

14 photo pairs - would you take the street on left or right

Is there anything else important which you think we haven't covered?

I am a reasonably confident person who in my job had to deal with people in difficult situations, I think that confidence effects my confidence walking.. at night as well as the actual physical environment. And so far nothing bad has happened to me..to disprove me

Interview 4

Does walking on the streets alone in the dark generate any feelings in you?

Not really. It depends where I am. If i am in town and the streets are well lit its not too bad. Where I live I know the area, normally I move about in certain streets.. the shortest possible way..so i know where i am going. But it's changed a lot..so it's getting used it..because my memory remembers the old Sheffield..but more or less no problem.

Do the streets where you feel confident walking alone share any characteristics If you had to summarize in three reasons..

One of the nicest street to walk at night is up from the railway station up Howard street into town, they have tried to make it welcoming and i think they have succeeded. It is a nice place to walk

And what makes it nice and welcoming?

It's nice and wide, bright and happy, and there is nowhere where you'd look around suspiciously, or there is something stuck in your way..to get a good view where you're walking is important..

And what about the areas where you might think twice or you dont feel reassured. What are the characteristics of those areas generally?

Long road that is narrow with very little no features ..possibly works, with long wall with no..because it bends you can't see anybody coming, at night poorly lit, or an area that is a bit higgledy piggledy, and area where you don't know.. what you are looking for you'd be careful. possibly You'd walk in the middle of the road if there is no traffic.

What do you mean by higgledy piggledy?

You get different levels...a sharp corner, a space that you can't see, dark alleyway the you cant quite make out what to expect. ..just a jumbled up place not nice and straight where you can see all the way. The clearer the better. ......as long as you can see you are ok..but If you are expecting it to be dark and you know the area it's not so bad. if you don't know the area, unless you know the area is not safe because there's been trouble then you are careful....

How do you know negative things about those areas? How do you find that out?

Basically, through experience like Darnall for instance its quite notorious, when you are on the bus sometimes there is trouble..you can see

trouble in the streets, and also the bus driver keeps driving doesn't pick anybody up...that's what you get in certain areas. Certain places used to be (it's getting better)..fighting (?). Past couple of years it has improved a lot. ....I don't really feel I am in any danger at all, unless I see something i think oh dear...

Are there any other reasons you might feel reassured on a street? When you've got no worries?

Basically if you know the area, some areas appear friendly for no specific reason ... if it's a nice night, but if it's miserable and foggy ..the weather has a lot to do with it. Sometimes these big buildings have little alleyways on the side and i would prefer not to walk down them because i dont know..if you have got to go down you go down..i tend to get a bit weary because they're very closed in .. But normally in town and..our way i do know there is problems, there has been for quite a long time but it has got better.......more often then not there is no problem.

Photos

Confident with: the bottom of the road of the area where i live - it's very rare that you get any ....ings, usually if they have come back from a party or....

One night my friend heard a noise, he opened the bedroom curtains and there were a couple stark naked....having sex....but its a very nice street no trouble at all - its friendly everybody feels the same, people are friendly -

Are there any other characteristics that contribute to you feeling reassured there at night apart from it being friendly and knowing people

It's always well lit, they've put in new street lights up because ....they ... car, vehicles or luggage .....with these new lights you can see things lot clearer..the older ones has the yellow lights but these are better lights ....I like living on a road where there is trees..that makes it friendly, and at night you don't have any trouble, you feel quite safe coming up, there is not a lot of people out at night, bec. we're nearly all of the same age group ..THe only thing late at night is taxis..we get taxis coming.. (than he tells an irrelevant story about five guys sitting in a car waiting for a woman to strip in a window..)

Next one Which street is it? That's a view of Flocton Avenue

Go to next one - tell me about this street

That's Andrew's (?) road, this is New Retford Rd, at the back of that is Old Retford Road, and that

is Beaverhill road,..this is where i get off the bus at night. Like i say, it's quite open, you can see everything, it's dark bec.of trees but they've put these new lights up on this juncture and its quite light, there is a crossing there, all this area is an industrial estate but there is trees all the way down, there is quite a wide area of woodland here. It's quiet area, the traffic moves very fast on this road, and there is some flats here, so its quite local, quite nice, no problem, ...(little story).. we don't have much trouble. A detention center for youth been knocked down.. and modernized, ..far better, you don't get now

That house there is Shawn Beans dad's....

So this is the street you're confident...

Yeeees, you can walk down from Handsworth top, ...there is no problem at all. Further down you go through iron bridge .. went down there to a little shop and they said things have improve there last two years. Ladies who work in shops there feel safer. It's not just me.

That was photo two - street name - New Retford Road

Next one

This is woodhouse which is not very far away from us. This is a little market area, market street, there's quite a few pubs, this is a new road where the bypass road comes, . they made ...a one way street, this is now a total no drink area,...this little bit..used to be a toilet where someone was raped.. This is the underpass on the council estate, not far away there is a ...for vagrants, so there is a lot of alcohol in this area, people don't feel safe at night. It doesn't worry me too much but if there is a fire or you see a big gang, if they start to look towards you you better off walking away - so you need to read a few signs...that's quite a notorious little area. We have got something like a curfew in this area at the moment. Even in daytime the police is here - but then again, it is improving. There are lots of new people moved into the area they are refugees, and they don't always behave very well.

Is there any other thing about it apart from its reputation?

These shops are all boarded up at night- somebody rang the police up about it and they...

- but apart from that its opening up, there is a cafe and a hairdresser so its picking up ....talks about pubs etc.

Are there any times when you would walk there?

It's ...ok?..daytime, possibly Friday night and Saturday when you stay clear of them. But nothing ever has happened to me there. It is mostly women who don't like that area. ...

Any other characteristics of that area we haven't talked about?

There is a car park.. the little village is not bad at all, an down this end,..............but the gangs seem to have been broken up and grown up.

So what street is this?

Market Square....Woodhouse

Now the last area

At the bottom of our estate....these houses in a little culdesac. This area is still a place where there is drugs...I can walk there at night but you need to be aware of what you are doing. In daytime its fine..if there is a gang i just walk straight through..a lots of people would not go down there

Is there anything else about it (apart from drug users) that makes you more alert?

This area is a den, there are trees, they would a light a fire and take drugs...... the area is get more used now, if an area is used you feel more safe.

What street is this? That particular cul-de-sac is Flockton Road.

Is there anything else that contribute to your alertness?

Sometimes you get this feeling for some reason as though you are being watched. I don't why - for some psychological reason..

Do you thing its an internal thing or external

Violence on television has made people scared - a lots of it is fiction, and exaggerated.

Interview 5

Does walking alone in the dark......?

No i am quite confident.

Can you tell me something about the streets just in general terms where you do walk alone after dark? Do they have any shared characteristics?

When I am walking after dark I am usually to and from the city centre to where I live which is about 20 minute walk and it takes me down a very long residential road which is the one I live on. Then

through the station and....the other side and into the city - and I am very happy with that walk.

Are there any streets where you'd think twice for walking down it?

I don't think so, I can't think anywhere in Sheffield where I would be bothered walking either at night or during the day - to be perfectly honest. Which says a lot for Sheffield i think. Are there areas where you walk, that aren't this typical road between town and home that you are familiar with?

I don't think so. I go to different functions at night and for some of those I use supertram for example. But no, to be honest.

Lets look at photos you took.

Tell me a bit about this street. What street is that?

......mine? street. Because I though where can I photograph? There is nowhere that I would photograph as an example of somewhere where I was be afraid..or nervous or anything like that. So I have just walked down the road and photographed..so that's part of my walk into town.

Can you give me three reasons you would be confident there?

One would be that it is close to home and I am very happy with the neighbourhood I live in. I should be living in a smaller house but I don't because i like it where I am. The other reason is it is a nice wide road, tree lined, its very pleasant to walk down, so it's a pleasant environment apart from hundreds of parked cars of course, but you can't escape those.

Third reason why...I would be looking forward to the evening enterprise or afternoon whatever time of the day I am walking.

Let's go onto second photo

What street is that you took?

Norfolk Road S2. And this is a very interesting road because this Norfolk Park Avenue and it's unusual because on the left there is the front of the houses and they have a moderately long front garden which ends not in a road but in a park. So you can't drive up to your front door and the wall on the right hand side is the wall of Norfolk Park. So the trees on the other side that are there are in the park. And it's ......all the way up. I decided to photograph that one because if anyone has a tendency to be a bit nervous walking at night I think they might be nervous walking up there

because not many people do walk up and down there, because just as easily you could walk up or down the park itself - as on this little lane, it's hardly more than a side walk with walls on both sides because you've got the low walls at the end of the gardens of the houses and then higher wall to the park on the other. So there is no escape if you meet somebody you don't want to meet.

So again, your three main reasons for feeling confident on that street?

I don't know I am just a naturally confident person perhaps. There are houses on the left, so if I shouted out it's possible that somebody might hear me shouting for help. It's quite a pleasant walk during the daytime bec. they can't do anything because the walls are toohigh but on the other side you've got the houses...you can look at what people have done to their front gardens and so forth which are more.....because they can't get their car there.

There are street lights so you can see

The third reason might be that I know several people who live on that road.

That was Norfolk Park Avenue and that is also S2.

Next choosing the photos after dark in unfamiliar residential area

He would choose the more open road, the one that looks interesting,

Interview 6

Does walking alone on the street in the dark..........

I think so, especially in Sheffield, I used to live in a village. I find it quite scary at night. I always about .....walking around in the dark. But I am not too bad now - I probably quite quickly. I were a bit scared at times.

And do you walk out at night after dark?

I do, but only if I have to. So I walk to the shop from my student village but I wouldn't do it too late. If I am out at twelve o'clock (?) then i get the minibus.

So could you in general terms describe when you work out your routes, what would be the characteristics of the streets where you do walk? What would you go for?

Big open streets, ones that have cars and street lamps. I walked through the park here once, it

was scary I wouldn't normally do that. I just walk on the main roads..

....So you rang her after you were in the park?

I rang her when i was in the park because i was a bit scared. I mean it was probably safer than it was made out it's just that there wasn't any lighting....there were big trees, so it was a bit scary.

Any other characteristics?

I .....street lamps, probably shops.... i am more likely to walk out because there are people around

How about the areas you'd avoid?

The areas that look dodgy in the day, or small streets that don't have lights, parks that arent connected to roads, because you feel safer when cars are going past. I used to live in Netherthorpe, and roads were were enclosed and there were trees..seemed to be scary because I see what I deem to be dodgy looking people..

Areas of photos

negative areas first

streets / area

Next to Nethethorpe tram stop. This off that street when you walk towards Tesco where the big park is. West street

negative pile

trees, not many street lights, and they are not very big, some houses are a bit funny, have often seen police cars and drunk people, there is a kind of tunnel there which is a bit scary

next one - the houses are ... not a student area, you don't know what goes on, have seen police cars there, people are not friendly, I just pick up on a feeling ?..also it is near the park, there doesn't seem to be that many people around there either,

What is it about the presence of park that is a negative thing?

Because there aren't any lights, because there are lots of trees and stuff, you always think you can't see anyone and wonder who is there ....might be childish, but you hear stories on the news..so that's why

anything we haven't covered? there aren't many people around there...

positive areas

Tesco is there, it is busy ok even in the dark, i have seen loads of different people there rather than people who look scary, there are not many houses

So less houses is a good thing?

I don't the area that well, they are not student houses I don't know the type of people, i think people tend to live in similar areas..It's better when there is less housing and more public space,

Last one

West street - it is always busy, places open until late, there is always students always walking up and down, people are handing out leaflets and stuff - you feel safer even when you are on your own..

Any other characteristics of West street?

The road is always busy, there are taxis, also big street lights and shops,

picture sorting...................

Anything we haven't covered?

I think because I am a girl I am a bit more wary than a guy..lot depends on what you are wearing.

Interview 7

Q- It depends on the street. At large I like(?) walkin I like(?) walking in the dark because most streets are beautiful at night g in the dark because most streets are beautiful at night .....a bit warm? Yes, I feel good but in these streets i feel safe.

Can you give me some general characteristics of the streets where you feel safe?

Where there are not drunk people or horrible people, their ....is not usual, their face decoration is not usual, also I feel safe when I see police cars on the streets. Maybe when the street is a bit crowded it feels safer.

Can you tell something about the streets where you do walk alone after dark? In general terms if you had to make a decision which way to walk.

I prefer a street which is open, if it's lighter and i can see different parts of the street, I don't like buildings that have corridor that is dark, then I prefer to walk on the other side of the street, to prevent crossing against those buildings. If I see a police car going through a street then i prefer to choose that one.

And streets that you avoid, can you give me a couple more reasons?

Darkness, strange people, closed stores, - if they are open i feel more safe.

What about streets that you don't avoid..? give me a summery

the streets that are light enough, ..people, police cars, also the familiar streets. Every night i walk from university to Crooks, i know the path here. I prefer streets where people have no long beard?

Next his photos

Your preferred streets - pick two

Western Bank

What is it that makes you feel confident to walk there at night?

It's a main road, there are students........home there, most of the time there are some people in this street, also since it is a main road there are cars driving on this road; the lights, the lights of the museum, mostly students live? on this street; people are not frightening for me;

Crooks Road

Because Co-op and Sainsburys, both of them are open until midnight; this is again a main road; there are lots of cars, also some people after dark; also there are banners and notices police issued --says this area is controlled by police; -to know that somebody is actually controlling this area makes me feel safe; if something happens police can catch it soon;

Any other characteristics?

Near my home; I can reach home soon;

Conduit road photo 2

There are lots of student accommodations there; and some departments of the university and Northumberland ......sport centre; that road is usually crowded; there are no nightclubs;

School road

My flat is around school road; safe because there are lots of those banners, there is enough light, and the people who live here are most of them are normal people;

....road

It is a bit darker, but people who live here are normal; it has its own culture..population; people who walk on this street are most of them are neighbours; people don't choose this road to pass through

So you prefer less people?

Less strange people

I saw some weird people in London road, also on West street at night, i can't see such people on this street..;

final one Redcar road

Safe because there are lots of students living there; light is enough; no weird people there;

Your negative areas

Just London road

I was there two nights ago; (West street) it was crowded, there were lots of cars; enough light but there were some drunk people five of them and one fell on the road and the other asked to help but i went on the other side of the road (Glossop road) because i felt that i helped they might attack me; Western street is sometimes horrible for me, i prefer to be there when it is day;

So there are times when you do go there?

Yes. London road is stressful. The shape of the street, the type of people who live there, the architecture of the street is somehow creates stress

What is it architecturally?

Compares it with Crooks where although the roads are old they are clean, you feel positively about it; the shape of the road is winding you can see the other side; but there are secrets in London road, there are places you don't know, you can't easily know them because of their lack of light the shape of the building, it's hard to know an area in the dark. I went to Aldi there at night and i felt stressed there. There were not many people, there some people with long beard.

Is that to do with religion or beggars and tramps?

No - to do with poverty.

Anything we haven't covered?

Have you visited London road...

Went there in the morning, went through on the bus, there were many old shops, you can see poverty there; i felt not positive there at the morning but not stressful. But at night yes.

If you had to list three main characteristics of what would not make you feel comfortable on London road in a few words what would they be?

Poverty, bad design of the street, some places have bad light;

What about bad design?

The shape of buildings, they are different from this side of city here they are more beautiful, there they are old and dirty, they are not on the same level (meaning standard), these are the kind of buildings where people might come up to you...to get you, maybe mug you,

the road itself is hazardous, it's not an easy road

So, what makes it hazardous?

the shape of the street, maybe the intervention? of the people who live there, they make it easy for themselves…

Interview 8

Sometimes. If I see somebody dodgy,..more or less I am alright because I get home before 11.

In general terms, can you tell me about the streets where you do walk alone after dark?

West Street, sometimes i go there to buy stuff, Mad....house Road which is where I live, and the other roads that are near like .....Court, Crooks road where i go to church,

Have any of these streets any unifying characteristics about them, what is it makes you feel comfortable about them?

Mostly there are people around, on West Street there is a pub, shops, on West street there are other older people around, ...there won't be any trouble. On Crooks road mostly cars are going up and down, so obviously that's safe, and ....road is residential so it's fine.

Are there any other characteristics you might look out for?

Generally other people on the road

What about those you avoid? If you had to come up for 3 reasons for avoiding a street what would be the characteristics?

I'd say if there is a pub around; although West street is ok bec. of students. But if it's only one pub in a specific area where people don't normally go; lighting -

What about the light?

Make sure it is working, if there is not much lighting I avoid.

Move to her specific areas

What is it about this area that makes you not confident?

It's very dodgy and always smell really funny; and there is the pub where sometimes drug people come; there is a corner when you often see groups of ....guys, and I just I hope they are not dangerous; there is sewage around there it smell really bad;

Which area is that?

That's Wilkinsons.

Can you summarize two main characteristics that you are not confident about?

The pubs, the people, that corner and the sewage.

Are there any other areas in Sheffield that you'd avoid after dark?

Only this one.

Do you ever walk in this area?

Sometimes if i have to do shopping which is about twice a month.

Which street is it?

Might be Castle Market Street.

Can you describe your two most comfortable areas?

Crooks Road. There are always cars coming up and down and you know that in case of emergency you can just flag one down; it is a residential area as well, and my church is just up the road and I have a few friends there;

Any other characteristics of Crooks road?

can't think.

Any other area where you feel confident to walk alone after dark.

Ma......road - other reason because it is a residential area. I live there, I know the people around there.

Interview 9

familiar neighbourhood, i know a couple of people on the streets

question

Yes,....because I am bit scared.. I avoid going out, i don't want to stay out at night. ....once or twice a month i go to play snooker with friend then i stay out late at night, i choose a safe road

Can you tell something about the streets where you do walk alone after dark?

My usual walk...you would see houses on one side then trees. The street which i particularly avoid is on the.......side of my house...once i was coming late at night around 11pm...there was a police, someone told there was a drug..bust..i don't walk on that street anymore.......it's a dangerous area it was very dark, no one there...

Three main characteristics where you do walk alone...summarize

- There should be streetlights, it shouldn't be dark at night; if there are more shops it is a lot safer for me to walk; familiar neighbourhood, i know a couple of people on the streets;

- the streets which you don't walk alone after dark or you avoid

Lots of trees on both sides with lots of branches; streets with less houses in them with open gardens spaces; graveyards nearby;

open grounds if no one is living there;

Is there anything we haven't covered?

No.

His photos

Joshua street, Wath? road; Woodstock road, Machonbank road

confident areas

Joshua road

I feel particularly confident late at night because I know the guy living there and people are pakistanis - where I came from; I know about 5 or 6 houses..and..the guys living there...I feel

confident there even at 2 or 3 am in the morning. There are no trees on this road - that is also a factor.

At night, what are the other characteristics?

It is pretty dark at night, apart from the lights of the houses which might be off at night. There are no trees, Sometimes friends come out for a chat..until late pm.

Wath? road

This is my daily route, there are lots of shops at one end there, this is the view from my door, also i know one guy who lives on the street; there is a tree but that doesn't bother me because there is a shop; there are a couple of houses with cats - I like cats....I am not afraid there even if it is dark because the shop is open until late 12 pm;

Next the not so confident areas

Woodstock road

I only walked through that road once .. it was very quiet, no lights and I didn't see a person; also the ...of the trees look scary? in the daylight...; at night i wouldn't go there, because of the trees, it's very quiet and I don't know anyone.

Machon Bank

.. on my way back from the snooker club one am in the morning, when i was coming there was police there, basically this is a very dangerous area I found after i came to this road, it was quiet and not my usual route so that was a factor but on top of that police raid also came to be factor and the neighbourhood is not so good, there was a drug bust there, I won't walk there late at night again.

Are there any other characteristics of the street?

It was also very dark, no one around and very quiet as well.

Sorting photos in order of preference

Anything else?

The streets here are generally darker than from where i came from. In Pakistan where his house there are more street lights which they put in at their own expense. People put streetlights up outside their own houses. Trees here are quite scary. The lighting is very important.

Why?

Because you can see, what is ahead, if someone came up to you and there is not enough people around there, i heard about robbery and mobile snatching ...- people are generally scared of the dark.

Interview 10

Does walking on the streets after dark alone generate any feeling in you?

Not generally if it's a lit street anywhere....

Tell me about the streets in general terms where you do walk alone after dark?

Generally around my area in Ecclesall, I walk into town don't venture anywhere else..

Could you summarize the 3 main characteristics of the streets where you do walk?

Main roads, well lit, quite quiet.

Tell me about the streets where you don't walk alone in the dark

Flat areas, where there are flats, high rise estates, ares which are not familiar to me,

Next streets

Thomas? street- tell me about that street, all the questions relate to you walking alone after dark

When it's dark there is not much street lights, it's not far from a busy nightclub, where there is lot of drinking idiots who come here, also not far from an estate, there are lots of dodgy people walking in this area, i know people have been mugged, it's just in the city center where ....

Next one

Students hang around there, somebody got mugged not too far from here,in dark i wouldn't walk there, maybe during daytime with my friends..I get off the bus everyday next to Ecclesall road,

Millhouses Lane

What is it about that area that makes you confident?

It is kind of a main road from Ecclesall down to Millhouses, it's not far from my house, it's well-lit, quiet, not lots of people hanging around there,

Last on is Ecclesall Road

It's a main road, it's well lit, cars are going up and down, not afraid of people trying to mug you or anything.

Interview 11

Question

Yes, generally i feel quite defensive, I don't feel particularly afraid, ... I plan the route carefully,

What do you think is the origin of you feeling defensive?

Because I am much more likely to be attacked, and bec. I can't see as well I feel I have one sense less in terms of spotting danger ahead. Even if it's a car, if you are crossing the road you are less aware of it at night time.

Tell me sg. about the streets where you do walk alone after dark just in general terms, what type of street would you go for?

It would be a wide street, i would avoid the narrow ones, well-lit, plenty of other people around, i try not to go to the ones that are too closed in, either high walls on the sides or with park on one side which is very open,

What is it about the parks that makes you feel less confident?

First, it's the logistics of how many people get mugged in parks, secondly it would easier to attack or rape a person if they could drag them off to the park or smg like that..

i prefer somewhere where it's not too closed in, but not too open..

What type of street is your ideal balance?

A street with houses on either side, shops that are more likely to be open, I would prefer a supermarket to a shop that sold alcohol..where there're plenty of people walking up and down, quite busy and very well lit. Cars and buses are not that important as long as there are plenty of people.

If you had to summarize 3 main characteristics where you'd avoid what would they be?

1.avoid all badly lit streets; 2; streets with open areas like parks; any street that has an underpass; streets where you are obstructed from view;

photos

positive ones

Crooks road

What is it that makes you confident..........

it's well lit, there is a number of shops there that's open until fairly late, there is always quite a few people walking up and down even around 2 am at night. It's quite wide, it doesn't have any parks or openings of it, no high walls where there is nowhere to go.

How often do you walk there after dark?

A couple of times a month, it's only about 10 minutes from where I live; there is a chance I could make it if someone chased me

Moan? avenue

The road I live on; I know the neighbors quite well..I could call their name; it has a primary school on one side as well so you don't get dangerous guys hanging around, it's quite a wide road, quite well lit as well.

Negative

Bolehill road

Quite a way away from where I live; it's on a steep down hill which makes it feel less safe; big park on one side; it's not very well lit; it's only got houses on one side of it, there are houses at one side but I am not confident that anyone would come out of them if I shouted; it's not a very well populated road, I have walked there during the day

I would walk there in the summer but not during the winter ... I would walk down there in the early evening up until about 8'clock. It's a very long road before you find 'civilization' again

Is it all residential?

Yes, park and houses all around it.

Northumberland road

There is only pavement on one side of the road so if a group of people walked towards me I would have no choice but walk right past them; it's not very well lit; streets lights only on one side again, very high walls on both sides; a steep drop on one side; single solitary people tend to walk along it; there are no houses behind the walls; there are always cars parked along the road, so you get the feeling of car behind your back.

Interview 12

Q - depends where I am walking, certain areas I would consciously try to avoid, or choose not to walk, but other areas like around the university I feel safe.

The areas you purposefully choose to avoid?

Down Broomhall....there was a shooting, further down Broomhall, there is a few council estates but i don't need to walk down there ...

tell me a bit about the streets where you do walk alone after dark

Generally around the ... students area, I walk on Crooksmore road, Crooks road, lots of students live there generally-

Any other characteristics of the streets apart from the presence of students?

Some of them are well lit- quite a lots of shops on Crooks road, it's quite busy as well -there are bus stops, shops have always got lights on

What about the areas you'd avoid - if you had to summarize. 3 main characteristics....?

Poorly lit - bad reputation - not for students -

Street photos

positive ones

Ramsley road

It's a dead end (school at the end) so no one hangs around there - you're conscious that not much is going to happen - mainly families live there with young kids - it's quite, no noise at night - reasonably well lit -

Crooks road

It's really busy, always well lit - loads of shops, takeaways, bus stops;

What do you think these two streets have in common?

Bright, feel safe despite the fact that they have differ. characteristics

Negative

Crooksmore road

Despite the fact that there are lots of students if you walk between 11 and one at night students are rowdy; that part of the street is badly lit, it is

quite a long street, lots of cars, badly lit wonder if they see you when you cross the road.

Northumberland road

It's a bit peculiar at night bec. it's absolutely deserted (busy during the day) so i try to avoid it.

Any other characteristics?

Both these are badly lit compared to the others.

Could you describe Northumberland road?

Narrow street, towards the left the gym, there is a building site, lecture hall, quite a bit on the left hand side but on the right hand side just the football pitches.

Interview 13

Q

Yes I am not really feeling confident when it's starting to get dark ... get someone to pick me up. I have lived in other parts of the country before, for example in York I felt less afraid walking along in York than I do here.

how come, why?

There just seem to be more people around at night - here there are quite a few dark areas ....

Can you tell me something about the streets where you do walk alone after dark?

Normally big ones where there are lots of cars, it's quite wide, you can walk on the other side of the road .....walk past; most of them are quite lit up and there are other people at night; shops also

Can you tell me smg. about the streets where you don't walk alone after dark?

Mostly the less.....areas, not much lit up areas; there are not many people just the people who live there;

Difference between York and Sheffield

Her bike got stolen in Sheffield first night? In York there loads of tourists, was always something going on at night, more people on the streets; Here I live where .....so I don't go home with other students;

Where do you live?

I live on Fearnly? road the other side from all the students..

Is that anything to do with it?

Yes, all my friends go home together but I don't like going home on my own after six when i take the last bus, nobody walks there, ... back streets

Summarize in 3 characteristics where you would walk ...

Generally where there are lots of people; there are buses; there are shops so there are always lots of people around; where it's quite lit; if someone comes towards me i can walk across, but on smaller roads you have to walk past them; the wider road the better;

What about the streets where you don't walk?

Where there is not much light; when you walk from one light spot to a dark spot and then again.....; or where there is just residential people, they can you look at you as if you are dodgy and you are the bad one; where there is not many cars; if there there are cars and smg happens to you they can see it, but if there is not many cars......someone to help me.

Her photos

Negative ones first

photo 2

This is not a road where cars come along, a bit dodgy; it's not lit up at night; every time I walked I have seen drunk people, or someone weeing in the park; its not very well lit up, there are lamp posts but it doesn't seem very light; at night i don't walk through the park, during the way i try to assess what's going on first ...

People in your environment effect your decision?

Yes,

Three main reasons for not being confident walking in this area

if anything happens there no one would hear or see it bec. it's hidden; no cars there; and it's not very lit up so i can't see anyone coming towards me;

Next street

What is it about this one that makes you less confident?

Don't like hopping between lights, trying to get from the dark spot to light spot quickly; its darker and lighter and darker and lighter;

3 main reasons;

can't get away quickly; not very light; not many people there, (only those living there - feel like intruding), with other ethnic groups you feel like you are intruding on their space;

Positive areas

Infirmary road

It has got quite a lot of bus stops; tram stops; lots of people, Tesco; there is always someone coming and going; it's quite lit up; quite wide so quite a few areas where i can cross over easily;

Glossop road

Pedestrian bit quite wide; always cars driving along especially in rush hours; the hospital is near there which makes feel a bit safe - help is near; it's quite light; there are no houses right next to the road which makes me feel less claustrophobic; there are other houses, pubs, you can jump over the wall to get away; spacious, don't feel boxed in.

Interview 14

Q - I normally try to avoid it. I would feel quite nervous on my own.

Do you actually walk around on your own?

Quite rarely, not normally at night after 9 pm.

Tell me smg about the streets where you do walk alone after dark? Their characteristics

Probably would be going to another friend's flat, sometimes I go to English......which is about five minutes walk, it's quite illuminated when you get to Ranmoor?

Something about the streets where you don't walk after dark?

Enclosed alleyways and streets without street lights. If cars going by I wouldn't be as nervous.

When you choose your routes, do you plan it in advance?

I am trying to stick to main roads,

3 main characteristics where do walk........

street lights mainly; open shops; 24hour shops; people around;

What about the opposite, streets where you wouldn't feel confident walking alone in the dark?

country lanes, no buildings; no street lights; just very quiet; no cars

Photos

Positives first

Glossop road

confident - it's busy even when it's dark; it's quite a wide street; big main road, always buses and people walking along; close to the union; you know there is somewhere you can go;

Endcliffe

the security services go round; if you see a car going past that makes feel safer; street lights; student village, students are everywhere; often quite a few people walking around; it's quite a newly developed area, its not run down, makes you feel safer;

Negative (not so happy to walk..)

Side street off Glossop road

It doesn't lead to another main road, leads to a quiet area; it's not a residential area probably not many people are using that street at night; littered and not well kept.

Broomhill

There are trees on either side, kind of enclosed; it has schools so those wouldn't be used at night; you don't see people walking there at night; it's winding and you can't see the main road; visibility is not very good; it's quite long when you are in the middle you can't see out at either end; I walk down there to lectures but loads of people walk there that time; there are a couple of street lights but even then i wouldn't want to walk down there; bushes as well.

Interview 15

Q. - Generally no.

Where he does walk - bottom of Ecclesall Road, Sharrow Vale road; Psalter lane for shopping etc. Access to our flat through a gate... Frog walk - narrow, constricted, sometimes at night i might avoid that- 2-3 years ago a woman was raped there - it's a sort of place where you haven't many options to run away - need to be aware of things, look out for anyone hanging around - but it's a walk way and access point to the flat -

Ecclesall Road - people are knocking about;

3 characteristics why you are confident walking alone on this road?

open; populous, people knocking about; not an area of crime;

Sharrow Vale road - 3 main reasons of feeling confident

same applies; open, people around; this is not area where there is much mugging or anything like that

Frog Walk

shortcut to Ecclesall road - narrow, constricted but ok during the day, he walks there daytime-

3 main reasons for not feeling confident

Restricted, narrow, not straight;

Interview 16

Q? I am very cautious - tend to be aware of my surroundings- it gets unnerving in some areas-

Streets where you do walk alone after dark?

I am pretty conscious everywhere - don't walk as much now in the dark (retired) but when I was working I was leaving home half past five in the morning, and where i lived? ...it's very dark, very quite, nothing is well lit, so I didn't particularly feel safe until i actually got onto Ecclesall road, I am ......person so i try not to select areas that intimidate me,

-Tell me something generally about the area that intimidates you

One particular road, Cemetery Avenue - i don't walk there in the dark alone because the road is very uneven, there is lots of trees, the trees hide the street lamps that are there - i would like to see the trees chopped down - but pruning back a bit would help - but bec. the pavement so uneven if you had to get a spurt? you'd fall down first. So I pick another route which is not better lit, but has a better surface. But then you go to Frog Walk and Toad Walk, near the bridge there is a little copice area which is lovely, but there are late night picknickers who leave a mess behind which puts you off. You don't see police on the beat anymore - you don't feel secure sometime.

If you had to summarize the 3 main reasons why you have to be cautious what would they be?

fear for you own safety, fear of falling underneath...hurting yourself, if i hear anyone around me i always turn round so that they know i have seen them- like to keep aware what's around me

What gives you confidence in areas ?

If the....well lit, traffic, people are coming backwards and forward; if there is...activity that

makes you feel confident -

Her area

Negative areas (she didn't do any positives)

Cemetery Avenue, Frog Walk;

Frog Walk

3 reasons; not very well lit; you get people...; in the dark it's not pleasant; she met a bloke with a coat over his head in the morning in the dark; isolation - not safe anywhere nowadays

What makes you think that?

Incident on Ecclesall road - rape, drug dealers around not it's more students

Cemetery Avenue

Bins tipped over, bottles, blames students....should be respect for both sides

Anything else

Use it during the day it is lovely, birds etc, could do with a bit more lighting more street lights;

Talk about streets where she is confident

Ecclesal road definitely; Sharrow Vale road;

What are the main characteristics each of those roads?

Ecclesall Road is better lit; even when the shops aren't open the lighting is still on; there are more people even early in the morning; there is always traffic; and the police are there;

Sharrow Vale road is better lit; you can walk on the side of the road so that you can be seen; there are people coming backwards and forwards; there are cars.

Interview 17

Q - No, it doesn't bother me

Characteristics of streets in general terms where you do walk alone after dark?

I don't walk on the streets at night very much not because i am avoiding but bec. i dont need to - i don't have a regular routine like I would have during the daytime - so it is difficult to generalize -

Reasons walking in the dark?

Probably bec. i am going to some kind of event - living on my own, i don't go to pubs - he does everything during daytime -

Are any characteristics of certain streets that would make you instinctively avoid them? streets that you know

There aren't any really - there are people i don't like the look of during the day so i wouldn't want to meet during the night either - it's not so much to do with the streets but who you meet and you never know who you're going to meet -

Any areas you don't know about

things you were told when you were a child......it's more to do with the darkness- in the dark you can't see what's there -

His photos

Negative streets (near an underpass?)

1. based on circumstantial evidence and hearsay; could see people meeting at street corner thinking might be something illegal; it is well lit;

Tannery Park

same distance from the underpass; where i live a big area of woodhouse ..big grassy area is Tannery park..kids playing etc - it is used for community events; the reason he chose it bec. he read in the community paper that the police can legally stop people drinking there - that was introduced bec. there are three good pubs there and they were having problem particularly with younger people hanging about the streets drunk falling down (i haven't seen any of this) so people went to (drink) into Tannery Park instead - but at a meeting the police said it was not true. So he picked this place because it was said to be a place where drunken youth congregated.

Are there any characteristics of that place which would contribute to your hesitating to walk there?

Cross street

I would feel safe to walk there at night bec, of the DIPB business....there are cameras; well lit, there

are people wondering about, Cost Cutter is open until 10pm, there is a pub, restaurant, takeaway there; never see any signs of trouble-

Bar? Lane (where he lives)

There are tall hedges 6 foot high and a narrow thing to walk up -there is a gap in the hedge and someone could leap out at you - one access to his this dark alley - but it doesn't worry me bec. i am used to it - he uses that access. Access to his house through a dark alley. (one access) - he uses that access.

Any characteristics that would make you feel confident in that area?

It's pretty well lit - traffic also makes a difference

Interview 18

Q - Not normally. Especially if it's well lit it's ok. But if it was a dark street with lots of alleyways ....people coming behind I might be a bit wary.

In general terms can you tell me smg about the streets where you do walk alone in the dark

I walk around the area where I live which is a very safe area. It's quite a nice road ...people could be behind alleyways - there is a bus route - i feel safe there

Tell me about the streets where you don't walk

I wouldn't like to walk on a street that is poorly lit - it was a less desirable area of Sheffield - possibly an are where lots of people are drinking, fights braking out ..

Any other areas?

wouldn't walk in an underpass - wouldn't walk through a park at night -

What is it about the park..?

Even if it's wide open I would still feel are any undesirables there, would i meet anyone?

What about where you do walk?

Where its nice, green, well lit -

How would you define a less desirable area?

Where everybody know they have drug problems, race problems, poor;

Her photos

Positive ones

Westminster Crescent, Crimicar Lane

Westminster Crescent

Confident because: it's wide; got green spaces on either side, meaning open grass area - well lit -

Crimicar Lane - wide road - has bus routes - better class area

Negative areas

Bakers Hill - it's dark; there is never anybody around there; it has steep steps which are old and dangerous

Pond Street - it's not a lot of activity around there ; it's dark; at one end there is like a tunnel, although the tunnel is lit it's not a place i would like to walk under - there is usually lots of cars and you don't know what could be lurking in between the cars; it's ok for walking (meaning tripping over)

Differences between these - and + areas?

+ more open; more visual, can see better; - are more closed in ; there is also a dead-end.

Interview 19

Q - yes, it depends what road. Generally it's not an issue if it's well lit and it's a busy road. On quieter roads a bit more wary of what's going on around you -

More about feeling of wariness?

It's just looking around and seeing, being aware of what's around you; just being cautious if you can't see very well, and its not a busy road;

Streets you generally choose to walk on after dark? (characteristics)

They are normally the busiest streets; Clockhouse road or Fulwood roads are the ones i generally use; they are on the way to and from from lectures;

What about the streets where you don't walk alone after dark alone?

They are the roads I don't use during the daytime - if i am not sure what they are like, don't know where they lead to then I don't use them (got lost a couple of times)

3 main characteristics of the streets you use?

- roads open and busy

What about the ones you don't use?

- opposite; dark and quiet

 if it leads through housing estate and not well lit then i wouldn't use that road.

Prefer to walk on less residential areas - residential roads seem to be darker as well -

photos

Negative

1. street that joins Fulwood road and another road - it's very dark; there is just a couple of lamp posts; it's pretty closed; there is housing on either side; very quiet, not a lots of traffic at night

Confident areas

Fulwood road

busy even after dark, shops; regular bus service; really well lit;

2. confident to walk down there; very close to.....it's used all the time; well lit; fairly busy not so much with traffic but people....;

Main difference between positive and negative areas?

the lighting; how busy they are; how open the roads are;

you can see more on those two streets than on this one - maybe something to do with lighting; seems a bit more closed as well -

not being open means how close are the houses to the road - close is negative- the main issue is the lighting with this road and it is steep

Shops also make him feel a bit more confident

Choosing streets of preference - left or right

Anything else?

Trees and bushes can be intimidating if it's not well lit. That may contribute to the road he is not happy to walk down.

Interview 20

Q - Sometimes I am a little bit scared walking on my own, I tend to stay in instead of going out when I am on my own.

Streets where you walk on after dark?

there is a very hilly street, quite dark;

what about the streets where you don't walk after dark?

i don't use them - just walk on the streets that are on his route..;

Describe the street where you walk, or just generalize..

One of them is full semi detached houses; there is few lights; some trees; not very hilly; quite large street;

what about the one you don't walk after dark, any other characteristics?

they are quite similar

What may effect your decision?

the length of the street - prefers the shorter one;

photos

less confident about

Crooks - even if good families live there it is a bit dodgy bec. it is not very light

What about the opposite, what would give a feeling of confidence?

More light, more people walking around there;

Negative photos first

street 1. - to do with light; you can't see to the right if people are coming; (had to walk there late at night to catch a bus....nobody came.

3 reasons to summarize why not confident

Poor light; isolated place; short view; (bend)

street 2 - he doesn't see where it leads to; always sees drunk students; hasn't explored this street; also poorly lit; he like straight views;

Positive - where confident Crooks

Street where he lives. One of the main roads at Crooks - people are coming around here late at night so not scared being alone - there a few lights too; you can see where the road goes to; familiar

School road

Perpendicular to Crooks, also one of the main roads in the Crooks area; also a big street; not very hilly, no main bends; fairly well lit; there are a few shops as well; always people coming around here; lots of students in this area;

Going back to the streets he is less confident about - are there any times you would walk there?

Possibly in the morning, or with friends - i try to avoid them at night - otherwise they are fine i think - when it is light

Interview 21

Q -- yes, it depends which street in Sheffield of Sheffield - walking alone in West Street is not too frightening for me bec. it's quite lively and busy...I don't have any problem in town even bec. I know the students around.

But in Netherthorpe where i live it's different, it's very quite...random streets...drinking.. those kinds of places can put me off - sometimes Crooks as well - when I have to walk back home and it's quiet...I don't like that

I you had to summarize the 3 main characteristics of those streets where you feel comfortable what might they be?

Streets that have bars, music around, noise, people walking on the side of the road, lights

What about the streets where you don't feel confident?

When there is little lighting on the street, no main road nearby, when away from the main areas where people would be like shops.., where the infrastructure is not good; and the place needs redoing;

Photos

positive areas

West street - loads of people around, the tram, shops and bars; it's busy, there is light; it's popular, I like walking down there even at night -

Western Bank

Busy main road; I don't feel vulnerable when I walk after late lectures; even though it's less busy than West Street, there are students around most of the day; it's on my way home; I don't walk around late at night on my own;

Negative areas

Netherthorpe Road

Try to avoid this area - there is a council estate nearby, have seen people standing around drinking /drunk at night - some looked as if they haven't washed; kind of rowdy, they stare at you; she feel on edge sometimes; it's quiet down there; there is wall (somewhere) you can't see what's round there;

2nd place?

Wall is quite long (not too high) and people wouldn't be able to see her if anything happened; it's not always light; in terms of street lighting it is not as light as West street or Western Bank; a car pulled up once near a friend on her way back to the flats; they didn't do anything but they made her feel scared; there are some lights that don't work or they are not always on;

Are there any times when you would walk there?

Yes, in the day - because it's short cut to town;- building look old and unused, warehouses? - so maybe bec. they are old.....there are no lights coming from the buildings;

Interview 22

Q- it depends, how many people are out there, what kind of people..some times there are drunk people

If you had to generalize some characteristics of streets you might avoid what they be?

quiet? streets, outside the center of city; near industrial parts where there are no houses;

What bothers you about quiet parts?

Sometimes there are no lights and you can't see other people; if someone attacks you can't do anything

Generally can you tell me about the characteristics of streets where you do walk?

Check recording as muttering.

What is the main thing that makes you feel scared?

Maybe darkness - not knowing people - and nobody can see you

Photos

positive streets

1. with the view of the Arts Tower - makes him confident

traffic,....attractive place not an abandoned place

how often do you walk there after dark - several times ; everyday

2. (next street) - Infirmary road

makes him confident: more people; you can see the shops; familiar?

Negative streets

Philips? road

1. Near Kelham Islands

Philips road- heard about burglaries; industrial; heard stories....his flatmate (lived with other students) heard somebody shouting at somebody else?......

There are family houses nearby and he suggests that that's where the danger is from...

Any other reasons? I think its the light?..........(he doesn't make sense)

Next road (speaks about different parts, the bad part is

industrial; quiet, nobody lives there, you imagine what might / could happen.

Interview 23

Q - generally I am not afraid of dark or night, and i feel ok walking alone, but sometimes I am afraid of places, and try avoid some streets especially when I am alone.

What would those general characteristics of those places be?

Darker places where there is no big au.......; far from city centers; or if someone draws attention....;

Streets where you generally feel comfortable to walk alone after dark...

main streets where there are lots of people walking; where there lights; streets i know (places you don't know you feel less comfortable); city center mainly

Photos

positive areas

Calver? street

several bars, light, cameras, police around; people guard discos;

West street

even it's light i don't like people on them, she was followed by two guys hoodies , - negative

.Division?....street is her favourite...........i know it always .use it to..city center coming back; there are shops, clubs restaurants; people wonder around; cameras everywhere, lights everywhere, I know....what to expect;

Her least favourites

Rockingham street - there were some people discharging ...sm; it was dark; nobody walking on it; wasn't afraid but would rather avoid it

Devonshire Lane - difficult to walk through because there is sand on it; dirty areas; rubbish; it's dark; nobody walking on it; - enough to make her feel uncomfortable; green areas make her more comfortable than grey areas;

Does that apply during the day or the night?

Yes, ...makes her feel better

.....street - goes down hill; dark; becomes unpopulated; no people walking on it; grey and dark;

Wellington street - off Division street, feels like outside of city center; no shops, no discos, no people going round there; mainly parkings; old factories, abandoned buildings;

West Street

Mainly bec. of her experiences and stories she heard from friends - a couple (her friends) been attacked by two guys; the girl managed to escape but the boy was injured; she and her friend were followed by two guys, they went into a bar and they waited for them outside, they told someone in the bar and the guys were held up and they escaped

Interview 24

Q - feels relatively safe walking on the streets at the moment; she works on Saturdays and the minute she gets back at 7'clock it's dark. She only walks from the bus she feel safe walking down there, A couple of weeks ago they were having issues with the street lights / electricity, so the street was completely dark and she used her phone to see where she was going but still felt quite safe going down there bec. it's a residential sort of area near the campus ..houses, quite a

nice family area; feels safe walking in places she knows

General characteristics of streets where you feel comfortable - what would they be?

Quite well lit; residential, don't mind whether people are around or not; ok with walking alone; likes streets that are quite open so that she can see well

How about streets where you don't walk alone after dark?

The ones I don't know very well; less houses, houses boarded up puts her off a bit; (no people inside, no people on the street= no help if you need) ; areas of town that not quite as nice as other areas, slightly more run down and not looked after;

precautions: her dad told her not to listen to her ipod when walking alone; take streets that she knows better; walk with a friend (not always)

In places where she feels safe she lets her guard down; in places she feels less safe she is alert. On the bridge a bit neurotic- she is aware of what's going on around her, not naive;

photos

less confident with

Mitchell street

- it was instinctual, houses on one side, hedge on the other, people can't see what's on the other side of the hedge; vision is restricted; near big Tesco, she frequents it less; not as well to do as Broomhill...and place she lives close to. was almost eerie quiet - in areas she knows less she is not so comfortable when it's too quiet.

.....road -

house is boarded up; less walkable street with the trees overhanging a bit it looks gloomy; never walked it properly in the dark; it's not much of a residential area, so at night time people probably wouldn't be walking in there.

-Describe your feeling when you were walking down there - even with a friend.

- Was not afraid, but her "senses picked up a bit" , keeping check of what was happening around them;

Anything contributed to eeriness apart from absence of people in the houses?

It was instinctual, quite nice area, open road but they were the only people on the street;

Positive areas

Peel Street

Jessop road

Walked it so many times before, used to it, main road pretty well lit; even if no-one is around there is still cars going up and down; it feels busier; people at the chip shop which is open until quite late at night; you know people are around even if it's empty;

Mushroom?....Lane

Nice street, lots of houses on either side; right round the corner from where she lives; walks it a lot the time, comfortable with it; residential area, big wide open street; not always cars passing it, but she knows that she is right next to her home; so feels safe there

- Any other characteristics apart from the openness and familiarity?

-it's a homely street; trees don't overhang the roads so you don't feel restricted;

-What contributes to this homely feel?

- big family homes rather than blocks of flats - the atmosphere around those (flats) is just not quite as comfortable as near family house;

Anything on Mushroom Lane or Peel street we haven't covered?

I know the quite well, it's not that they are busy, even if there are no people around it's a wide open road; there is less likely something to happen on a main road than on a quite road or back alley street;

With this one? it is a bit contradictory bec. there are not so many houses around but it's a really wide open street; you think it's more easy to get away on an open street; Close to where I live, there are houses round the corner, there is an office block where they work later on,

Photos

Anything else we haven't covered?

The fact that she is a woman puts her at a disadvantage; if it comes to attack men are stronger, and it is men who normally attack women.

299

Interview 25

Q - Not very much, it is not that different for me if it is day or night - if anything I would rather not have so much car traffic than people traffic?

Are there any general characteristics of the streets where you do walk alone after dark?

I take pretty much the same route i would during daylight - so I don't make conscious choices, or very rarely,

- Three main reasons why you do walk on streets you feel comfortable with?

- Streets that are convenient for to get from A-B. So uses direct routes; prefers paving rather having to walk on the road but that's pretty much all; streets lights are important but everywhere she walks there are street lights...

- Is there anything that would put you off walking down a street after dark?

Too much distance from houses; doesn't like walking next to traffic; prefers residential areas because they are usually nicer and greener; she may hesitate walking on the footpath by the river at night instead of the busy road..

What makes you hesitate (3 main characteristics)

-whether it's quiet or not; whether I see people walking on it or not; I would prefer if there somebody there unless it was a shady character in which case she would prefer him not to be there; distance from the houses, if houses are far apart with big front gardens it feels secluded if you were to shout nobody would hear you; I suppose lighting, but even the footpaths are quite well lit, so I don't think lighting makes that much difference; (this woman contradicts herself!) - so i think it's mainly the quietness....

photos - positive

It's a busy road; ......there are restaurants, a pub, off-licence open until late, so there are people always around there, also shops open, lots of traffic coming in and out; not a nice street to walk on, prefers others but acknowledges that it is safer. It's close to her house; she knows it very well, if she had to run she knows where to run to;

Psalter Lane

near where she lives; relatively busy; (gets quieter late at night) there is a pub, so there are people; dance school (night school?) people keep coming out at evening time; there is usually a pedestrian traffic, not as much as Ecclesall road; it's very well lit; houses on both sides of the road (a bit removed);

Hesitant area

Road that leads from uni to Ecclesall road

She walks it during daytime; evening as well, using it as a short cut; ethnically diverse area, rich houses as well; they are always pedestrians on this street; bit of traffic too; well lit;

Continuation of that road - a short cut - wasn't sure first but when saw others using it she felt better about it - secluded means danger to her mind -

3 main characteristics that make you hesitate

- quiet, big distance between houses and the street makes it feel secluded, there is a park at the end of it which makes it feel even more secluded;

Frog Walk

She has been warned about it, but actually she quite likes it bec. actually lots of people use it at night - it's a good area; can relate to people walking down that way, they are the same kind of people as her - but it is very secluded, you are not visible; possibly no one could hear you; so it's the seclusion that would make her hesitate; also it is quiet

Interview 26

Q - I become more aware of my surroundings; it's easier in a crowded place where i am not bothered, but it's different in an alley or a gunnel; I might avoid it if I am not familiar with the area;

Tell me about the streets where you are happy to walk, and feel more confident?

- West street, Fargate; round where she lives 20 minutes outside of Sheffield (Ashton?)

knows lots of people there, it's like a village; feels safe walking around there after dark; normally ok in built up areas;

Characteristics of those streets where she feels safe

bec. they are wide; lots of people even 4-5 o'clock in the morning; there is police as well; its always bright, lots of street lights; it has got to be busy and she knows the area;

There are some areas you wouldn't go bec. you have heard things about them; wouldn't walk on a council estate;

Are there any characteristics of the streets you would avoid apart from what you have just said

run down houses; gangs, even if they are just teenagers; she is normally ok if she has her dog; if hoodies she would walk on the other side of the road; or just avoid that area;

photos - negative areas

.......she was walking on it on thursday and realized that it is not that light - it was really dark with just one street light; there was nobody around; not a very open place, there is lots of places where people could be hiding; if something did happen there are only offices nobody is around;

The park near where she lives

There was / used to be a group of teenagers doing drugs; wide field, only a bit of light; you would get abuse (this happened when she was younger and went to her piano lessons); chose to walk the longer way on well - lit streets. No light, or only one or two in the park, a wast expanse of darkness

Streets where she feels happy

St Georges..Row?...(by the cathedral) built up, well lit.......does smg around there; never heard anything bad about it; all flats and CCTV so things are on record; confident bec. she walks around there everyday.

West street

police patrol, wide street, built up, lots of people; familiar; even there are problems they are never provoked- feels in control -

Photo selection

Anything important haven't covered

All boils down to how well she knows the area - some places she would not walk down even if there are lights on - just because the way the trees are placed; if you have somebody with you (eve if its her dog) you feel safer - if you have knowledge of an area it effects your decision; to some places she would prefer to avoid she might goes with her dog, but not everywhere i.e. the park

Interview 27

Q - depends where I am walking - depends what kind of feeling that street gives me. If it's very dark, or is not the area I know, I'll be aware of people. If

it's a familiar street i wouldn't even think about that -

Can you describe the streets where you are generally comfortable to walk alone after dark

Characteristics: if they are lit up and can see properly where he is walking; if he had been there before; what type of people he sees around;

What about the area where you don't go? ....characteristics

Specific areas that are not close to the city center; high blocks of flats and you see groups of people talking loudly, street he had heard about something happening; sidewalks where somebody can come to you really close; he wouldn't feel frightened but uncomfortable; if it's dark - light is really important

Anything about the light? The intensity and maybe the frequency of street lights;

photos (he only took photos of negative areas)

Springfield road?

One of his flatmate nearly got stabbed; he walks there everyday bec. it's on his way to uni, and it's usually quiet, but since he heard about his friend's incident (wanted his mobile etc at knife point) - he ran back and told him about it - apart from that it looks like a friendly street but maybe people come there bec. it's a student area (meaning to rob)

Side passage between two streets

really narrow and dark, not pleasant to walk; always damp; people could come from the pub and try to squeeze through - risky;

Would you walk there during the day? Yes

Positive streets

Conduit road and Western road

Student areas; most of the houses are inhabited by students; familiar environment; walks there everyday; plus visibility - they are long streets; they are down hill, wide visual area; he lives near both of them;

photo selection

Anything haven't talked about?

his mood, if he hasn't slept he would feel different; if he is relaxed he wouldn't even think about things like this; also he hasn't seen people on

301

these photos - people and how he feels about them make a difference.

Interview 28

Q - If he sees a group of youths he would be apprehensive - He walks on his own on Friday night to the club, but he never any trouble at Crooks. It is safe as much as anywhere.

Can you tell me smg about the streets where you do walk alone after dark?

He walks on the main road at Crooks no trouble at all.

What is about those streets that make you feel confident to walk there?

They are well lit and Crooks is more or less a small village and you know everybody.

-Is there anything else about the streets you don't walk after dark apart from the reasons you have just given me? (groups of youth..)

Reputation, there is lots of druggies...,they was a shooting two months ago..at the bottom of Burngreave road,

photos - Northfield road

reasons why you feel confident walking there on your own?

he knows everybody -

New House? road - couple of reasons why you feel confident walking there.........?

he know everybody, streets are all well -lit;

Not so comfortable areas

Burngreave road - ok main road but Carleisle street.......gangs of blacks on the street acting strange; there was a mad mad among them and they told him not to look at him....;

Burngreave road has a bad reputation which is why he would be worried to walk there

Interview 29

Q - not especially

Tell smg about the streets where you do tend to walk alone after dark?

There is a place from where I live in Portabrook? view where he quite likes going..gets there

through Toad Walk and/or Frog walk..but has been warned about it, so goes different way..generally there are people around.

3 main characteristics where he does walk alone at night and effects his decision

...escape routes; depends who is wondering around; prefers to walk in the light but it doesn't bother him if he has to walk during the day or night; he goes back streets as well; back streets are a bit safer in a strange way; heard stories people being mugged at a particular pub; both times bunch of Pakistani lads (they might just be blamed for that) jumping out of the car, but you don't get that in the side streets; on a main road people could jump out of a car and get you, doesn't think there are any hard and fast rules whether it is safer on main where there are more people on roads or not. He walked in lots of places at night that were supposed to be dangerous (Central Park, Nottinghill...)

Are there any other areas you avoid apart from by the river he had talked about.....

Wouldn't think about walking up Broomhall; not his turf, he doesn't know it; doesn't like the flats on Exeter drive; you do get people hanging around street corners;

-In the ares you wouldn't go is anything else about them that effect you decision apart from reputation?

It's reputation and escape route;

photos

Wahington road, Club garden road;

Summary of 3 main characteristic of the areas he would avoid (mentioned a few street names) Club Garden road; way to Cremone or London road? - he is wary

-the kind of people you get around there; flats; doesn't like the lights either; there are dodgy people in that area;

positive areas

Rundel road; not far from where he lives;

3 characteristics that make you feel confident to walk there alone at night

It's safe; you don't get idiots..; generally if he wants to walk alone at night he will wherever;

Sharrow Vale road

He lives down there; no danger;

photos - anything we haven't covered? - psychology is important, he refuses to be intimidated, if you believe smg bad will happen it will……

Interview 30

Q - It depends which streets. He avoids Napier Street coming home and Stalker Walk. He walks home late at night quite a few times but he doesn't use his normal route because there is hardly anybody about -

Characteristics of the streets where he does feel confident to walk alone in the dark at night

Well illuminated; traffic there even after midnight; there aren't a lot of people about -he used to be a bouncer ..have a bit of confidence

Streets where you don't feel confident to walk alone after dark?

- tries to avoid Napier street and Stalker Walk? Walk because there is hardly anyone about; there is a block of flats but it is not principally a residential street; there are industrial places; factories; medical stuff; not well populated at night apart from the big block of flats - little traffic, if anything happens..well....It's not that badly illuminated........waffle......

photos

Not confident

3 reasons what made him choose that specific location

On the South part of Napier street illumination is one issue; - name the other issues?

-there is hardly anybody about; cars are important too

Stalker Walk

It's a footpath, high wall here, not clear, very little illumination; he uses torch there; at six o'clock very little usage; he doesn't use it late at night; even if it was well lit he wouldn't use it

Tell me about the high wall

- It's the Sheffield cemetery on the other side; there is an access to it, but he doesn't go there at night;

Streets where he is confident

Sharrow Vale road

beautifully lit;

Cemetery road; - reasonable most of the way along its length, meaning well lit, don't have to stumble away; if anything happened to you, you can be seen by other; if you are distressed the odd car would be coming up and down the road even after midnight; there are also houses as well;

Back to Sharrowvale road - what was the reason for that? - because its very well illuminated and there is the odd car and person about

Interview 31

Q - sometimes I could be cautious depending where I am going;

What does it depend on? people around; whether there's a lot of traffic; whether she knows the area;

General characteristics why you would feel confident in an area

- well lit; busy; busy with traffic as well as people; sort of preen?

How busy you mean?

Cars passing fairly regularly; few people walking past; you are not isolated;

In general terms again, what about the places where you feel less confident?

Groups of people coming towards you or lingering around corners; if it's dark and also there are lots of buildings that aren't occupied;

anything else? - If i had prior knowledge of the area that bad things happened there then i would be very wary

Her photos

Negative

She knows that certain things happened in that area so it would be wise to be cautious especially in the dark. Daytime is fine -

Are there any time when you would go there?

Definitely daytime; in the evening if it was light I would; if there lots people especially young people around I would be very vary; there would be no way of removing herself from the scene (there is only one road off which leads into a very quiet

road, and that one also leads into a very quite road) if she met somebody she didn't like the look of. So if she thought she might be followed she would just avoid it.

If you had to summarize in 3 main reasons ...

few people walking here; there is car park that isn't used; there is a school then school fields so there is quite a long way before you get to another house on this side so it's quite isolated. She knows a spot where someone has been murdered, it was at an alley way; also drug dealing; people come down there to buy their drugs; there was old cinema which is now a carpet shop; not many people come to the shop; she would be very wary to go near the alleyway which leads back to the main road. Place is quite lonely, knows somebody who was offered drugs, etc. Near the alley way smashed bottles..

anything we haven't mentioned?

leads onto a council estate, surrounded by trees ...

picks out a picture that is the most representative of that area

Next area

Hatfield? house lane

near the previous place, near the school; large pub on the corner, looks fairly derelict; then working men's club.........at night she would be wary, lots of ..people could approach you; busy junction but terrifying at night quite lonely and the people who walk there she is wary of....

3 main reasons

lots of places where people could hang around; fairly lonely; you are quite away from housing; she doesn't anybody living around here, feels safer when she knows;

anything we haven't talked about? it's very dark; trees and bushes;

Next area Barnsley Road main road going to Barnsley Northern General is on it, busy ambulances, traffic lights etc

- same area, but feels safer because it's a main road; people coming up and down; there is a fair amount of traffic; there are lots of people but there are not a lots of hanging around; usually people are going to places, and it is also quite open; there is a good view of what's happening; and i know some of the people who live on this road;

so if something did happen she could bang on their door and get help;

any other characteristics?

don't think it's particularly well lit; it has a fair number of trees but it's quite open; you are very visible as you walk up and down; cars can see pedestrians from a distance; if anything happened they might stop..

next photos / area - Hereward road

Red Oliver - know those people on the road, and if someone followed her she could knock on any of those doors...houses are near, accessible; it's quiet but you do get people passing; lots of houses with lights on, although the street is not particularly well lit; feels fairly secure

Interview 32

Q - I don't like it very much -

Tell me a bit more......

Mainly because there aren't many people around; ....exposed....(she is telling some story about walking up to somebody at 11 o'clock and police asking her what she was doing)

any other reason apart from past experience? - caution;

Do you go out alone after dark? - not very much no.

When you do, what would give you confidence and reassurance?

people; light; houses where you can go to;

What when you don't feel reassured?

light, somewhere you can access people if you needed to;

photos

negative area - near the city center

lots of bars, restaurants, student accommodations; little alleyways; there are lots of louts;

any other reasons you might not feel reassured there?

somebody further up I know was mugged an early sunday morning; this an area where people could be challenging at night; mainly alcohol related;

The bottom of London road - wouldn't feel confident there at night, because people on the street would have been drinking;

next area

in the city center between the Crucible and High Street - it's very lonely even daytime aren't many people; wouldn't walk there night time; there is a little road you wouldn't be able to see if anybody was around;

any other characteristic of the street?

tall, dark, not much light on it; narrow; feels very enclosed;

next - George street 3rd area so ignored. - there are no people; there aren't any street lights you can see; dingy and dark, cuts through from one place to another; wouldn't walk there at night;

Positive areas

Springfield road

where she lives; knows people; even at night no doors have locks on? ..there are street lights; it's in ....suburb, it feels very safe; only a few minutes from here to Abbeydale road; if you get off the bus you don't have to come very far; the houses are not very tall; it's broad; it's more open you could see if anyone was there;

Tudor Square - the center of town

lively after theatre, lit, spacious, attractive; although wouldn't go there in the middle of the night; but she meets friends at the theatre and no worry about that at all.

anything we haven't covered?

CCTV - it's important, you are being watched.

Interview 33

Q - Yes, on occasions I feel uneasiness - darkness always bring an extra set of problems particularly in the city - yes, i do feel sometimes i feel unease but not all that often.

Tell me what could possibly cause your feeling of unease?

on occasion one is totally on his own which you don't experience during the daylight; every two weeks he treks into city center to meet former colleges ..traveling out about 8o'clock, coming back about 11o'clock; sometimes the roads are a bit lonely and dark; you cant' see what's around you very well; but sometimes in the city center

you can feel apprehension because you are not quite sure about the people - why they are there, what they are doing that time of the night; whereas during the day you know that they are there for or shopping...

It's certain fears of not being in control in the sense that your not quite sure what's going on around you...or what potentially could on around you.....they only factor that you are missing here is daylight; during the daylight you can see ahead of you, youths milling around - you can take action - if you can't see them and it's dark and they just come up at you out of blue, your actions to protect yourself are limited. daylight does produce an element of control although for older people that is fairly minimal -

Do you walk alone after dark?

Always, because i have a dog, take the dog out around 10.30 at night; occasionally i go out with my wife something to eat - we normally get the taxi back, but also have walked back.

Could you come up with 3 reasons why you might not feel reassured (when walking in the dark)

darkness; if you can see what's going on around you feel better; not surrounded by trees or high shrubs; if he is isolated he feels insecure

What would be your reassuring elements?

they are obvious

reassurance is sometimes afforded by the presence of some kind of authority - police cars / ambassodors of city center /

Streets

Unsafe

Q - few street lights and only on one side of the road; very dark; woods encroach unto the roadway, anyone could hide; poor lighting; one pathway, no way of crossing over; there is some barrier.. you cant get away; very few houses; goes into Chelsea park which attracts youth ; lonely; never sure what's going to happen

next street

bottom of London road - feels unsafe - it's to do with reputation which is to do with social problems, notorious for knifing shooting, although several pubs there, there is lighting and movements, uneasy there; fight between two guys while they were sitting in the restaurant; feel that anything could happen there;

next- not many street lights; well apart; on one side no houses; there is nothing to stop people there; wall running along there; you are not in control;

Positive areas

Ecclesall road - it's got shops either way; pretty well lit on both sides of the road; bus route (you could always get on it) taxi route; wide pavements; you can cross over; (if there is fight cross over)

next

He lives there. familiar - sometimes not quite safe - it's cul-de-sac used for parking - there was a van with no lights on at 11pm but when he passed by the light came on and there were young men in it...so if he didn't live there he would have felt differently - there street lights on both sides of the road; got houses you could get help from if needed; lighting, access, (to help) feeling able to see ahead, seeing what's going on..get away if need to

photo pairs selection

anything haven't talked about? individual protection, self reassurance - if you have something with you to protect yourself you feel safer - America..guns)- we could have some device to help with protection, some alarm bell / stunt gun etc..

Interview 34

Q - yes,

describe those feelings? - anxiety, I don't feel comfortable; constantly looking around - i am quite nervous now and i never used to be;

What causes the anxiety?

darkness and places where people can hide; and overactive imagination; - but it's very real when it's happening - bec. I am older and have a slight disability and can't walk fast; she doesn't feel she could defend herself if somebody came at to her; so that doubled the anxiety because i feel vulnerable.

When you do walk alone after dark are there any things that reassure you?

people around; big wide streets where i can see everything; good lighting; traffic - people around me make me feel safer - I am probably not but that does make me feel that I am not so alone.

What about...is there anything would make you feel particularly not reassured?

I certainly wouldn't go down the roads i have been talking to you about even though it cuts ten minutes walking time from me..i wouldn't go down there - it's quiet, it's dark, it's eerie, it's shadowy, it sends alarm bells off in my head even though it's probably perfectly safe. But i can't go down there, i haven't got the confidence now to do that.

Now we are going to talk about the places you chose

We are going to start talking about your positive areas

Abbeydale road south

I do use it a lot because there are loads of restaurants on it. I tend to go out to eat with friends and i always suggest Abbeydale Road. Because I feel comfortable because of the bus stops and all that.

Talk about Abbeydale road first

Can you tell what is it about this street that makes you feel confident to walk there alone at night?

I don't like the sense of being trapped. in so the broadness of ... the boulevard ... you can see a long way in front, and the shops even when they are closed they are often lit; so I get the sense that there is always going to be there somebody round the corner, somebody is going to walk the other side of the road, I could get somewhere, I could to a house if need be; and I don't get any kind of anxiety feeling there at all. When I go to town I will get off the bus on Abbeydale road and then I ring my husband to fetch me from there, I would not walk there; I would stand on Abbeydale at a bus stop quite happily quite late and I would feel just ok, bec. it gives me a sense of that I can see what's happening around me and I am not going to be shocked by anything, somebody is not going to jump at me ... I will be able to see it happening

What makes you very vulnerable when you can't walk very well like me is crowds of boys and kids ..jostle you because i fall quite easily and there if i would see them i would make my way away from that but in a small confined road you can't always do that.

photos 1b was taken at Millhouses Park - are you confident there as well?

No, it ends at Millhouses post office,...right from town but I don't think I would go past the park. I

306

would perhaps would on the other side of the road because its still wide...but I don't feel comfortable on Abbeydale road

Any other characteristics we haven't talked about, anything we missed

I don't think it's wonderfull lit because it's a very old road i have been here for 60 years and it haven't changed very much- and i hasn't got some of the wonderful lighting town has - but it's just a feeling that i am nearly home; even the dark bits don't worry me like they do on other places -

Arundel Gate

These are the places i go in the dark on my own bec. i go to the theatre a lot, i go to the cinema a lot; these would be the places i would to the bus at night -

What are the main characteristics of Arundel Gate

Arundel Gate has the same kind of feeling for me as does Abbeydale road; it's wide, the buildings are always lit; so it always seems light, there is lots of people around, there is lots of buses I just feel I could get to safety quickly from there if I need to be ... it's not a very homely friendly place ... quite big buildings mainly office blocks so i know they are mainly empty but it's because they're lit - it's dark and corners i dont like and shadows, and i don't see that there - I walk on there fairly often on my own. yes i do.

Anything we haven't covered that effect your feelings of confidence on that road?

It's very near Sheffield Hallam and there is always lots of students and it feels very cosmopolitan, friendly place...probably it isn't i don't know but i don't feel anxious

The other thing i like about Arundel Gate and Abbeydale road they are fairly flat, i find it difficult to getting up on high pavement, it's fairly flat, there is seating..so i am going from seat to seat if i am going quite a long way up it; I would stop and sit on a seat even late at night; it's lit, it feels friendly

Not so confident areas

Chapel Walk

There are places nearby she visits and she could be at her bus stop in two minutes if she used it but she never walks there in the dark; it's like an alley way, it's full of shops that aren't lit, dark, bits of recesses to Marks and Spencer, i find it really scary; the other thing freaks me about that it like a dog's leg......can't see what's round the corner and the times I have done it in desperation my

heart was beating, years gone by I'd have run there but I can't run anymore.. I don't think there is any light other than shops, one or two street lights on the wall? I have seen people sleeping in the doorways there - my heart goes out to them but they still don't make me feel very comfortable.....

last one

it's like a prison, with all them bars at the shops i hate it ...

It's a real problem because it's how I get come from the bus to to come home, if I come that way i have to come up through a wood, there is a little wood, it is not a known road -it's just an alleyway on the side of the wood, or I come down through Fraser road and I hate both of them. I have to get off the bus and I have to ring my husband to come and fetch me from the bus stop whatever time it is, which is very inconvenient if he wants to have a drink or whatever, or sometimes I get a taxi from Abbeydale road to hear which is ridiculous - but i just cannot walk down there.

What are the main characteristics that make you feel not confident

everything about it - over the railings on the corner on the other side of the road is Fitness First, McDonalds, but they seem to be not part of it they're cut off with big railings, so there is no way through..so all i have got is Laycock? which is a recreational ground and wood; and often the lights aren't on; there is only two and one of them has been out for ages - it's just too dark; also I find it terrible because it is wood on one side and grass on the other they don't clean the pavements any more, they get very slippy with leaves, i can't hold my feet, i can't look down, i can't see, it's uneven pavement...it's got a tiny little bend on it but if you walk down on that side you cannot see past - and we used to have an awful lots of problems at the pub at the corner (it's lovely now) had loads of trouble with noise; people hanging around, it was horrible - then you walked past and one night they threw a glass - not nice - it's not like that anymore but it didn't help me...- it's just all these trees - just scary really

If you had to summarize the 3 things that caused you not to be confident what would you say they were?

lonely, very dark and hazardous under foot

Anything important you think we haven't covered?

i particularly don't like if i am walking down the road and it's dark and there is a pub with thumping music or a car that comes past you and

beeps - that kind of thing starts to make me feel edgy, don't know why, probably somebody is just enjoying himself - 2 or 3 month ago somebody had a party and it was thumping all night i was really on edge all the time i could hear it; i think that it is trigger point for me

Interview 35

Q -- Not really, I am one of those people quite confident, I would say very confident. Whenever I go walking in Derbyshire anywhere I need to find my way alone - six foot tall, on my own, also i have worked in the East end of Sheffield, teaching. I am streetwise as far as the people are concerned and my body language is very very strong factor because they are looking for the more vulnerable ....One body language sign is male - i think that's a massive factor..male - so no, i have no real worries and fears. Maybe one or two concerns....maybe more alert...

Just in general terms what is it that creates those feelings of alertness,..that you're more alert then in other areas?

-example - we went up to Division street towards the university and one evening there was a drug exchange, you become well aware because that that type of activity was taking place and I know other areas like in the Wicker, and Spital Hill - I used to teach in that area and I know you have got to be streetwise and you've got to be alert and aware. It's knowing the district and knowing what might be going off in those areas, and of course if people are drugged their rationality changes

Are there any factors apart from what you know about the area already, are there any other factors that could make you more alert?

Places for hiding; talking about high hedges and alleyways, escape routes and so on..you are talking about not only people but the type of architecture really; street furniture; if somebody is lurking behind a hedge...you're not quite ready for it, they could catch you by surprise

Anything else at all?

no, talked about street furniture, areas of deprivation, ..

Are there any areas where you'd feel particularly at ease, what are the characteristics of those streets?

well, one photo he took is looking down Howards street towards this station. That is pedestrianized, it's wide; it's..CCTV ... hours a day; there is activity going on either at the polytechnic or pub or

whatever, people are walking up and down there constantly; so it's not a matter of you are on your own, or somebody can run off...it's not that type of area - its openness, its high density population; people are moving through; and its lighting of course, good level of lighting yes.

Anything else

Street furniture, high buildings, hedges, feeling enclosed if there is only one way out and somebody gets you at the other end ...that could be another factor.

His photos

Positive areas

Ecclesall road - what is it about that street?

It's a busy street, there is traffic going up and down there 24 hours a day, there is a population going..on the side roads, pedestrians 24 hours a day.., restaurants open at night time, people are coming in and out

What's on the photograph?

Its Nunners it's a restaurant round the corner

It's a wide road, high population in terms of pedestrian movement; there is activity most of the time; one where you go up and down frequently

Any other characteristics about the streets?

Restaurants, pubs, all that activity..attracts people; on this side is the Catholic center as well, people going up and down, up here is the Botanical Gardens, Sheffield Hallam Collegiate Crescent; it's the buildings around it which causes that population movement; it's never a quiet place

Howard Street

What are the main characteristics of this street?

No traffic there at all, you can see how wide it is, the vista..you can see right the way along; and again good lighting; nowhere to hide; people are coming in and out, it's busy 24 hours a day people are coming from the station; Millenium Gallery, it is a main thoroughfare; hight movement; ok there are some places...Science Park....but those people wouldn't go for that type of area.. if i was in their shoes i would be looking for the other type...

Negative areas

What is it about Exeter Drive that makes you feel less confident?

That is an area ...very transient population, where people are put, people with low economic status, and maybe poorer mental health...so it's a ripe area where people could be exploited; I don't think there is community identity as far as I know; and if you haven't got neighbours looking after one another....they are frightened, they are fearful, they are not going to say anything because they want to look after themselves.....getting mugged at the door, so even they saw anything out through this window they are too afraid themselves..likely to be top guns..It's a type of area which could be dominated, on the other hand Sheffield council made a big effort here, its has got grassy area, its openness, the effort has been made to make as reasonable as possible. I am looking for a negative area if you like,

Are there any times of the day when you would walk there?

I used to leaflet there during the daytime with no worries and fears..and i would walk through at night time personally but i would be more alert than would be

Any other characteristics of this area?

I can't see lots of lighting either, i mean street lighting - i think that's one of the big factors; lack of community identity; ..and also the alleyways..if somebody knows this area then you can slip down between these places and get into..as well.

Rockingham place

Very high buildings both sides; there is street lighting there but you've got one, the only way out is one end or another; it's very oppressive; it is an area where if they wanted to they could do mischief

What's oppressive about it?

The buildings, the height of the buildings, mainly the narrowness, the togetherness; as well as what you've got there...wide openness - altogether it's in on you oppressive, and place where you can do your dealing

Anything we haven't talked about

... oppressive building ...

What's oppressive about it apart from the height?

closing in (after he came back from Africa Meadowhall was to him oppressive - that's after the openness of where i have been.); narrowness, lack of exits; closer to Division street where i have seen dealings going on

Interview 36

Q - I don't have any problem no matter where I am - middle of city, suburbs, ... you might occasionally feel a little upset because there is a gang of people there, but you might see those anywhere, so I don't have any problem with the streets at night

Are there any general characteristics of the streets where you do walk alone after dark?

it's a reasonable cross section because I readily go down to ... Harlequin? ... pub at the end of Nursery street, I leave there at 10 to quarter to eleven, walk down on Nursery street waiting for the bus at Castle Gate outside the Market..I don't feel any less safe there then walking down on our road at home; but when i am walking to town at night I ....credit card just in case; (taking precautions)

What is it that makes you take those precautions?

Just in case.., I don't ever feel I am going to be mugged or anything, but what's the point of taking a risk when you don't need to-

Are there any streets that might make you think twice...?

No. When i look at it, do i feel unsafe getting into the car to go wherever - and i don't....(don't get it)

photos

positive areas where he is most confident

The ones near home;

first one - what makes you feel confident....

Because I live there.

Anything else? Not really, it's well lit; most people down there i know anyway; it's just familiarity;

Abbeydale road South ---- what is it about that street?

I suppose I am familiar with it; enough people about, you are never on your own there; it's well lit; it's familiarity as much as anything

We pick out your least preferred area

these houses bec. they are not well lit; although they are quite close to home; they are all near home, but they are not lit;

any other areas?

they are very close to each other;

The Ash Path - the other two are Water Lane; the other one Ashfirm...long road: it's narrow and twisty; it's worse in the daylight than in the dark bec. it's narrow and there is barely room for the cars, not so bad at night because of the lights you can see;

Any other characteristics of Ashfirm Long Road?

no, it's the lack of width and the lack of visibility; feels safe from within my car but not....

Main characteristics on next photos?

It's the lack of lighting; there is one street light half way up;....it's difficult to see where you are going; you dont know who is about

Any other characteristics?

No..

photo selection - anything we haven't covered? no, mentions smg about

his son and gang of youth hanging about........., but fortunately I have never had any trouble with anybody......something about council estates, ...but fear is a lot to do with media hype..things that people didn't know about in the past are likely to be in national news, people think there is more going on than there is, because it comes through collective culture and they relate it to where they live.

Interview 37

Q - depends where I am - I am quite happy if it's well lit and I know the place where there is lots of traffic and people around - if it's isolated, yes that generates anxiety.

What types of area would you have those feelings in?

Isolated country roads; where there is no traffic or lighting, no people - there are some part of the inner city now where there would be quite a bit of traffic and a few people, but where i wouldn't feel absolutely safe. I don't feel absolutely safe in Burngreave anymore walking at night - I did 30 years ago, because I used to work there, i had to do night work and i was quite happy walking around Burngreave - i was recently in the same area and i didn't feel so safe - I felt out of place and therefore ill at ease. I didn't feel that i was part of the community anymore - i don't know whether that's about age; it maybe about age, something to do with being young... she was the only older

person walking around the others were younger, groups of youth, male youth

Was that the only reason or were there any physical characteristics of the street, or was it only to do with the presence of people -

No for me it's not necessarily to do with the physical characteristics - as long as it's well lit, there are people of different generation around; less? traffic, i generally feel safe

The areas where you feel more comfortable about could you summarize 3 characteristics of those streets

- It's well lit, there is traffic and pedestrians;

Anything else

- i suppose where the houses come up to the pavement - in other words areas where there are great long drives like Abbey Lane would leave me feeling more unsafe bec. your access to people is quite a distance, if you wanted to shout people are less likely to hear if the houses are at the top.

photos starting with less positive areas.

Whirlowdale road

Very pretty to look at but really isolated at night; because when you are walking through the walk way here,..it's very near the woods, so it feels that people could be there; it would be a good spot if anyone wanted to pounce out; and there is not a lot of traffic at night; and there is not a lot of pedestrians either; isolated spot of woodland, no houses, sometimes the lights are not always on all the way down so that's makes it worse;

next area is the footpath by Tesco

it's riverside walk in daytime, quite pretty, at night not well lit; the light is not working, very few people use this access route after dark and again bec. of the wooded areas it feels unsafe bec. potentially people could be there lurking; never actually seen that to be the case but it's the woodland areas that make me feel insecure; and that light is quite often not working; two or 3 times i have been at night and i wouldn't go anymore; in fact twice i turned back when the light wasn't on and just made my way and went along Abbeydale road;

Does that path go all the way here?

No it comes to Archer road (then she explains where it is)

More confident areas

Springfield road (tell me smg....)

- it's suburban, the houses, the front garden aren't very long, the houses are near the pavement, there is lots of traffic, lots of pedestrian traffic as well bec. people get off the buses and walk up ; it's quite settled community as well in that there is not a lot of turnover of people;........maintanence?.... ; the trees are not mega bushy, decorative along further up mainly cherry trees are lining the pavement; so you can see even at night; it's well used by traffic; it also got a pub at the bottom and a takeaway; restaurants on Abbeydale road; because of that you often get pedestrian traffic where i live - further up there is less pedestrian traffic bec. the bus only goes every half an hour now; on the other hand it doesn't feel isolated, and it's well lit; bec. the pavement is near the houses you get lots of light from the houses, makes it feel that you have access to people...

Do you feel comfortable walking at the top of Springfield road?

I do. I rarely do it bec, my natural bus route isn't there; i mainly use that to walk up to the library, and i don't do it a lot at night bec. i have no need to go there - it doesn't worry me. and the road is not wide; (unlike on Whirlowdale road)

main points: well lit, houses on both sides; bus route; traffic; has restaurant; pedestrian traffic also;

Bannerdale road

it's a busy road, with street traffic and houses on both sides, there is usually some pedestrian crossing; street lighting is on, the houses the front gardens are not very long, the street is narrow, so i do feel quite safe; very well used traffic wise, you'd feel access to folks if you needed it;

Anything we haven't covered with your four selected areas?

Are there any times when you do walk on Whirlowdale road or the pedestrian walk way to Tescos?

I have done it this winter, early evening time about six to Whirlowdale road ; I wouldn't go again...dont' feel safe......

Interview 38

Q - depends where i am, some areas i feel relatively safe although obviously it is more difficult in the dark, in other areas i would feel very uncomfortable - walking in those area she would rush, put her bag across her chest; ...pockets, would be very focused;

In general terms can you tell me smg about the streets where you do walk alone after dark?

Walk along Ecclesall road on my own, and the South-west area on her way home; i do walk in a lots of areas but i wouldn't go off necessarily the main streets unless I knew the side streets were safe; i do also walk up to Bents Green on the road and back....I would walk on side streets that seem calm and resting;

Summarize in 3 characteristics the streets where you feel reassured....?

I like it to be light; lots of it to do with the area ...in; if there are people around or not; and if they are probably slightly wider

What about the street you would choose to avoid?- any common characteristics of those streets?

Lots of the time, it's if the houses on them are very enclosed, or very forbidding, even though they are very shut off from the streets, than you feel more alone or whatever..

there are areas where people might be congregating, and areas where there are parks and greens where people could congregate......exit (doesn't make sense); also dark, narrow streets;

What makes houses look forbidding?

to do with........ particularly where walls are high and they are set back from the road and you can't see them; or they have got big walls or whatever in the front; there is no visibility, but there would also be roads where the terraces are fronted on the streets..but where you didn't feel that anybody would be interfering, or come out ...

What does not welcoming mean?

In area i know to be quite rough; quite mixed and i would probably be more nervous walking around Heeley or Nether edge at night because I know there are lots of drug dealers and stuff; and i also know that they are very mixed areas, i have no racial problems, I know people who live there and do have lots of problems, there are guns on the street....and people do drive....shooting things ..we don't hear about it - basically areas that i know to be quite violent; areas with big blocks of flats are quite intimidating;

Anything we haven't talked about?

Visibility as well; where the roads are very curvy and you have blind spots; and you don't know what's going to jump out at you; ... also about can you assess what's ahead, can you get out of places as well;

photos

1. Brincliffe edge road

Beautiful road, people would say it's like a bit of countryside, in the middle of the town, and i do walk up there in the day, but i would find it quite spooky at night; i wouldn't walk up there in the night; I walked along that woody grassy slope, path and found that even the daytime quite spooky; even though people walk dogs there and some of the dogs are quite vicious, there are lots of gaps where people could come out at you; lots of blindspots because it's very curvy, you'd never see what's round the corner; it's a very narrow pavement;.......I would feel very uncomfortable - there are trees and everything - there in the dark; and also the streetlights are only on one side of the road; which is probably why it feels dark when you are driving up; - but it struck me that i wouldn't want to walk up there alone at night. it would feel spooky and the trees and open space doesn't help..you can see, there are gaps, and further gaps going up....you get the odd not very solubrious character there; but it's not even in a bad area; ....(the rest is repetition.!)

2. Broomhall

Walked here to the university, find the whole area quite difficult - the underpass is probably the most scary bit; probably wouldn't go there in the evening; i am very unsure around many of these blocks of council flats; partly bec. i know there is lots of drugs and violence; know that lots of the gangs live in these places; ...even her son does not go to this area......(things her son told her - I give it miss) ; you feel you are not part of the community; they know who is local and who is not; she knows lots of honest people are living there; so it's because she knows stories... - so feels its not really safe to walk down there;

there is a bit of grass where anybody could jump out at you; she often crosses over when she gets to the petrol station on Ecclesall road; they have railings up - quite uncomfortable;

so it's about security

Anything else that we haven't covered?

I don't know what the lighting is like bec. i have never walked there in the dark; the street lights are not that near to each other by looking at the picture; it's quite wide,.....the forbidding thing is

that mass of flats there.....; and also the in rest of the area..lots of drugs are dealt;

Are there times when you do walk there?

I have walked there and felt towards the end uncomfortable during the day; even during the day i could get mugged;

Reassuring streets

1. this part of Netheredge is safe area.

Union road / netheredge road?

It's straight and short; knows somebody there; walks there regularly; goes to Netheredge market, walks up Chelsea park ...; wouldn't worry her so much at night; there is a big house with stone wall but it doesn't feel that anybody will jump out at you; wide and open bec. you've got these ...; you can see things going on; when you asked about welcoming houses - these houses don't have high walls in the front, high bushes in the front; ... they are a bit set back from the road so they are not very austere to you, but you feel that it is a quiet residential road; it has some trees but it's not totally obscured by trees; pavements are wider than Brincliffe edge road; pavements on both sides; ....you can see at a long distance what's coming; never seen gangs of youth congregate;

could have picked any side streets on Ecclesall or Netheredge; she likes it when houses are set back so you are not right close to people's front rooms but there is some barrier but not a big one..neighbours cut back huge hedge and it feels much safer......;

Summary of 3 main characteristics..?

straight, reasonable width; houses don't have high walls; you don't feel you are really on your own; there are escape routes but...quite open; there aren't people hanging around;

next Ringinglow road

It compares with Brincliffe edge road, you've got the cemetery, she did walk there in the past in the dark and she did meet young people coming out of the cemetery but they were fine; but she knows local kids did do drug dealing in the cemetery; however those kids aren't necessarily to sort who would mug you for money; it's a wide road, well lit road; it's a bus route; the houses conform by and large with those she mentioned earlier - no high walls, set back a bit; no high gates up; pavements are very wide; very well lit, lit on both sides, and they are frequent bec. they have two schools; there aren't any little places to jump out from; although it's a bit curvy there are long areas of

straights; normally where you are you can see round the corner; no blind spots on it; the only spooky bit is the cemetry;

3 main reasons:

wide, well lit; safe area

photo selection

Anything we haven't covered

I don't like isolated places, i don't like dark places..particularly i don't like underpasses…

Interview 39

Q -- not really, i am not alarmed, not frightened usually -

......something about the streets where you do walk alone after dark?

mostly when i am coming in and out of town; - if i am coming back after the theatre, cinema or train station - no problems with getting home

Could you summarize by some characteristics what these streets have common with each other?

 they are pretty well lit; in town few people around, not many, when i get the bus usually nobody is around.... they are quite, ok.

Is there anything that can make you think twice before going down on a street?

If I went down a corner and saw a large group of young men looking rowdy and drunk - I would probably be trying to avoid and go a different way.

Are there any streets in Sheffield where you wouldn't walk?

I would prefer not to walk on West street on Friday or Saturday nights bec, you can get pushed and shoved..

Photos

1. story - A street where there was/is a yard where youth used to gather and they threw a water bottle at her husband; after that she was a bit wary of that but they have grown up now.....or gone somewhere else..and sometimes they used to be on the church steps -

Confident areas

1. Ford road

reasons why you feel confident..

It's quiet, it's well lit, it's residential street; so far i am aware there has never been any difficulties,or trouble, and there is nice cat ..

High Storrs Drive;

Main reasons why you feel confident?

It's familiar, it's well lit; it's a quiet residential street;

With the other photos you took is there anything else you havent' mentioned?

no, they are all near where i live;

Tulibardine road

used to be some boys hanging around there but the booze shop closed down ; at night it is darker; there were fewer people about; once you get cross the corner into Banner Cross there are loads of people; there used to be railings in front of the church steps which seemed to have encourage them, then they removed the railing and now they are not there -

West street - why less confident?

Not a residential street, shopping street, fine during the daytime, but friday and saturday nights particularly after 11pm it can get quite noisy and rowdy and you get some pushing and shoving and i have had some verbal aggression along so wouldn't walk there by myself. It's perfectly well lit - but can get rowdy

One place i don't like is.. from Arunder Gate to the Interchange - there is a flight of steps and underpass; fine during the daytime, not so keen at night esp. the underpass -

Reasons for that?

Bec. you feel enclosed; if met a group of rowdy..where would i go to, bec. there is no escape - it's gloomy and murky down there, but nevertheless i do do it.

Anything we haven't talked about?

No

Interview 40

Q - doesn't bother me.

Can you tell me smg. about the streets where you do walk alone after dark?

It's mainly in the city center, and then round where i live bec......between..and the cinema and the bus stop and home

Do those streets have common characteristics are they quite different?

..streets are residential; ....depends what day of the week it is; monday, tuesday, are ...better, friday, saturday tends to be busy street chavs? are getting drunk.. - depends what time of the night in the week it is as well - if you go home at ten o'clock it's different from 11 o'clock.. - it's different now that pubs haven't got chucking out times, no they come out at different times ...

describe 3 things that made you feel comfortable walking alone.at night?

Lighting, street lights as well; ..residential area where there are lots of houses about.; and other people about as well; where i live now in students area there are people about..

What about the opposite, if there are any streets where you think twice about going down...?

Certainly there aren't any where i live, there are one or two in the center that I would hesitate to pass on my own; particularly the ones with bends in, bec. i can't see what's coming over.or the ones are not particularly well lit..if the shops are closed and the windows aren't open .. there aren't many really,

1.a Tapton? or tatton? House road

This is the street i walk up when i come home from the 51; it's a residential road and the houses are set further back and there are lot of big houses turned into flats so you don't get the lights from the houses then you do on the other road; it's wider and it's got bend in it; and the street lights tend not to be all on; it has a different feel and i don't know why bec. it's still in the same area - never had any trouble walking past, but i have a different perception..bec. it's a bit darker and longer than the other one. It runs from Manchester road, and ends....Tapton crescent road...

Chapel Walk

Ok during the day; at night she wouldn't there on her own because the shops are closed and there are no lights on, no street lights, and it has a bend..you can't see round at all; don't know if anything is waiting for you round the bend; if there were two of you, then i would walk..; it feels quite closed in, the wall on one side is very tall, and there are quite a few empty shops as well with dark doorways; not part. nice; so i tend to give

that one a miss; never heard anybody being mugged on Chapel Walk, but doesn't feel quite as safe somehow..

Confident area

Bute street

This is where i walk home from the 52; it's shorter road than Tapton House road; it's not as wide and the houses are terraced houses by the pavement, there are always lights on and there are usually people about bec. people usually get off the bus here, so you are not usually walking up on your own; there are usually people about, it just has a more friendly feel to it; and it sheltered? as well; it's shorter

What makes it feel friendly?

I think bec. the houses are unto the pavement, the houses are nearer to you, they are more lights on in the houses and the streets lights are better, of course you usually see somebody about anyway

George street in the city center - i wouldn't have walked there at night; i don't why it feels less threatening than Chapel Walk..bec. it's got that bend in it; although you can almost see round the bend,...jumble..where the Chinese restaurant is, so that's open late; just as you go round the bend there is a hotel as well which usually has got lights on, you can almost see the end of it whereas on Chapel walk you cant- it just feels less threatening; because the lights are out?, you can hear the traffic as well - you can't on Chapel Walk, there is no traffic; the buildings are quite nice as well; just a bit more life on it;

Anything we haven't covered?

It's just feelings i think,,,some places you don't feel as comfortable...

Do you think they are coming from you or the environment?

A bit of both. If you never had any problems, if you feel more confident you're less likely to be attacked - Sheffield is the safest city anyway; plus other peoples' perceptions as well, they get passed onto you

Interview 41

Q - I am very happy in this area bec. i lived here for thirty years. So familiarity makes it easier. If i was in the city center I'd go where it's very light, Tudor Square, Winter Gardens, all that area is fine. But if the streets at all dark I wouldn't enjoy it.

If you had to summarize 3 main characteristics of the streets where you do walk alone after dark what would they be?

- Suburban, familiar and enjoyable - bec. of the gardens.

If you had to summarize the characteristics of the streets where you'd be weary to walk alone after dark what would they be?

-They would be streets without shops, poorly lit, and probably in the city.

Anything else you'd like to mention?

- If i was walking in the city at night it would be because i had a destination - the theaters, cinemas or the city hall. So i would walk fast, i'd know where i am going and just get there.

If i am walking in the suburbs, i would be more inclined to think i need some fresh air, i go out and walk.

Photos

Dalewood road

Tell me a bit about the street? I used to live on it, so it's familiar to me, i know some of the people who live there, i would be quite happy - bec. I't familiar ground, i know the pavement.

Anything else about it?

The lighting is not marvellous but it is at fixed intervals, because i know the road i feel all right; and there are dog walkers,...yes, happy

Folds Drive

Similar situation - Again, i would be reasonably happy, because i know the road - although it is a very private road, bec. i walked it so many times during the daytime i wouldn't be worried.

Campo Lane

In the pictures it looks lighter then my perception of it when i walked there. I think the reasons i am not happy here are that at night there are not many people here - there is a car park..what has put me off that i go to the City Hall for concert and we have always been able to park at....near the City Hall - that facility has been taken away and we were advised to park at the NCP one on Campo Lane and when I looked at it with a friend i thought 'it's very lonely here'..there aren't many people around and i've discovered this when i have been in the city center with some friends who park always off just Campo Lane. Obviously i

felt safe walking down with them, but i still thought it was dreary down there, 'there aren't any folks around, and it always seems to me fairly dingily lit - consequently i don't park on Campo Lane because of that perception for being lonely and. I always go to the "Cheesegrater" where it's light and bright and there are plenty of people in that area.- restaurants and things...So although during the daytime I might wonder around there..back of the cathedral, it's not an area I would particularly want to go at night, certainly not alone. IF i was with a friend ...parking over ok we'll do it, but - no.

Discussion about it being busy on saturday night with students...

Locked shops with shutters down at night is also off putting, there is no light coming from the shop, and I am not a public person and the fact that there are some pubs down there would work against rather than for me bec. I would think what state are they going to be in as they come out

Any other characteristics of the street?

Even in the daytime i think it is pretty lonely - I do go down occasionally for coffee..you never see many people around. It's just sort of away from the High Street, just the fact that it is blocked by the cathedral and it seems to be the kind of area where would be if you had business or wanted to go to..........it's not my territory

The last one, Beauchief Abbey Lane

The lighting goes to the cottages and there is a little bit further up....perfectly happy with daytime walk. At night, because the lane is narrow and twisting and there's not much light, my main concern would be that somebody might run me down, bec. there's a sports club at the top and even daytime you get one or two mad drivers who don't take much care as they buzz up there; again it's familiar territory but i wouldn't go up there at night.

The bit down at the bottom as you come to the cottages - there's plenty of lights there, and as far as Beauchief Abbey it would be alright. But I wouldn't then follow the main path.

I think the main danger is other people - just as probably on Campo Lane i would be a bit worried anybody i might meet, on this suburban lane i would be worried about the motorists.

-On Campo Lane when you've said it's a bit lonely, i am wondering about other people, what's the difference between the ones who you wouldn't want to meet, or the ones you want to be there and stop you being lonely?

If I am in the brighter lit center, Far Gate, even High Street, the area around Leopold street, StPaul's area, the Winter Gardens, Tudor Square, all of that, you know there're people there out for the night, plenty of them, you may get some boisterous crowd buT I am not concerned because there is so many around. Campo Lane is just that fraction off the beaten track. So if there was a rowdy group coming towards me on Campo Lane I would feel apprehensive in a way that I wouldn't i were near the 'hub'.

Interview 42

Q - Not for me no. But when i go out with my wife at night that does give me concern especially in the darkened areas bec. she is partially sighted and the pavements in Sheffield are not the best in the world.

Can you tell me smg. about the streets where you do tend to walk alone after dark

-The only time we go out is to see friends down at Meersbrook and up at the club at the top. There is a photograph on this street which is poorly lit, so I am not too happy with..but we do go up obviously....but not too happy..basically we don't want to go out at night at all.

If you had to give 3 main characteristics of the streets where you do walk alone in the dark what would they be?

- poor maintenance, poor lighting on some of them, and overgrown hedgerows but other then that not too bad.

What about streets that you purposely avoid? I don't purposely avoid any streets.

photos - positive streets where you feel confident

- like Baslow road where there is plenty of lighting, Green Oak Avenue; Leamont;

Baslow road - Nice and wide, dual carriage; lit on both sides of the road, and the hedgerows are nicely trimmed; you've got bungalows facing the road, well kept properties; it's just comfortable to walk on with the lighting and everything.

Green oak road

Ok, bec. there is lighting on both sides of the road; it is a bus route, the houses are well set back, no protruding hedgerows directly unto the pavement - nice and comfortable walk

Negative, less confident area

Leamont road - that is a singular lit side until you get further down where it switches sides; there is no parking on one side, you've got a building site that's been there for nearly four years, and it's only recently that they cut......round this corner you've got a parking area which is well lit, but is comfortable, here there is a library entrance, than you've got flats on either side; basically what i don't like about this one is that there is parking on one side, it's a very narrow road and some of the idiots do tend to do more then thirty coming up; and unfortunately the lighting for that is on the other side of the road, so if anybody's coming in if you're in the shadow they can't see you. So that is a difficult road to walk on.

Green Oak Avenue ---- took this at dusk, you can see how poorly lit, there is only one standard...down one side, if you get down further the light standard changes (lamp posts) to the other side. This is a complex that's been built like on Leamont..they've just started after four years to sell these houses, so they had all this area darkened off; down at the bottom you've got hedges that come unto the pavement - anybody can get behind them if they want to. A bit further down there're still hedges - so this is the worst of the lot out of these.

Anything else..? Apart from road and pavements in terrible condition- no.

putting photos in order.

anything we haven't talked about

all to do with poor conditions, you can do with the poor lighting if you've got good surfaces to walk on. People who are partially sighted some of these roads are treacherous. In Derbyshire there roads are magnificent compared to ours. Heard that the council might switch every other lights off - that would make it ten times worse for everybody. It's about saving money and complains that public buildings are all well lit up ….

Interview 43

Q - It's not something i do regularly bec. I drive. I am reasonably aware these days even in daylight. I am not anxious, not uptight about it but more conscious than would've been sometime back

Reasonably aware what do you mean? The situation around you. Whether it be youth, or darkness or just empty space or whatever.

If you think about the streets where you do walk alone after dark, assuming there are some, can you give some basic characteristics of those streets?

They are very......around here, very open.

Three reasons why you don't feel concerned when walking on those streets?

I am very conscious if there are no houses, you haven't got gates and doorways where passing, if its all hedges or vast open area i'd be more in in trepidation then if you know you're passing civilization.

Tell me smg about the streets you would avoid after dark, where you don't walk.

Really, just what i have said - example, I used to play badminton on one of the roads she has photographed, her daughter gave her a lift, and she did walk there once but she would never have done during a winter night - bec. there is a school one side then you've got a hedge, and it's all open playing fields on the other side before you get to where the estate is

Are there any houses there? No.

Anything else that effects whether you're feeling reassured or not?

Obviously it's the lighting, if it's well lit then you are more inclined to feeling comfortable than if you're in dark shadows for a long periods of time.

Even in an area where you played badminton, if it was well lit it wouldn't make any difference.

I think it is well lit, it's a bus route, but it's the hedges and then you've got the open space on the side and its the anonymity of it somehow...

her photos into positives and negatives

Most reassured areas

round the corner where we are, familiarity and everything else..

Twentywell Lane - leads from Bradway down to Abbeydale road south - you've got the train station at the bottom, you've got shops at the top, in between time you've got sections of the road where you've got properties, the rest of it is just a rural lane. It's a road she used to use car-wise bec. she used to go to the dentist that way, she used to use the shops, but she would find it quite sinister in the dark

What are the main reasons for those feelings?

It has got a very narrow curve for a start, it's got lots of trees, it is used, but not used by a lot of people, again it's just a nobody around situation,

you've got to go quite a way up before you come to civilization;

Anything else about it? the lighting isn't all that bad, but it's not comparable to Meadowhead; i think it's just that it's quite, very pretty in daylight but a bit foreboding in dusk or dark.

Streets vary from section to section

Dyche Lane

It's in a bus route, you've got the Meadowhead roundabout here, Norton college on one side, then houses way down the bottom of the road. Again. you don't see so many people walking up and down, it's and area where you've got a dense hedge, the lighting is good bec.of the bus route, but it's just that sense of openness on one side and hedging coming unto the pavements on the other.

Anything else..? no.

Street just round the corner from her house - very busy thoroughfare now, I feel comfortable there, a bec. it's so close to home, b. there's always people walking and driving, even though its open on ones side you've haven't got to walk there, you've an option to walk past the properties on this side, and the same going through the village, it's a twisty little lane that goes through, but you've got the properties there,and invariable activity with the shops and pubs in the evening, so there is always somebody walking around; the lighting is good;

Anything else?

I think it's bec. it's your own patch and you know it, feel familiar with everything..

Meadowhead

Main thoroughfare coming out of Sheffield, going to Chesterfield, it's a really busy route, you've got the big supermarkets Morisons, Graves Park on the other side, you've got the contrast of the rural aspect and the urban; but again, you don't have to walk on the wooded side...i would walk on the house side until you get further up where you've got paths on both sides of the road; well lit; well peopled; just busy all the time; no problem at all with the lights in that area;..

photo pairs.........

Anything we haven't talked about....?

The other thing is your personal state of mind at the time - if you'd been watching smg on the television or read smg in the papers it might effect

317

you, but i you're an up-beat sort of person you go with an up-beat sort of mind

Interview 44

Q - Not really.....

Can you tell me smg about the streets where you do walk alone after dark?

They tend to be in the city area; they are fairly well lit and populated (there are other people about); not lonely student spots;

Can you tell me smg about the streets where you don't walk alone after dark?

.....an area where there're closed up factories & houses and so on; that?....thinks more about the safety of his car then him.

3 characteristics of the streets he avoids walking after dark?

If they're poorly lit; tend to be very few people about; maybe if in my mind I think it is a bit of crime area, or potentially a crime area. I may not be right...

Where would the idea that it might be a crime area come from?

If the property itself is run down; close up, factories and other signs...graffiti, litter; all that kind of thing

Talk about photos

positive areas

very familiar to me; i would know people, houses and properties if there was a problem; main road well lit; traffic always about; people always about

Greenhill road through village

two pubs very close by so there's always people about at night time; it's a well known area to me, it's quite well lit and generally bec. of the nature of the properties.. - generally people about and traffic

Meadowhead

Even more so, than the others; very much a main road, at night time very well lit; a quite a well kept area; even though ....park area, in my, mind it's a safe area..feel comfortable there

Three main characteristics that make it feel a safe area?

Well lit, you can see clearly what's front of you; and it's busy, security

Less reassured areas

Dyche Lane

Can be isolated, not much traffic or people about although daytime it's different because there is a school; night time it can be quiet, it borders by hedges and open fields..

Are there times when you do walk there?

Yes, not so much anymore bec. it's an area where i used to teach...i do on occasion walk there but wouldn't say late at night.

Twentywell Lane

For a good section of it there's a lack of pavement; you haven't choice in many ways there bec. of the nature of the road - it's steep, at night time not that much traffic goes up and down there. It has it's safety problems the main one is if anybody is walking there..it is quite isolated, there are hedges, very little housing beyond the hedge, on one side there is a drop away from the pavement; you can't see that far in front of you. The main thing ...pavement and poor lighting

Interview 45

Q - No, not particularly. We have got get this in perspective here bec. obviously..not very frequently that i walk, i am in the car and usually got the dogs with me......they only thing that do scare me if i am taking the dogs with me in the park..you know where Bihops House is? There is a little cut through Bishops House which is more or less on the main road, a few little steps on the side, and there is nearly always a gang of youth and girls hanging around there at night, and they intimidate you; they have a go at the dog and start barking, making comments about you..older...gets annoyed with them bec. do it everybody...i stopped going that way now...that's the only thing that annoyed me but that's not on the road but off the road at the beginning of the park.

Can you describe that area to me?

It's only up the road from here, lovely area, very nice houses, quite well lit, obviously not well lit in the park if you're going there in the winter, it's a busy road, main road....nice people who live on the road, it's just somewhere for the kids to go, and they do that and then they get cocky bec. they are showing off to each other...they are probably quite harmless, but they found one or two dogs hung in that park............

Maybe the one (road) on the bottom of Heeley Green where there is a pub on the corner..you get a few lots of youth hanging around; they don't talk you but it's the presence of them, and they are pretty rough, but i am normally in the car when i go down there.

Do you ever go out without the dogs?

No.

Tell me about the streets where you do walk after dark?

This one going up the road to the park, which i would normally do, and down the road there's some gardens and some allotments, that's quite nice walk there, but would never feel scared there bec. the houses are big and nice and I've never actually seen anybody who is not doing the same thing...like walking the dogs....So the only place i would walk on a constant basis is down there......it's just the youth in the park that annoy me...and walked higher up and that's been fine. Sometimes i walk to my son or from his house to Coop, that's fine except when youth is hanging around, but it depends who it is that hanging around...But I walk there sometime..But I don't walk on the other side of the road bec. of the youth that accumulate there.

3 characteristics of the streets in general terms where you would alone after dark?

there are loads of cars parked, people walking up and down, you don't feel threatened bec. its more or less like a community; a little further down the road there are some Asian families and youth and they are very threatening, they don't like dogs and they'll have a go at the dogs, but the lighting is fine...

there are houses on either side of you (Sylvia road?) you're not isolated, there are cars going up and down on it all the time, there is activity some way all the time so i wouldn't be worried on there.

General characteristics of the streets you would avoid..

Predominantly the youth hanging around; you'd want the lighting really bright up there (she is talking in the context of the streets she knows near her); if it has the feeling of apprehension about it;

The main thing the apprehension comes from?

Gang of youth; one characteristic of this street that the traffic goes down very fast, scary, dangerous for the dogs - you just avoid the area you are not happy with..

photos

Streets she avoids

Carfield street

It looks erie you get gangs of kids hanging around the chip shop, there are nooks and crannies where people could be hanging around; I have a feeling of being uncomfortable when I am on that street; there is the doctors surgery and a car park, loads of places where anyone could jump out on you;

What makes it erie? -

The look of it; maybe it isn't well enough lit; it just looks anybody could be hiding behind any wall, if I walked down i would probably walk in the middle of the road; i wouldn't walk on the pavement on either side; the makeup of the place - it has too many little bits and bumps, walls and trees; there's no houses down there, no one walking down there, you are quite alone on that streets; if anybody attacked you nobody would hear you; the nearest is the chip shop and some sheltered homes which are way back ... It's isolated, nobody would hear you...so you feel very vulnerable walking down there; probably bec. i have never seen anybody around..; occasionally a car would come up or down the road; it just feels uncomfortable

Kent? road

Main thing is gangs standing outside with drink in the pubs. again you are isolated, there is nothing to make you feel comfortable, no cars, nothing; lack of people around; nooks and crannies...just the feeling of the place, maybe it is the isolation

OK streets

Carfield road

There are houses on either side of you; there are people around and houses within reach distant; constant traffic; its the continuation of the road where her son lives; just a nice road; things are happening; traffic is on it; houses are near to you, if you shouted people would hear you; i don't think i could ever live in the country...i know the area, where Chris lives....

her road, I know it bec. i live here, it's familar, know the shops (Coop) etc. i have friends, neighbours if anything happened i could easily access someone; well lit; (sometimes one light goes out which makes a huge difference); an active area with nice people

she goes round the back with the dogs on Thorpe House road

photo pairs - anything haven't covered - no, main problem is the speed of the traffic

Interview 46

Q - Not really. Where i come from Mexico city, it is considered one of the riskiest cities in the world and ..city like Sheffield feels completely safe. I go out and stay out until 2 or 3 am and go back to my flat and no problem with it.

What is it about any street that makes you feel confident?

For example like big streets, like two or three lanes on one street, buses, people walking on it, probably light, I think that's the kind of place that makes me feel safe...for example West street where you have several... places; that kind of place makes me feel safer than the street that is completely alone;

You mean streets where you are alone or where the street is empty?

Meaning walking alone; there are some streets where there are no houses but like warehouses - those are the kind of streets I try to avoid bec. there is not a lot of walking people walking at that time, in case you have any brawling.....you don't know where to go bec. there are no places you can ask for help.

Any other characteristics that would make you avoid a street?

It is about bad lighting I think, that it is full of warehouses instead of houses, it depends, there are some streets that I like, with the walls and stuff painted, that makes me feel like not unsafe bec. it's a sign of kind of vandalism at night it should be not secure.

Anything else.? Depends who is there, If someone is sleeping on the ground it's not so good..- we try to avoid those streets

his photos

Street where he does walk

Seven road

all lights are working, there is the hospital in front of it, there're people, all the ....street is full of houses; there is usually cars stopping? it's close to ....avenue, that's...makes me feel safer, besides my friends live there,

Withens?...road

this is one of the most popular, lots of people walk on this avenue at night, kebab places, lots of students living in these houses; the light is really good; bus stops close to each other; there's always people like footballers..(there is a football pitch nearby) - there is always somebody there; you don't see walls painted, ..you only see students watching movies...at the nights - makes you feel confident about that area

Streets where he is not so confident..

This area....roundabout and underpass where people are walking under there; between these tunnels where it is painted, (graffiti) if you are walking at night you cannot see properly if someone is approaching from the other side; the lighting around the roundabout is not so good; sometimes it doesn't work properly; people avoid to go there and prefer to cross at the street; it's usually not so clean; most of the time a couple of people are sleeping in the tunnels; there is nowhere you can ask for help;

Exeter drive

This is a street...apartment towers, there are 3-4 floor apartments...closed street no cars are passing this way, or people; the lights are far away from each other, there is a park here but in all this area there is no like..any stores, or parking; all the houses are in the dark...at night there is not a lot of light there, my friends told me this is not a good neighbourhood...prefer to avoid it.anything else?

If i see apartment buildings that do not look nice, if it's not a safe neighborhood..it does not give me confidence..everything feels shut down so that you feel people do not want you to go out ...

what do you mean by 'shut down'? Curtains on windows are down so you cannot see who is inside, if somebody is coming out..also the lights not go out to the streets;

Interview 47

Q - Yes, you are not sure what's happening around you, if it's a bad district, bad area, dangerous places...

How would you summarize your feelings

It's like not sure of what's happening

Main things that contribute to lack of reassurance?

It's objects around you, it's people; ..generally it's buildings and people

What about the people?

how they are dressed, it's also depends on gender.....if i am alone or in company

What about the gender?

If you see woman you feel more safe that if you see man

How do buildings effect your feelings?

If you see a not usable building with broken windows or just dark...makes you feel not confident..if you see modern lighting its better

What contributes to you feeling reassured?

Lighting, lots of lighting and if you're not alone but with someone else; and if it's daytime not night time

his photos

1. construction site,... you don't know what's behind the fence; .

Are there any time when you do walk here?

Yes, when i am just passing..

any other characteristics? - no life? there..?

2. It's looks like a not usable factory or smg.; lots of rubbish and no lighting, seems like pretty scary

Do you ever walk there?

Yes, I walked once, I saw like a prostitutes coming in - I think it's quite unsafe

Tell me more about the time when you did go there?

Usually i go after lectures, it's cross road.......

Positive areas

photo 3

This area is of students;..wide road; lot's of people...

photo 4.

also bec. the street are very wide; there are student buildings and intensive traffic all the time; lots of lights ...looks quite clean also

photo selection -------- anything we haven't covered?

it being different when you walk with somebody else, if you go with somebody else you can choose an unsafe route...bec. you're talking.

Interview 48

Q ----Yes, I hear boys......look back after ......meters

What does that make you feel like? I feel i need to get home or get to my destination as fast as possible;

Are there any other characteristics, if you tell me about the streets where you do walk alone after dark?

It's like normally between Information Commons and my home; around the city center, about 50? minutes walk - there are areas that are really dark and there are areas i feel safe walking in ...

What are the characteristics of the area where you do feel safe?..three reasons

If there are sufficient light there; lamp stands nearby; and there are people walking by; and I am familiar with the streets; like it's not somewhere I haven't been before;

What are the characteristics of the streets where you feel less confident?

for example like.towns...? or streets without any people...just really quiet;

Anything else?

It depends on what time, after midnight you get the feeling that it's very dangerous...

Why do you feel that after midnight?

Bec. ....people shouldn't be wandering the streets on their own that time...

Her photos

photo around IC

What is it about that street that makes you feel confident to walk alone......?

Even it's dark there are students coming into IC and going out of IC, cars pass by bec. it's a roundabout and very busy;...and also it's the most familiar place in Sheffield, so i feel comfortable walking there day or night; there is sufficient light but then there are really dark areas ?

2nd photo

What is it about this street that makes you feel confident...

Student accommodation here; this area is also where the trams go by; it's not quiet at night and there are always people; also there are ..shops and the sport center down..; I always take this route from the IC going back home;

Do you live here? Yes, just a bit further down, I always take this route - I feel comfortable

Any other characteristics?

I always chose streets...lots of lamp posts, and sufficient light..because in the Uk there aren't really many lights on the streets, dark areas.., soft light - I tend to walk not the places that really dark..

What do you mean by soft lights?

In comparison with the country i live in Hong Kong - the lights are dark

In Hon-Kong or here?

In Hon-Kong the lights are brighter - they are really less bright here, also the streets are wider in Hon-Kong

Photos where she doesn't feel safe

St Edwards street

It's a link between.....streets; it's narrow and really dark when it's night time, and I tend not to walk here bec. I can't see anything

Why can't you see anything?

Because there aren't light there....one here one there....and sometimes it's not working, i don't know why - i tend to walk along here to lectures in the morning but not after 6 pm. Whenever i am walking there i feel insecure....it also leads to. (somewhere)......insecure.

Scotland street

(she doesn't make sense) something to do with shops where nobody is working..people used to put rubbish in there; even daytime few people are passing by; ...there are garages..tend to avoid it. This street leads to the city centre..and another one..

Which one do you walk on to the city center?

.....where the tram goes, i don't go out very much at night;

Anything else? .....not many people walking there

Interview 49

Q - No, not really, depends what king of neighborhood it is, if it's quite a run down place i don't really go there...usually i am fine walking alone in the dark if there aren't any dangers associated with it...i am ok

Can you tell me a bit about the area generally where you do walk?

Main streets, busy roads, where ...street lamps as well;

What about areas where you feel less confident?

Run down areas, places where it is really dark; where trees everywhere and can't really see;

When you say can't really see, can you tell me a bit about that?

.....trees and stuff..

her photos / areas

photo 1. What is it about this street that makes you confident to walk there alone after dark?

..Street lamps; lots of people along there, so if anything did happen people would hear..; not really very secluded;

Do you know people who live on this street or not?

No;

How often do you walk there?

Quite a lot, once or twice a day;

Is it a route to the university? Yes

photo 2

I live on it, it has got street lamps; lots of people live round there; security.....going up and down;

Are there any other things that effect your confidence walking in those streets apart form what we have been talking about?

There are other people walking there too, but even if I am on my own I am close to my home anyway...

322

Less confident areas

photo 3

It's just a little path, and it's fine there are street lights and stuff, it's just at night lots of people hang around there; really drunk, ...come into contact with them bec. rowdy and stuff, so i just stay away from that bit...go round

Are there any times when you do walk there? Yes, during the day, it's fine during the day..

Are there any other characteristics of that street - if you can give me one more reason?

photo 4.

It's the street I go on to the uni, and it's fine during the day, but at night no one is really there, it's really dark and at the end of the street there are trees and stuff..a bit scary; I don't think there is any light or anything; people said that that's where Jack the Ripper hid his bodies and stuff...so scary. So it's just there are trees and stuff and no lighting..no one is ever there at night.

Are there any other things that effect you not feeling reassured in these streets that we haven't discussed?

No, it's just no one really lives round there..

Streets in order of preference..

Anything we haven't covered - no, it's the areas reputation

Interview 50

Q - I don't like walking in the night, but it depends what time, i think before 9 o'clock it's ok, but after ...11 there are few people on the streets, i would feel scared walking down the streets alone. But normally i don't walk streets alone, we usually if we have activities we go home together; ....

Are there any times when you do walk alone after dark?

Yes, but not a long way, very short...previously I lived at Endcliffe and i think Fulwood road is relatively safe bec, that area is a good area in Sheffield, so ...

Could you tell smg about the streets where you do walk alone after dark are there any general characteristics of the streets you could describe?

There are shops and small restaurants, there are not many pubs around; in West street there are and I will find that scary bec. people may get

drunk.....shops and supermarkets are closed (presumably in West street?)..in a residential area i feel more safe; I know in residential areas many white people, not many Black, Arabian or Indian people living here so I feel safe;

Do you prefer the streets busy or quiet after dark?

I am not sure,

If that street is busy with pubs and i see people waiting to go into the pubs...some people get drunk? ...

Can you tell me smg in general about the streets where you don't walk alone after dark?

Especially the streets......in that area.. there is a building where the government provides for poor people, for those people who don't have any house to go, there are criminal people like whores, and people who do dark business, maybe they don't live there now, but the rooms are still very cheap, I was told that those areas are very unsafe... (talking about a tunnel being unsafe even in the light) because it's narrow and if two or three people walk........ you can't escape anywhere

Even my friends and i, two or three people together we don't go in the tunnel

Is there any characteristics of the streets we haven't talked about?

photos

1. poor people living there, there has been robbery there long time ago - chinese students; i chinese friend told her that area wasn't safe; (still goes on about that building and that criminal people live there, whores used to live there; i feel on this street unsafe alone even before 9 o'clock;

Are there any times when you do walk there?

Daytime - name of the street? Solly? (don't get it) street - it's not like Fulwood road, Fulwood road makes me feel safe - I feel that people with relatively high salary live in Fulwood road - looks different from this area - in Fulwood road even if there are not many people on the road I feel safe.

When you say the area looks different, what are the main different looks?

Houses are good quality,...green? I feel good people are mostly white people ...(something about she can't afford to live there)

Machon Bank

It's safer here bec. I haven't heard any robbing on this street but I still feel unsafe bec. this street is very narrow, one way driving street, if 4 or 5 people wanted to rob me they would occupy the whole street and i can't escape anywhere; and especially this one is very long; in the tunnel you could run through but this street is very long and it's quite far away from the main road; and there are very few people going in this street;..and here is a park, where there are also few people in the night; and there are bushes and trees in the night that makes me feel scared, it's very dark in the bush area with the trees; mentions smg about a short street leading to the sports centre which is also makes her feel scared

Streets where she is more confident

West street, Bolsover street

West street?

q - main high street, even in the night is busy there are many cars and students here, i can see people around; but heard smg from students living in the West wing that ...some people got drunk, they shout from the window very loudly, about midnight 12 o'clock, but 8 o'clock at night i think that's ok; Tesco round here would be open when it's dark; and especially it is a main street in the city;

any other characteristics?

and because cars and trams coming.. so relatively busy

Bolsover street

Sometimes i go on this street at night after studying, around here are the university departments, university area, mostly students around here, it's a relatively busy street bec. cars always come and go;

3 main reasons for feeling confident on this street?

First, university area students live round here; not many houses which are bad quality or houses the government gives to poor people; it's wide, the view is open;

photo selection

last question - anything we haven't covered?

after doing the test i feel i would feel scared .in?...dark place, if the light level is very low i would feel scared

Does that apply generally or just to the places you have talked about?

I think generally, bec. I remember the lighting in Mushroom lane? is not enough high level....in the park is very dark and i'd feel very scared

Interview 51

Q - all depends how lonely the place is, and the time, if it's very late i would be probably a bit nervous, not nervous but aware my head is looking around;

Can you tell me smg about the street where you do walk alone after dark?

Usually i walk Northumberland road, its usually safe but sometimes when i come back from the pub late at night it's very dark and there isn't very much lighting, sometime i am uncomfortable with that,..i think when you see houses around there is more safety

I was also living in Broomhall i think that's a bit different because there are gangs on the streets late at night, once you get used to that it doesn't really matter, but at the beginning....it worried me.

What are you looking out for? (referring to his head 'looking around') are there any characteristics of the street or is it nothing to do with the streets just time?

I think it's to do with me because i come back? from Mexico city, i am not a city boy and usually in the city you are aware all the time; ....i feel much more safe in Sheffield. But its a thing i have already learnt just to check around the place...................I do it everywhere i go doesn't matter if i am aware of something happens or is just normal...i just check. But particularly on the streets i do it......

If you could summarize the 3 main characteristics of the streets where you feel confident to walk alone after dark what would they be?

One; should be well illuminated; one; not empty streets; the other thing is where the street is abandoned there are warehouses ...makes me feel to get out; houses can make me feel really safe

What about the opposite..?

darkness, empty land; and ...warehouses; solitary people wondering around;

You said you don't like empty streets, what about people walking alone.? Not people alone with a

hood on them....if you're walking home and people are also coming..ok.......................

anything we haven't covered?

photos

positive areas

Hannover road

There are cars and people around also trams; more streets around therefore more cars

Harcourt road

Close to home; usually lots of people; residential area;

not confident areas

London road?

It's emptier and not very well cared for; ok during the day, at night walked it with friends, but at night it's red light district?, not very nice; i think it's that it's empty and abandoned and not very well cared makes it not very safe, it might be safe but i just wouldn't like to walk it all the time; and sometime there are guys standing on the corner, they are not doing anything and you think why is he doing that;

next picture? 3b?

it was saturday afternoon....saw similar places near Meadow Hall, just warehouses, no one is walking around, just empty,

any other characteristics? - it's dark, if you look at the number of lights on the street there are not very many;

another street

He is saying something about empty buildings;......when you pass by it's dark and light; .....groups gather along,

If you had to give 3 main reasons you are less confident on this site what would they be?

Same reasons - land is not cared; dark perhaps;

most characteristic photos - anything we didn't mention in these areas where you're confident? - green areas make everything look nicer; abandoned places make everything in their surrounding dark;

At the end he explains that the fact that he comes from a city where you have to be careful all the time effects his behaviour.

Interview 52

Q ---- There is going to be a bit apprehension sometime depend where you are walking. But there is nothing that prohibit, it's not something i avoid massively, the thought of walking home after a night out doesn't stop me; it's not smg i think about too much; it doesn't generate a lots of feeling;

Can you tell me smg about the streets where you do walk alone after dark?

Majority of them are going to be residential, with street lights, you know there're going to be other people walking about; it's not going to be completely deserted; and it's a known route i have done during the day...it's not anywhere i have not walked before;

What would be the characteristics of the streets which make you think twice walking alone...? What type of environment would bring that out, if it's the environment?

If it's particularly dark i suppose; if there's no sign of human activity maybe; if it's away from residential areas; ......and you are 95% certain you're the only person there, then it's not the street i would walk down; and, if i don't know it - it may not stop me but it would make me more wary.

photos

negative streets

Mowbray? street

It's quiet and industrial area,.....residences ...i used lot's of dark areas to the sides which you wouldn't what's down there to live round the corner from there, i walked down on it at night coming back from the pub; the main thing it's not residential, it's industrial, a lot's of dark areas to the sides which you wouldn't what's down there; it's not so bad now, but had? a reputation of being a bad area; in 2007 it had a bad reputation then, I think since then it has come up as new flats sprung up around it;........the main thing is that it is in between...residential... and during the night nothing goes on; very few people around there;............... you see people driving

3 main reasons of not feeling reassured

it's industrial..; not as close to residence as you'd like; lack of people traveling to there walking wise, reputation of the area, stigma is remembered

Smithfield Avenue

Again, this is industrial, nobody lives round here, even more disconnected from residential areas then Mowbray street. Student flats have been built nearby which gives it a bit of sense of.....but they are not too near, again you've got all the dark areas at the sides, there is a street round the corner which is single lane, called......and that's fairly dark,.. mentions smg about security camera; it's quiet, burglars come round....... I walked through a couple of times on my way home when i lived there,..when there is a club night it may not look as sinister - people are coming and going?- but when he was taking the pictures he was the only one there driving around;......if smg bad happened to you nobody would find you. It's very disconnected, it's not a main street.....it's quite hard to get to; again it's an other place that had a bad reputation in the past;....smg about being a red light district as well; i think that's moved on somewhere else now;

3 main reasons for negative streets

not part. well lit, alleyways on the sides, far away from centers of residence; the reputation of the area

positive streets

Green hall? street

It's middle of a residential area.....i use it as a cut through to the city,.....used in the night, in the day, no problem; whatever time of the day you are there there is usually quite a lot of people are moving around, esp. bec. the shops are just down from here....it's open, it's probably not the best lit street but there are works? out there, it's a bit more reassuring bec. people are around....i had a good experience there, one night i got particularly drunk, people tried to put me in a taxi but he decided to walk home, he got as far as the subway which is ....the next thing i know that i am woken up by someone asking me if i was all right and sent me on my way......i could have turned nasty......it gives a better confidence in the area....if he had been on an other street there could have been a different end to the story

3 most important things that make him feel confident in that area:

it's residential, it's quite open, not closed in and the reassurance of people walking past no matter what time of the day; ………

Psalter Lane

I know the street well..., walk down to and from work.....it's purely residential, there is always people driving people consider it to be quite a good area, it's open, it's well lit, dark in some areas especially if walking on the side of the trees; but it doesn't phase me bec. you can see all the way down, and the street is very open, you don't need to keep your wits about you, you can just walk down daydreaming ...you know what...coming up, what to expect,

3 main reasons for feeling reassured

bec, I know it so well, again, it's quite open, you can gauge what's coming, and it's quite main thoroughfare, people would be driving or walking; maybe not so many in the middle of the night as the other street bec. those are main walking street but still people go down there regularly;

Interview 53

Q - I feel pretty safe with friends no problem;......................there aren't many places where i am alone

Can you tell me smg about the streets where you do walk alone after dark?

they are wide?, there are no alleys - I try to not go through them; really busy; I prefer well lit roads, usually there're cars i prefer; people are passing by on foot or by car;

Tell me smg. about the streets where you don't walk alone after dark?

Dark, not many people; smaller roads; prefer to walk on busy roads;....nearer houses? likes to make sure nobody is walking right behind him, meaning nobody is approaching..

photos-positive

West street

busy, lots of people, police is usually around; well lit;.... people are always passing by, you're not alone; he knows people, close to home;

St George's Close

there are cameras; if you asked for help there is always someone there; there are students....walking; there are houses with small gardens ....I don't go through there at night (a part of St George's close?)....smg about Broad lane street and going to IC there; I don't go through the gardens

Can you tell me smg about the gardens?

 Saying something about front gardens and paths and roundabout (too quiet can't hear); smg about can't see from the road;

St George's Terrace

I don't like the place it has a construction site and it's pretty dark, it's a place where you can easily hide; I prefer to go to places where I can see the area; also nobody passes at night; ....smg about somebody watching him, dark,

Bolsover Street

During the day very busy, during the...not so? smg about university buildings……….

B.2. Binomial test tables

	Spaciousness				Light Levels			
Image	Open	Enclosed	Binomial test result	Sig. level (p)	It is light	It is dark	Binomial test result	Sig. level (p)
1	51	0	0.00	< 0.01	53	0	0.00	< 0.01
2	49	0	0.00	< 0.01	42	1	0.00	< 0.01
3	2	35	0.00	< 0.01	18	22	0.64	n.s.
4	0	49	0.00	< 0.01	0	50	0.00	< 0.01
5	19	7	0.03	< 0.05	17	26	0.22	n.s.

Table B1. Number of people who identified the scenes presented by the images as being open or enclosed, dark or light, when presented with preselected reasons on a tick box sheet.

	The presence of houses				The type of area it is			
Image	Residential	No houses	Binomial test result	Sig. level (p)	Good area	Bad area	Binomial test result	Sig. level (p)
1	48	1	0.00	< 0.01	24	1	0.00	< 0.01
2	46	1	0.00	< 0.01	19	1	0.00	< 0.01
3	5	28	0.00	< 0.01	8	1	0.04	< 0.05
4	0	35	0.00	< 0.01	2	4	0.69	n.s.
5	0	33	0.00	< 0.01	3	4	1.00	n.s.

Table B2. Number of people who identified the scenes presented by the images as being residential or having no houses, in a good area or bad area, when presented with preselected reasons on a tick box sheet.

	I can see the path ahead				Presence of other people			
Image	Can see where I'm going	Can't see where I'm going	Binomial test result	Sig. level (p)	It looks busy	It looks deserted	Binomial test result	Sig. level (p)
1	50	0	0.00	< 0.01	3	3	1.00	n.s.
2	47	0	0.00	< 0.01	2	5	0.45	n.s.
3	25	6	0.00	< 0.01	1	26	0.00	< 0.01
4	5	45	0.00	< 0.01	0	38	0.00	< 0.01
5	21	10	0.07	n.s.	0	35	0.00	< 0.01

Table B3. Number of people who identified the scenes presented by the images as streets on which they could see where they were going or not, or busy or deserted, when presented with preselected reasons on a tick box sheet.

	View of my surroundings			
Image	I have a good view	I don't have a good view	Binomial test result	Sig. level (p)
1	**50**	**0**	**0.00**	**< 0.01**
2	**42**	**2**	**0.00**	**< 0.01**
3	16	21	0.51	n.s.
4	**1**	**46**	**0.00**	**< 0.01**
5	16	23	0.34	n.s.

Table B4. Number of people who identified the scenes presented by the images as streets on which they had a good view, or didn't have a good view, when presented with preselected reasons on a tick box sheet.

B.3. Older and younger group comparison test results

Reason	Reassured (R) or Not reassured (N)	Probability the observed result would occur if the null hypothesis (no real difference between old and young) was true.		
		Figure 4.5	Figure 4.8	Figure 4.10
Access to Help	R	**0.024[ab]**	0.491[a]	.161[a]
	N	0.589	0.704[a]	0.546
Lighting	R	0.074	0.704[a]	0.423
	N	0.088	0.250[a]	0.691
Spatial features	R	0.695	0.695	0.052
	N	0.487	0.728[a]	0.550
Threatening others	R	n/a	n/a	n/a
	N	0.908	0.305	0.435
Familiarity	R	0.341	0.407	0.437
	N	0.420[a]	0.142[a]	**0.046[c]**
Mobility	R	n/a	0.111[a]	0.057
	N	0.610[a]	0.293[a]	0.111
CCTV	R	1[a]	0.610	0.363[a]
	N	n/a	n/a	n/a
	Bold denotes significant evidence to reject the null hypothesis.			
[a]	Fisher's Exact test used instead of Pearson Chi Squared test.			
[b]	25 younger people and 19 older people gave lack of access to help as a reason for feeling reassured.			
[c]	8 younger people and two older people gave familiarity as a reason for not feeling reassured.			
n/a	Reason not given by any participant's therefore test does not apply..			

Table B5. Summary of results of statistical tests (Pearson Chi Squared and Fisher's Exact test) used to assess the probability that the observed result would occur if the null hypothesis (no real difference between old and young) was true.

Appendix C

C.1. Description of assault

Measurements were taken for Pilot Study 3 (section 5.2.3.). After about half an hour residents became aware of the activity. Two women left their house to shout derogatory comments and throw snowballs in the direction of the author and colleague from their front garden about 10 metres away. When the author and colleague moved out of view to the lower end of the street, they stopped throwing snowballs and retreated to their house therefore the measurements were continued. However when their house was passed to complete the measurements, they ran out, one held the author whilst the other forced large quantities of snow down the back of her jacket resulting in snow on head, neck, back and all over the sheet where measurements were being recorded. Following this incident the measurements were stopped and the street was consequently not used in the main test. The incident was reported to the police (incident number 656).

C.2. Spectral transmittance of glasses

Glasses were placed over spectroradiometer lens (Figure C1) linked to a laptop running Konica-Minolta CS-S1w data management software which records spectral radiance and outputs a file giving values at each wavelength weighted against CIE standard functions. The reference lamp was a daylight lamp. It can be seen from Figures C2 and C3 that different glasses have a very similar effect on SPD, and SPD with glasses deviates little from broadband reference SPD except for loss of small peak at 400nm.
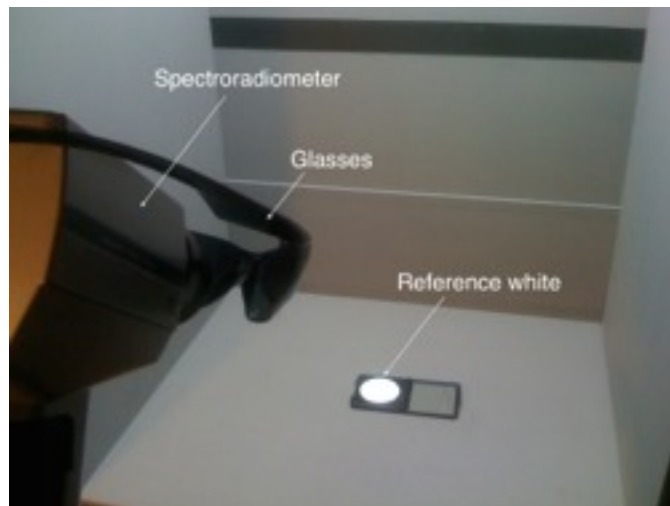
Figure C1. Measurement of spectral transmittance of glasses.
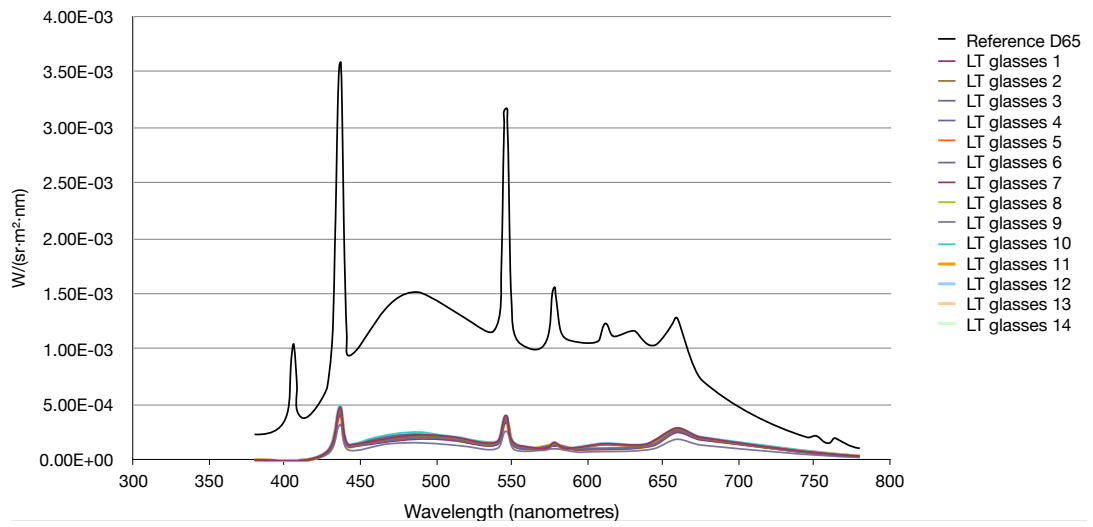
Figure C2. Spectral transmittance of low transmission glasses, showing dimming effect on reference light source.
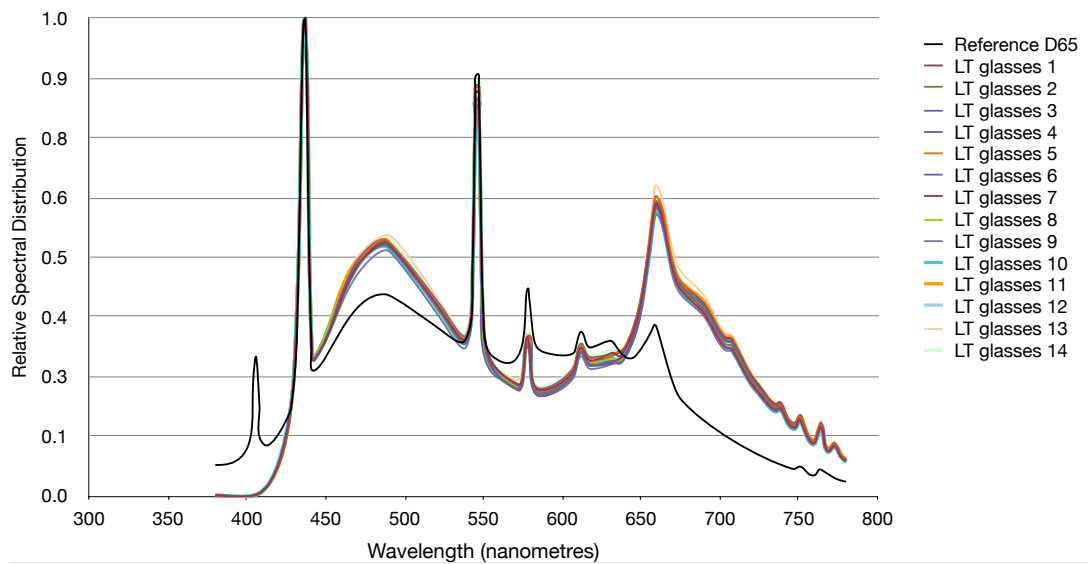
Figure C3. Normalised spectral transmittance of low transmission glasses compared to reference light source.

C.3. Ethics approval and application

The University Of Sheffield.	Office Of The Vice-Chancellor.

Jemima Unwin
School of Architecture
University of Sheffield

Stephen Walker

School of Architecture
The Arts Tower
Western Bank
Sheffield
S10 2TN

29th November 2012

Telephone: +44 (0) 114 2220345
Fax: +44 (0) 114 279826
Email: s.j.walker@sheffield.ac.uk

Dear Jemima

PROJECT TITLE: The effect of street lighting on pedestrian reassurance

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 29.11.2012 the above-named project was unconditionally **approved** on ethics grounds, on the basis that you will adhere to the following document that you submitted for ethics review:

*   University research ethics application form (15.11.2012)
*   Participant information sheets
*   Participant consent forms

If during the course of the project you need to deviate significantly from the above-approved document please inform me since written approval will be required. Please also inform me should you decide to terminate the project prematurely.

The only suggestion that came up in review was regarding the personal safety of the researchers, which we also mentioned to Jim Uttley who is running very similar tests as you know; you explain clearly about having mobile phones available during the tests and so on. Sometimes researchers in this situation make arrangements to phone someone when they return (to home, to work) from such tests; if they don't ring by a certain time to confirm their safe completion, the contact can raise the alarm. You might have thought about this, or may be it's too much, but it seems to fit your general approach to safe working. Your mini bus approach is a bit different to Jim's situtation, but this may be worth considering.

Yours sincerely

Stephen Walker
Ethics Administrator

University Research Ethics Application Form

Cover Sheet: School of Architecture

I confirm that in my judgment, due to the project's nature, the use of a method to inform prospective participants about the project (e.g. 'Information Sheet' / 'Covering Letter' / 'Pre-Written Script'):	
Is relevant:	Is <u>not</u> relevant:
X (if relevant then this should be enclosed)	

I confirm that in my judgment, due to the project's nature, the use of a 'Consent Form':	
Is relevant:	Is <u>not</u> relevant:
X (if relevant then this should be enclosed)	

Is this is a 'generic' application (i.e. does it cover more than project that is sufficiently similar)?	
Yes:	No:
	X

Date: 25/10/12
Name of applicant: Jemima Unwin   1
Research project title: Effect of street lighting on pedestrian reassurance.

University Research Ethics Application Form

Part A

A1. **Title of Research Project:** Effect of street lighting on pedestrian reassurance.

A2. **Contact person** (normally the Principal Investigator, in the case of staff-led research projects, or the student in the case of supervised-postgraduate researcher projects):

Title:Miss First Name/Initials: Jemima Last Name: Unwin	
Post: PhD student. Department: School of Architecture	
Email: jemima.unwin@sheffield.ac.uk Telephone: 07912560821	

A2.1. **Is this a postgraduate researcher project?** Yes

If yes, please provide the Supervisor's contact details: Prof. Steve Fotios, School of Architecture, Floor 13, Arts Tower. 0114 2220371

A2.2. **Other key investigators/co-applicants** (within/outside University), where applicable:

Please list all (add more rows if necessary)

Title	Full Name	Post	Responsibility in project	Organisation	Department

A3. **Proposed Project Duration:**

Start date: 19/11/2012   End date: 30/03/2013

A4. **Mark 'X' in one or more of the following boxes if your research:**

☐	involves testing a medicinal product *

☐	involves investigating a medical device *

☐	involves additional radiation above that required for clinical care *

☐	involves taking new samples of human biological material (e.g. blood, tissue) *

☐	involves children or young people aged under 18 years

☐	involves using samples of human biological material collected before for another purpose

☐	involves only identifiable personal data with no direct contact with participants

☐	involves only anonymised or aggregated data

☐	involves prisoners or others in custodial care (e.g. young offenders)

☐	involves adults with mental incapacity or mental illness

☐	has the primary aim of being educational (e.g. student research, a project necessary for a postgraduate degree or diploma, other than an MD or PhD)

University Research Ethics Application Form

A5. **Briefly summarise the project's aims, objectives and methodology?**
(this must be in language comprehensible to a lay person)

Design criteria for street lighting on residential and subsidiary roads in the UK usually specifies a required level of light in terms of illuminance on the horizontal plane, yet there does not appear to be any empirical justification for the recommended levels. The MERLIN (Mesopically Enhanced Road Lighting: Improving Night-vision) project is a collaboration between the University of Sheffield, City University and University College London. Its aim is to examine visual and other requirements pedestrians have when walking down a street at night from a street-lighting perspective, with the overall aim of providing evidenced future recommendations for street light design criteria.

The proposed research project is part of MERLIN, and aims to understand what effects pedestrian reassurance as they walk down a street at night. A study using participant's and researcher's photographs has been completed and this has indicated that the presence or absence of lighting does impact reassurance. This proposed follow on study will use real streets to give context validity. The study will measure people's perceptions of safety when walking on residential streets, by day and night. The aim is to determine how much light is necessary to ensure that perceptions of safety are close to what they are in day light.

Participants will be driven in a minibus to 10-20 streets in Sheffield over two afternoons (daylight conditions) and two evenings (after dark). Streets have been selected on the basis of illuminance levels. On arrival at the selected streets, participants will alight, walk up and down the street (no more than 50 metres), and then fill in a survey at a set vantage point. They will then be driven to the next location and complete the same task. The aim of the daylight visits is to obtain a base reassurance level against which nighttime reassurance in various light levels can be measured. In order to obtain results for lower illuminance levels after dark participants will be asked to cover their eyes with a filter (equivalent to dark glasses).

A6. **What is the potential for physical and/or psychological harm/distress to participants?**

The streets selected for the experiment will be cross-referenced with crime statistics data to ensure they are not in areas of known high crime levels.

As the experiment will largely take place during winter months the hours of darkness trials should be able to take place relatively early during the evenings, and it would be expected that there will be a number of other members of the public walking up and down the street at the same time. This should reassure the participant and minimise any crime risk.

Potential participants will be informed about what the experiment entails and what they would be expected to do so that they can make an informed decision about whether they want to take part or not. They will be free to leave the experiment at any time.

A7. **Does your research raise any issues of personal safety for you or other researchers involved in the project and, if yes, explain how these issues will be**

2

managed? (especially if taking place outside working hours or off University premises).

The experiment will take place in streets outside University premises, and part of it will take place outside working hours as some trials will require completion during hours of darkness. As participants will be taken in groups of 7-12 people, the number of people will increase personal safety and reduce any risk from threatening or hazardous circumstances.

The experimenters will keep a record of experiment times and locations that is accessible to colleagues, to ensure that the experimenters' location is known to others. The experimenters will also ensure that they have access to mobile phones and that these are charged whilst carrying out the experiment, so that contact can be made with colleagues or other relevant people in the event of an emergency.

A8.   How will the potential participants in the project be (i) identified, (ii) approached and (iii) recruited?

The minimum participant age will be 18 years. The other main criterion is generally healthy eyesight. The research does not target people considered to be particularly vulnerable. Healthy eyesight means that participants should not be visually impaired. Visually impaired does not include those whose sight problems can be corrected by glasses or contact lenses. Participants will be approached through email canvassing and word-of-mouth. A significant proportion of participants are likely to be recruited from within the University. The test procedure and time commitment will be explained to each participant before they are recruited.

The total number of participants required for the experiment is approximately 50. Participants will be given financial compensation in the region of £20 in return for their time in taking part in the experiment.

A9.   Will informed consent be obtained from the participants?

YES X   NO ☐

If informed consent or consent is not to be obtained please explain why. Further guidance is at:
http://www.shef.ac.uk/ris/other/gov-ethics/researchethics/policy-notes/consent

A9.1. This question is only applicable if you are planning to obtain informed consent:
How do you plan to obtain informed consent? (i.e. the proposed process?):

Informed consent will be recorded on the participant consent form (included with this application). The participant will only be asked to sign the consent form once they have been talked through the instructions for the experiment, shown the equipment being used and had an opportunity to ask any questions. Please note the consent form and the participant information sheet (also attached with this application) use a different title from the one given above on this form. This is deliberate and is done in order to reduce bias, influence or preconceptions about the research in the participants.

A10.   What measures will be put in place to ensure confidentiality of personal data, where appropriate?

The personal data collected will include age, gender, use of corrective lenses, and whether or not the participant has normal colour vision. No personal data will be circulated to third parties or appear in reports.

3

A11. **Will financial / in kind payments (other than reasonable expenses and compensation for time) be offered to participants?** (Indicate how much and on what basis this has been decided)

YES X   NO

Incentive payments amounting to £20 for involvement in the experiment will be offered to participants as compensation for their time and to contribute to local travel expenses.

A12. **Will the research involve the production of recorded media such as audio and/or video recordings?**

YES   NO X

A12.1. This question is only applicable if you are planning to produce recorded media: **How will you ensure that there is a clear agreement with participants as to how these recorded media may be stored, used and (if appropriate) destroyed?**

N/A.

Guidance on a range of ethical issues, including safety and well-being, consent and anonymity, confidentiality and data protection are available at: http://www.shef.ac.uk/ris/other/gov-ethics/researchethics/policy-notes http://www.shef.ac.uk/researchoffice/gov_ethics_grp/ethics/er/guidance.html

4

University Research Ethics Application Form

Part B – The Signed Declaration

Title of Research Project: **Effect of street lighting on pedestrian reassurance.**

I confirm my responsibility to deliver the research project in accordance with the University of Sheffield's policies and procedures, which include the University's '*Financial Regulations*', '*Good Research Practice Standards*' and the '*Ethics Policy for Research Involving Human Participants, Data and Tissue*' (Ethics Policy) and, where externally funded, with the terms and conditions of the research funder.

In signing this research ethics application form I am also confirming that:

- The form is accurate to the best of my knowledge and belief.

- The project will abide by the University's Ethics Policy.

- There is no potential material interest that may, or may appear to, impair the independence and objectivity of researchers conducting this project.

- Subject to the research being approved, I undertake to adhere to the project protocol without unagreed deviation and to comply with any conditions set out in the letter from the University ethics reviewers notifying me of this.

- I undertake to inform the ethics reviewers of significant changes to the protocol (by contacting my academic department's Ethics Administrator in the first instance).

- I am aware of my responsibility to be up to date and comply with the requirements of the law and relevant guidelines relating to security and confidentiality of personal data, including the need to register when necessary with the appropriate Data Protection Officer (within the University the Data Protection Officer is based in CiCS).

- I understand that the project, including research records and data, may be subject to inspection for audit purposes, if required in future.

- I understand that personal data about me as a researcher in this form will be held by those involved in the ethics review procedure (e.g. the Ethics Administrator and/or ethics reviewers) and that this will be managed according to Data Protection Act principles.

- If this is an application for a 'generic' project all the individual projects that fit under the generic project are compatible with this application.

Name of the Principal Investigator (or the name of the Supervisor if this is a postgraduate researcher project):
Professor Steve Fotios

If this is a postgraduate researcher project insert the student's name here:
Jemima Unwin

Signature of Principal Investigator (or the Supervisor):

Date: 15.11.2012.

Email the completed application form and provide a signed, hard copy of 'Part B' to the Ethics Administrator (also enclose, if relevant, other documents).

1

Participant Consent Form

Title of Research Project: **Perception of Streets in Sheffield**
Name of Researcher: **Jemima Unwin**
Participant Identification Number:

Please tick box

1 **I have read the information sheet for the above study and have had the chance to ask questions.** ☐

2 **I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason.** ☐

3 **I understand that my responses during the experiment will be kept strictly confidential. I understand that my name will not be linked with the research materials, and I will not be identifiable in the report or reports that result from the research.** ☐

4 **I agree for the data collected from me to be used in future research.** ☐

5 **I agree to take part in the above research project.** ☐

6 **Do you have any visual condition which affects your sight, not including short or long sightedness which can be corrected by wearing glasses or corrective lenses?** ☐ Yes, please give details.

   Details, if applicable: ☐ No.

7 **How old are you? Please write in:** _____

8 **What is your gender?** **F** ☐ **M** ☐

   Your signature will certify that you have voluntarily decided to participate in this study. Thank you.

   _____   _____   _____
   Name of Participant   **Date**   **Signature**

Research Project Information Sheet

Perception of Streets in Sheffield

1. What is the project's purpose?

This is the second stage of a three year project which is investigating what affects reassurance in pedestrians when walking on residential streets at night time. This work will contribute to recommending optimum design criteria for residential streetscapes.

2. What will I have to do if I take part?

You will be asked to fill in surveys at a set vantage point on 6-10 streets in Sheffield twice, once during the day and once after dark. After alighting from the minibus, you will be asked to walk up and down the street, and then when standing at a point marked on a plan facing in a given direction, to fill out the surveys. You will then be taken to the next location to complete the same task. The visits will take place over two afternoons and two evenings. You will be asked to come to the Arts Tower (Western Bank) car park at 1 pm and 6 pm, and then will return when the visits are completed a few hours later.

On completion there will be a cash payment of £20 to compensate for your time.

3. What are the possible disadvantages and risks of taking part?

Taking part in this research is entirely voluntary. If you decide to take part you will be asked to sign a consent form. You can still withdraw at any time without giving a reason.

4. Who has ethically reviewed the project?

This project has been ethically approved via the School of Architecture's ethics review procedure. The University's Research Ethics Committee monitors the application and delivery of the University's Ethics Review Procedure across the University.

If you are unhappy with the way you have been treated, or with anything that has happened during or following your participation, then please contact Professor Steve Fotios (Tel. 0114 2220371). If you feel your complaint has not been dealt with satisfactorily then please contact the University's Registrar and Secretary (Tel. 0114 2221104).

C.4. Minibus driving qualifications
DVLA qualification

DSA
DRIVING STANDARDS AGENCY
SAFE DRIVING FOR LIFE™

U 417812 2

Issue No.   Fee   Rem Type   O/D   S/C   T/P

PRACTICAL DRIVING
TEST PASS CERTIFICATE

This is to certify that:

Name   MISS. JEMIMA UNWIN

Driver Number   U N W I N 7 5 7 0 2 9 3 9 9 b X

Has Passed

Category   —   —   D1   automatic yes / no   extended yes / no

restriction code

On   13 /02 / 13   At   SHEFFIELD LGV DTC

Signature of Driving Examiner

Name of Driving Examiner   R.D. SENIOR

Applicant's Declaration (only to be completed if sending this certificate to the DVLA)

I apply for a full driving licence for the category shown on this form and declare that there has been no change in my health since I last applied for a driving licence.

Applicant's Signature: Jemima Unwin   Date 13/ 02 /2013

INVESTORS IN PEOPLE

IMPORTANT
PLEASE READ THE NOTES OVERLEAF

U 417812 2

DSA 10
Rev (03/12)

DRIVING ASSESSMENT REPORT

Name	JEMIMA UNWIN

Date 21/02/13	Time 09:00

Licence no. UNWIN757029J99DX

Licence expires: 25/01/16

Vehicle type: TRANSIT MINIBUS

Registration no. NL10 BPU

Weather:WET

Eye test:	Passed ✓

Minor fault /   Serious fault X   Dangerous fault D

Starting precautions		Positioning		Road signs	
Moving off		Cornering		Use of speed	
Stopping		Reversing		Hazard awareness	
Steering		Overtaking		Reaction	
Gear box	/	Vehicle sympathy		Emergency stop	
Clutch control		Observation		Eco driving	
Braking	/	Anticipation		Handbrake	
Signals		Judgement	/	Pedestrian Crossings	
Mirrors		Speed limit		Junctions	
Horn		Courtesy		Traffic lights	/

Type of route:

Comments:. EXCELLENT USE OF MIRRORS THROUGHOUT THE DRIVE. OVERALL A GOOD DRIVE WITH A FEW MINOR MISTAKES AND NO MAJOR ONES.

Standard reached: YES

M HIRST
ADI

C.5. Detailed participant information

Global ID	Within group ID	Age	Gender	Length of time living in Sheffield	Nationality	Group
1	P1	22	F	5 years	British	1
2	P2	22	M	3 years	Nigerian	1
3	P3	26	M	8 months	Greek – Jordanian	1
4	P4	23	M	5 years	British	1
5	P5	39	F	6 months	Ugandan	1
6	P6	21	F	19 Months	British	1
7	P7	29	F	3 years	Mexican	1
8	P8	28	F	2.5 years	Polish	1
9	P9	19	F	19 years	British	1
10	P10	20	F	3 years approx	British	1
11	P11	24	M	3 years	Botswanian	1
12	P12	22	F	6 months	Chinese	1
13	P13	20	M	2 years	British	1
14	P14	20	F	3 years	British	1
15	P15	22	M	3 years	Romanian	1
16	P16	21	F	3 years	British	1
17	P1	29	M	7 months	Mexican	2
18	P2	20	F	1.5 years	Malaysian	2
19	P3	19	F	1.5 years	British	2
20	P4	22	F	6 months	Chinese	2
21	P5	19	F	1.5 years	British	2
22	P6	20	M	2 years	Malaysian	2
23	P7	21	M	3 years	British	2
24	P8	32	F	2.5 years	Indian	2
25	P9	28	M	3 years	British	2
26	P10	20	F	6 months	Malaysian	2
27	P11	?	M	4 months	Spanish	2
28	P12	29	M	18 months	Chinese	2
29	P13		M	18 months	British	2
30	P14	21	F	2.5 years	British	2

Global ID	Within group ID	Age	Gender	Length of time living in Sheffield	Nationality	Group
31	P15	19	M	5 months	Romanian	2
32	P1	70	M	46 years	English	3
33	P2	72	F	Born here, lived here again since 2007	British by birth. Canadian citizen joint nationality	3
34	P3	57	F	34 years	British	3
35	P4	64	M	30 years	British	3
36	P5	59	M	30 years	British	3
37	P6	76	F	76 years	British	3
38	P7	67	M	34 years	British	3
39	P8	59	F	21 years	British	3
40	P9	51	M	All my life	British	3
41	P10	61	M	36 years	British	3
42	P11	52	M	20 years	English	3
43	P12	67	F	18 years	British	3
44	P13	50	M	20 years	White British	3
45	P14	53	M	3 years now + 14 years in past	British	3
46	P15	63	F	37 years	British	3
47	P1	24	M	2 years	British	4
48	P2	?	F	5 years	British	4
49	P3	21	M	3 years	White British	4
50	P4	22	F	10 months	Singaporean	4
51	P5	29	M	19 months	China	4
52	P6	20	F	2 years	British	4
53	P7	25	M	2 years	Romanian	4
54	P8	23	M	3 years	Hong Kong	4
55	P9	24	F	10 months	German	4
56	P10	20	F	9 months	Malaysian	4
57	P11	20	F	2 years	British	4
58	P12	27	M	9 months	Indian	4
59	P13	22	M	4 years	British	4
60	P14	27	F	2 years	Jordanian	4

Global ID	Within group ID	Age	Gender	Length of time living in Sheffield	Nationality	Group
61	P15	22	F	Missing answers		4
62	P1	31	F	9 months	Nepalese	5
63	P2	24	M	8 months	Chinese	5
64	P3	26	F	9 months	Malaysian	5
65	P4	26	F	Since last September	Indian	5
66	P5	33	M	5 year	Irish	5
67	P6	25	F	9 months	British	5
68	P7	23	F	5 years	British Indian	5
69	P8	23	F	9 months	UK	5
70	P9	23	F	2 years	British	5
71	P10	22	M	9 months	Indian	5
72	P11	23	M	4 years	Pakistani	5
73	P12	40	M	1.5 year	Iraqi	5
74	P13	22	M	10 months	Indian	5
75	P14	23	F	2 years	Mexican (resident of India)	5
76	P15	23	M	9 months	Indian	5
77	P16	27	M	1 year 9 months	Jordanian	5

Table C1. Participant information.

C.6. Questions asked by participants

Following the trial route around the Arts Tower car park, most people did not have any questions. Two people asked the following question:

"Do the questions apply only to what you can see from the viewpoint, or the whole street?"

The reply was that the questions are regarding the whole street as the reason they are walking the route is to gain an impression of the street, however at the point of filling in the survey they should be facing the view and refer to that if they find the street contradictory.

"What is the difference between "I can see clearly around me" and "I can see far enough ahead"?"

The reply was that "I can see clearly around me" is regarding immediate surroundings, and "I can see far enough ahead" is regarding having a good view into the distance. The difference between these questions (questions one and three on the day survey) were explained to both summer groups and the elderly group.

If participants asked "is this sheltered housing?" the author replied that she didn't know.

Other situations:

- Two participants wearing sunglasses during the day were asked to remove them for the daytime tests, for consistency between participants.

- If participants wore glasses, then they were asked to place the sunglasses over the glasses.

- On four occasions participants couldn't read the sheet due to absence of reading glasses. Three were in the older group and one was in the younger group. On these occasions the author read out the questions to them.

Missing answers

Means were calculated of all the data provided. Out of a total of 77 participants, 61 people completed the night-time surveys. Group 5 completed the day survey twice because at 7:30 PM it was still daylight. There were 22 responses per street, multiplied by 11 streets therefore there were total of 242 responses. Altogether there were 22 missing responses which is less than 1%. No answers were missing from the daytime surveys except from participants who did not answer the question regarding whether they were wearing sunglasses or not. The reason for missing answers at night may be that the conditions were not ideal to complete the visual task of filling in the survey. Although participants were provided with pen torches, the distribution of luminous flux was not optimum for the task.

C.7. Street notes during surveys

Group	Street	Day Weather	Day Other notes	Night Weather	Night Other notes
		Day		**Night**	
		Weather	Other notes	Weather	Other notes
1	s1	Cloudy on all streets.	-	Cloudy on all streets, had rained so some surfaces shiny.	Old man checking parking meters for money. Student had headphones on.
1	s2	-	-	-	-
1	s3	-	-	-	Some noise from uni building.
1	s4	-	-	-	Lights on in windows. Sound of cars passing the top of the street.
1	s5	-	-	-	-
1	s6	-	Sound of people working in warehouse building. Student with shopping walking across top.	-	Car came down opposite road. Road busy at the bottom.
1	s7	-	-	-	-
1	s8	-	Sound of children playing (from nursery).	-	Road works on pavement.
1	s9	-	-	-	-
1	s10	-	Group of people walking down bottom of road. Man & kids.	-	Two guys in corner, student wearing fluorescent jacket.
1	s11	-	-	-	-
2	s1	Cold, windy, cloudy snow on ground on all streets except:	-	Dry and cold. Clear Sky.	-
2	s2	-	-	-	-
2	s3	-	Beeping from vehicles on construction site.	-	-
2	s4	Sun breaking through.	-	-	-
2	s5	-	-	-	People shouting from the car.
2	s6	Sun breaking through. No snow on path, as on other streets.	-	-	-
2	s7		-	-	Young men running away from something/up the street. Sound of people shouting. Comments from resident about the area.
2	s8	-	Kids screaming in playground.	-	-

Group	Street	Day		Night	
		Weather	Other notes	Weather	Other notes
2	s9	-	Cars and people moving along Broomhall Street at the bottom.	-	Two students walking out of houses, group of men and teenagers acting territorial. Group of women (3) on adjacent street however within sight. Refer to description in section 6.9.1..
2	s10	-	Sound of dog barking.	-	
2	s11	-	-	-	
3	s1	Cold on all however variable-Sun came out.	-	Clear, cold, snow frozen on ground on all.	-
3	s2	Cloudy, light snow.	Person crossing at top. Asda van.	-	-
3	s3	Sun breaking through.	Students leaving building, 1 man jogging, builder, machine cleaning road, stationary car indicating.	-	-
3	s4	Very light snow.	-	-	-
3	s5	Light snow, went darker.	-	-	-
3	s6	Sunny.	People fixing cars in garage at the top. Road is busy at the bottom.	-	-
3	s7	Light snow, cloudy.	Building work truck at top of street. Group of men sitting in van.	-	-
3	s8	Snow stopped, sun out.	People on the street were talking to each other.	-	-
3	s9	Cloudy.	-	-	-
3	s10	-	Police car on adjacent street drove off.	-	2 cars passing at end.
3	s11	-	-	-	-
4	s1	Cloudy.	-	Warm, clear sky, a bit cloudy on all.	Couple walking after jogging (to residences), taxi looking lost, reversing down. Taxi stopped adjacent to survey spot with engine running. Man walking out of residences.
4	s2	Bright and sunny.	Noise at the bottom of the street near grass.	-	Whilst putting glasses on - noise of group from building. Two women were talking.
4	s3	Bright and sunny.	Noise from construction site.	-	Not many cars parked, unlike before.
4	s4	Bright and sunny.	-	Dark blue sky.	-

Group	Street	Day		Night	
		Weather	Other notes	Weather	Other notes
4	s5	Bright and sunny.	Women sitting in car on phone.	Dark blue sky.	Taxis driving up street noisily. Cars passing at the bottom, general sound of traffic at the bottom.
4	s6	Bright and sunny.	Noise of building work.	Dusk.	Lights on in student residences.
4	s7	Bright and sunny.	Many cars passing at the top of the street. Two local ladies talking loudly about high levels of crime in the area.	Dusk.	Rough looking man talking on phone,man going to mosque, resident's daughter leaving, young male running past smiling for camera, 2nd male with dog walking down slowly. 2 men going to mosque.
4	s8	Bright and sunny.	Car driving into nursery. Car leaving revving engine, children playing loudly.	Very dark grey sky.	Students talking loudly/ joking from within house.
4	s9	Bright and sunny.	-	-	Lights on in two houses.
4	s10	Bright and sunny.	2 males drinking from cans and smoking on the street.	-	Student drinking beer from window at the end of the street. Movement from house. Two friendly residents.
4	s11	-	-	-	-
5	s1	Hazy, warm.	All car parking space taken. Sound of children playing.	-	Child shouting loudly in Oakburn Court.
5	s2	Hazy, warm.	One hoodie.	-	Taxi pausing on street. Couple of residents leaving house. Dog barking. Sound of rowdy group in park at the bottom. Birds singing.
5	s3	Hazy, warm.	Lorry parked at survey filling in point, so had to change location to just in front of the lorry.	-	House alarm went off as walking past and stayed on for the duration of the street walk and survey filling in. No cars on this stretch of road, 5 cars at the top. Cars drive up this road quite fast.
5	s4	Sun out.	Cars counted on the participant route only.	-	Boys shouting at the top of the road in football gear.
5	s5	Sun came out.	Ambulance.	-	Very quiet except for birds. Evening much quieter than during the day. Cars drive at a fast speed up this street.
5	s6	Sun went in, wind.	Tram passing, busier at the bottom. Student walking across top.	-	On route to Roscoe Road from St. Philip's Road observed groups of students carrying their shopping.

Group	Street	Day		Night	
		Weather	Other notes	Weather	Other notes
5	s7	As above.	Talking to residents in front of students, friendly.	-	Two cats on the street. Cars parked in driveways only.
5	s8	Hazy, warm.	Sound of children playing.	-	Police siren in background, music playing from house next to where filling in surveys, squirrel on street.
5	s9	Hazy, warm.	Broomhall Road end busy, sound of passing traffic.	-	Music started playing from one house.
5	s10	Sun out then back in.	2 men and one woman sitting in a car.	-	Pile of rubbish in front of where filling in surveys. Car driving past was low soft top racing car style.
5	s11	-	-	-	-

		Changes of conditions on the streets:
	s9/s10	In the summer months there was a pile of rubbish in front of the point where participants filled in the survey.
	s11	In the winter months there was some old scaffolding in the view from the survey point. Scaffolding came down by summer experiments.
	s3	During the day test of group 5, a lorry was parked in the location of the survey filling in point. Therefore the survey filling in point had to be relocated to about 5 metres in front of the lorry.

Table C2. Street notes regarding weather and other conditions.

C.8. List of equipment

Measurement	Equipment used to take the measurement
Illuminance	Konica Minolta Illuminance Meter T-10AM. Body serial numbers (32521035 and 36621047), and head/detector serial numbers (73511023 and 75611009).
Luminance	Konica Minolta Luminance Meters LS-100 / LS-110.
Semi-cylindrical illuminance	Hagner Digital Luxmeter, model E4-X attached to Hagner SD11 special detector.
Chromacity coordinates	Konica Minolta Chroma Meter CL-200A.
Low transmission glasses SPD data	Konica Minolta CS1000 spectroradiometer.

Table C3. Equipment used to take measurements.

C.9. Additional luminance measurements

A couple of measurements from what appeared to be the darkest, lightest, and mid-range areas of luminance were recorded.
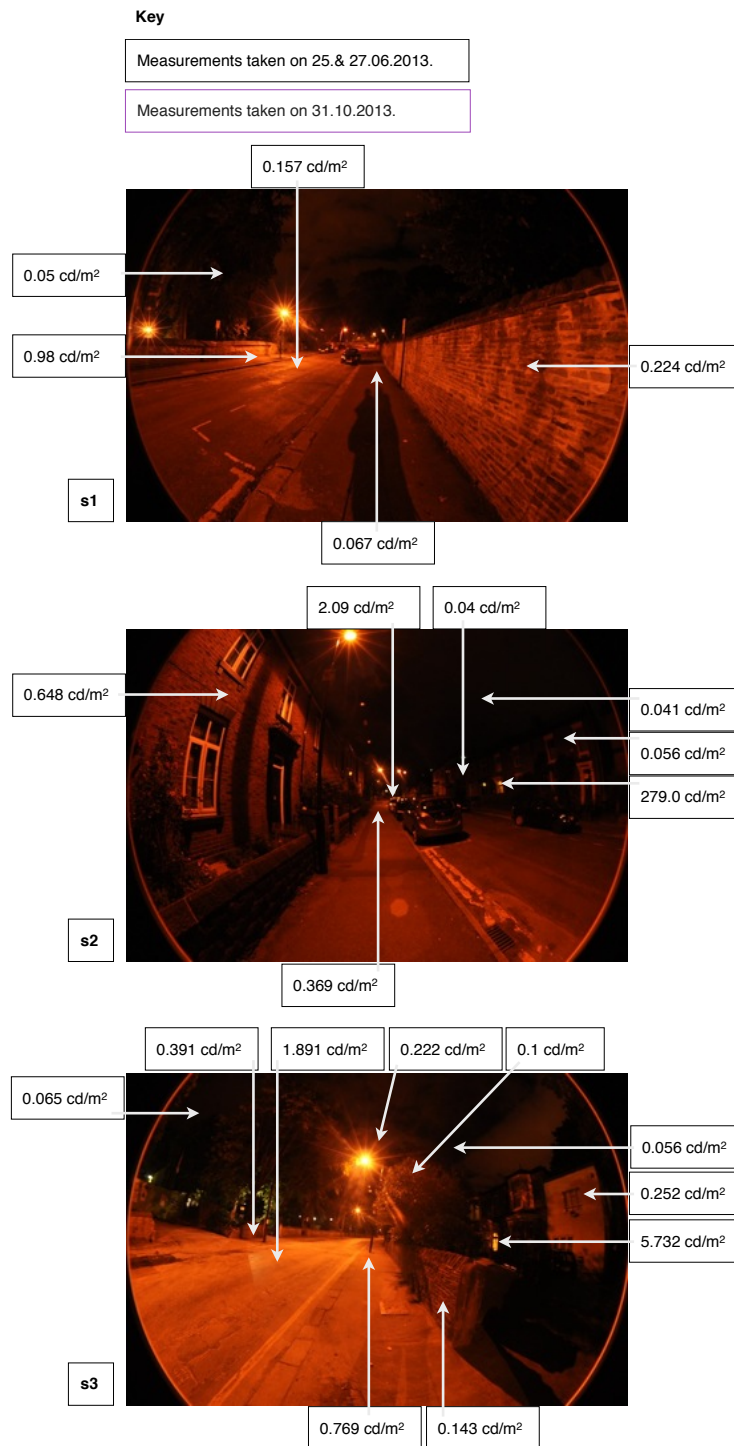

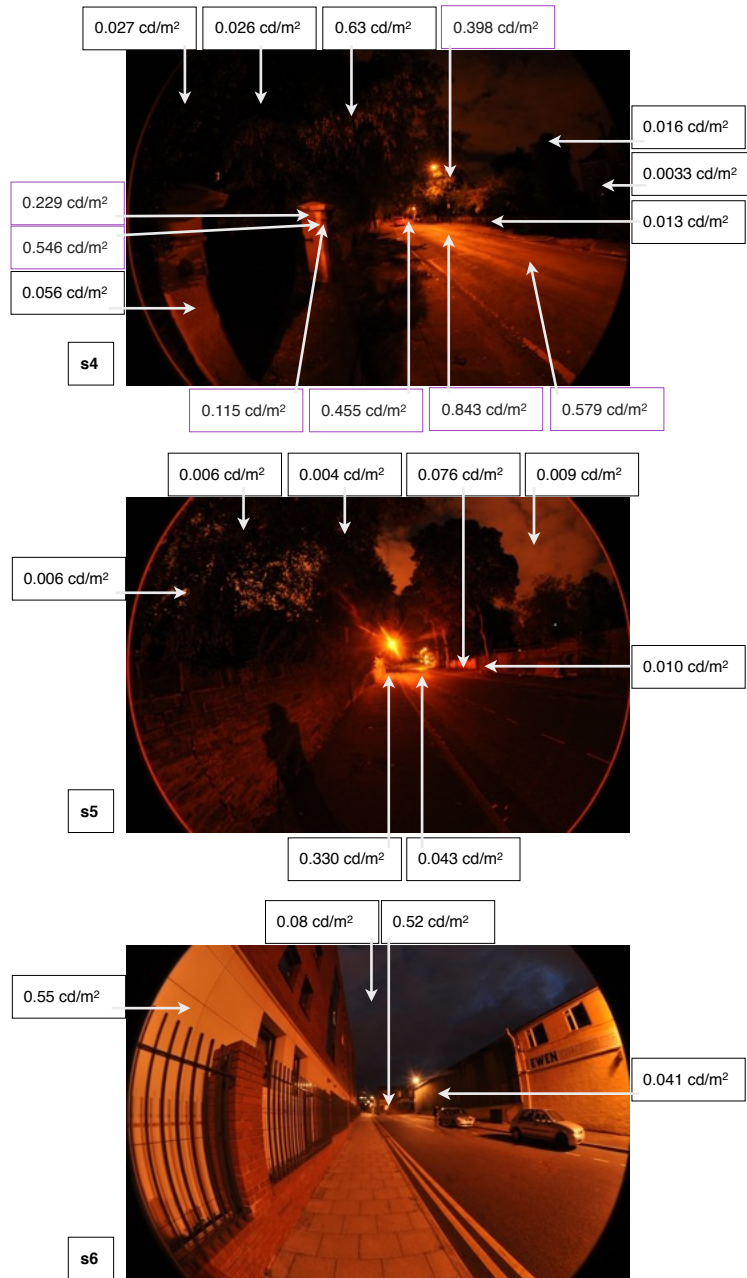*Figure C4. Luminance measurements on s1, s2 and s3.*

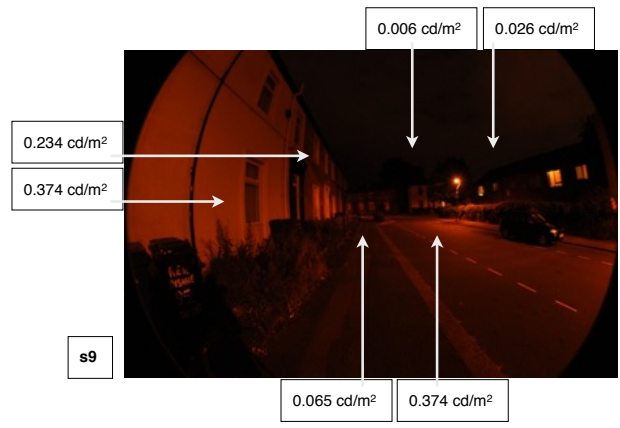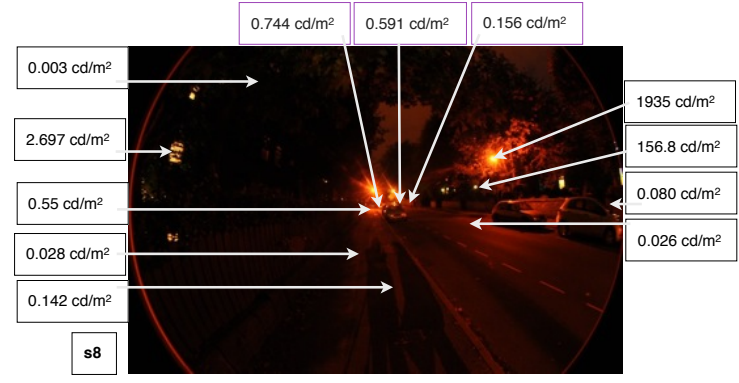*Figure C5. Luminance measurements on s4, s5 and s6.*

Figure C6. Luminance measurements on s7, s8 and s9.

Appendix D
D.1. Light source information
Chromacity coordinates measured under light sources on streets

Lamp post	s	1	2	3	4	5	6	7	8	9
1	x	0.5545	0.5370	0.5346	0.5344	0.5458	*0.461*	0.5357	0.5354	0.5403
	y	0.3928	0.4140	0.4232	0.4286	0.4204	*0.4098*	0.4107	0.4239	0.4249
	S	HPS	HPS	HPS	HPS	HPS	*MH*	HPS	HPS	HPS
	H	?	6.5000							
2	x	0.5385	0.5361	0.5320	0.5396	0.5458	0.5131	0.5437	<u>0.5536</u>	0.5387
	y	0.4218	0.4231	0.4227	0.4137	0.4184	0.4064	0.4240	<u>0.4435</u>	0.4223
	S	HPS	HPS	HPS	HPS	HPS	HPS	HPS	<u>LPS</u>	HPS
	H	?	4.5000							
3	x	0.5400	0.5429	0.5297	0.5336	<u>0.5553</u>	*0.472*	<u>0.5540</u>	0.5469	0.5364
	y	0.4208	0.4221	0.4199	0.4259	<u>0.4437</u>	*0.4068*	<u>0.4433</u>	0.4040	0.4178
	S	HPS	HPS	HPS	HPS	<u>LPS</u>	*MH*	<u>LPS</u>	HPS	HPS
	H	?	6.0000							
4	x	0.5383	0.5469	0.5330		0.5402	*0.465*	0.5383	<u>0.5529</u>	
	y	0.4248	0.4243	0.4230		0.4284	*0.4070*	0.4217	<u>0.4448</u>	
	S	HPS	HPS	HPS		HPS	*MH*	HPS	<u>LPS</u>	
	H	?	3.0000			3.5000				
5	x						*0.469*			
	y						*0.4065*			
	S						*MH*			
	H									

Key

High Pressure Sodium

<u>Low Pressure Sodium</u>

Metal Hallide

S = Source, H = Height.

Table D1. Chromacity coordinated measured at a height of 1.2 metres under each lamp post.

Reference light source data measured in laboratory conditions

	Direct						Cabinet	
	-2.00%	x	+2%	-2.00%	y	+2%	x	y
Low pressure sodium	0.55713	0.56850	0.57987	0.421302	0.42990	0.438498	*0.5704*	0.4283
High pressure sodium	0.532042	0.5429	0.553758	0.406798	0.41510	0.423402	*0.5458*	0.4150
Fleurescent cfl	0.378868	0.3866	0.394332	0.380044	0.387800	0.395556	*0.3963*	0.4025
Metal Hallide 1	0.424634	0.43330	0.441966	0.409346	0.41770	0.426054	0.45970	0.4155
Metal Hallide 2	0.377692	0.38540	0.393108	0.366716	0.37420	0.381684	0.38250	0.3838

Table D2. Typical lamp x & y coordinates used as reference light sources (Cheal 2007).

Sheffield City Council lamp information for streets

	100w son/t - Standard Gear	11w PL Fluor - Electronic	11w PL-L Fluorescent	150w son/t - Standard Gear	180w sox - Low Loss Gear	300mm 8w Fluor't - Conv. Gear	35w sox - Conv.Gear	35w sox - Low Loss Gear	50w son/t - Elect - Dimmable	50w son/t - Zodion Elect Gear	50w son/t + - Standard Gear	55w sox - Conv. Gear	60w CPO TW - CosmoPolis	70w son/t - Elect - Dimmable	70w son/t - Standard Gear	70w son/t - Zodion Elect Gear	(blank)	Total
Broomhall Road											9				6			15
Clarke Street	2							1		1	1			1	1			7
Collegiate Crescent	23		6							1								30
Park Lane			2					4	1		5			1	4	2		19
Roscoe Road													4					4
St Philip's Road	17		1	2	1	12		1			11	1			4	1		51
Wharncliffe Road							2	1			5				1		1	10
William Street		4	2					2			6				6			20

Table D3. Extract of lamp information received from Sheffield City Council.

D.2. Illuminance map method

The illuminance measurements taken on the streets were imported from iWork .numbers into SigmaPlot. The maximum number of rows of measurements was 17, therefore on each street rows were added up to 17 and the value of zero given to the extra rows. This meant that the contour plots were of roughly the same scale therefore can be compared to each other. The reason the scale is rough rather than exact is because the measurement grid varied slightly between streets. The plots give an indication of the distribution of illuminance based on the measurement grid and can therefore be compared.

D.3. Luminances along route

The following graphs show path luminances (assuming a pavement reflectance of 0.2) along the routes walked by pedestrians on all streets.

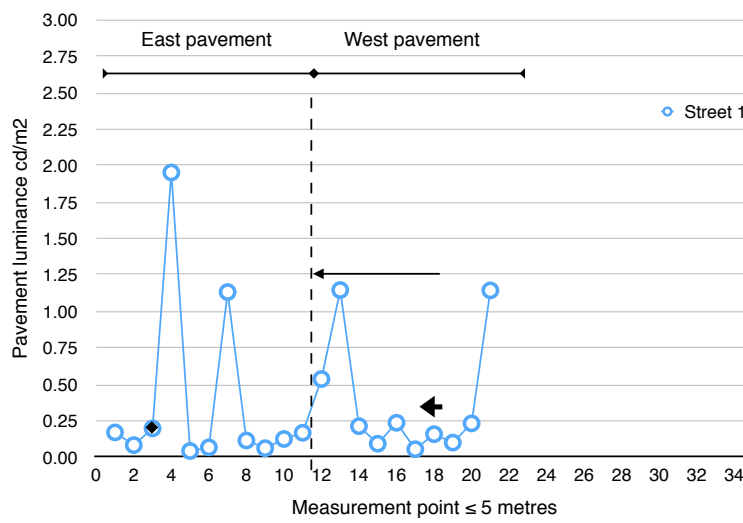Figure D1. Key for Figures D2 to D10.

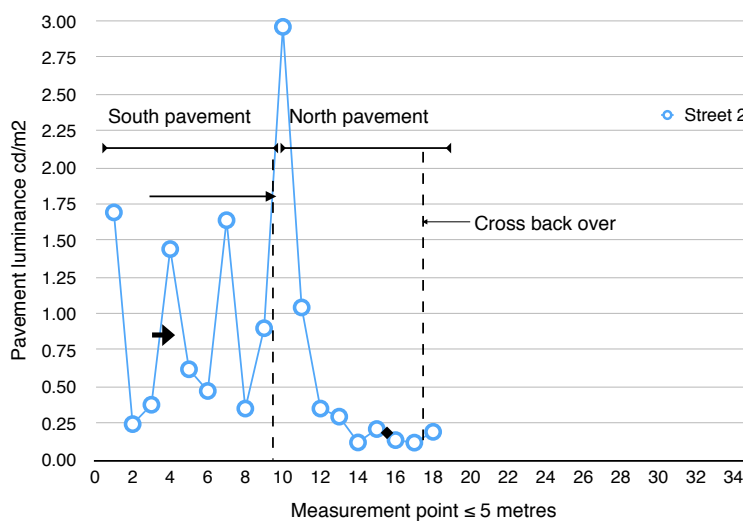*Figure D2. Luminance points along route on street 1.*
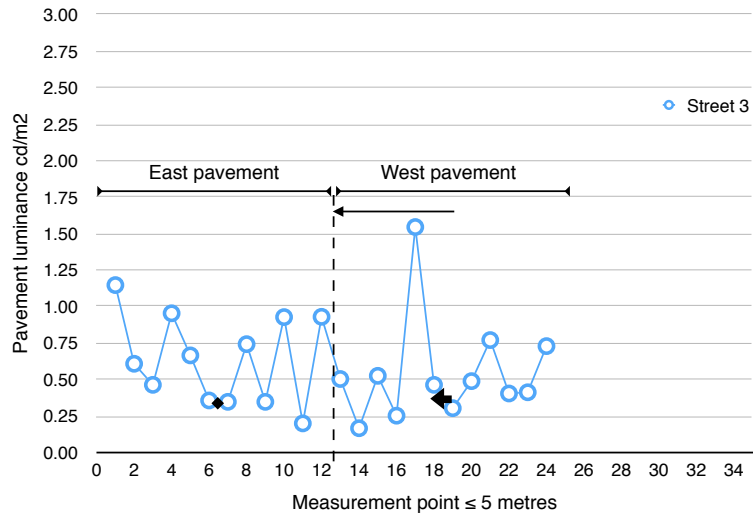

Figure D3. Luminance points along route on street 2.

357

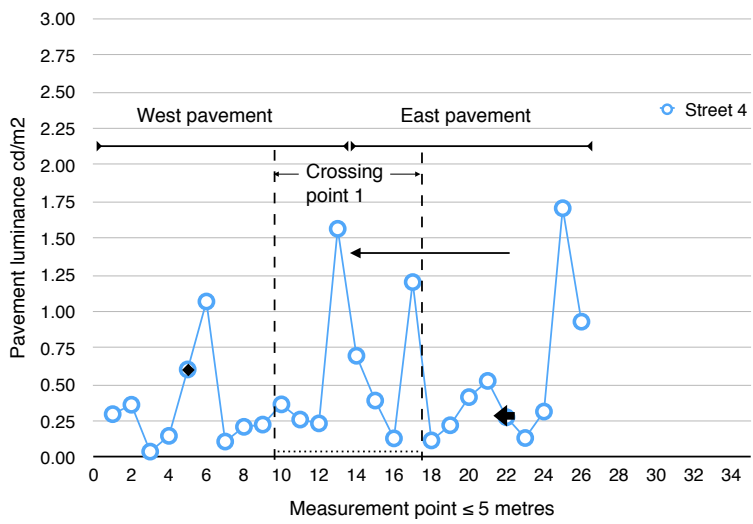Figure D4. Luminance points along route on street 3.

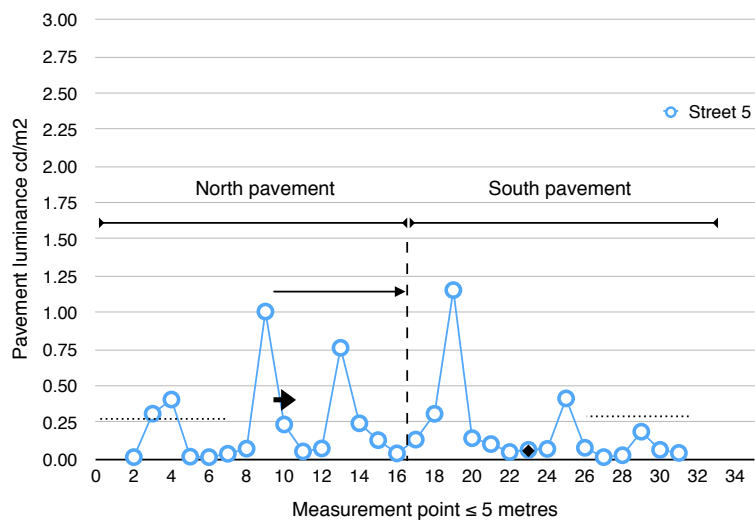Figure D5. Luminance points along route on street 4.

Figure D6. Luminance points along route on street 5.
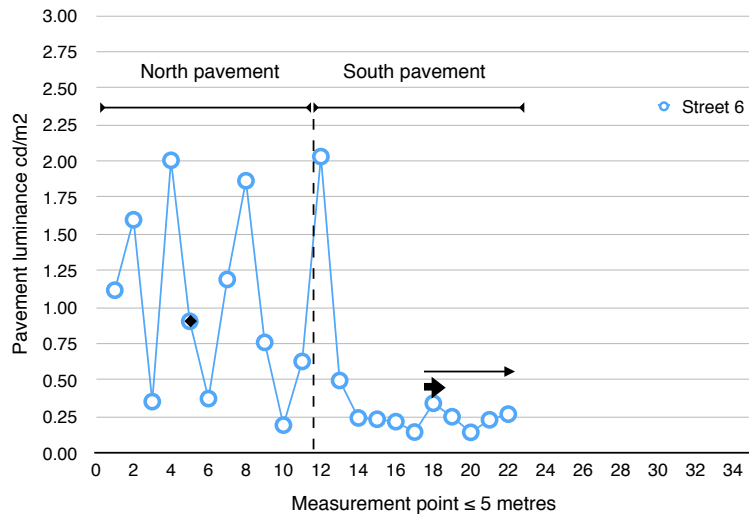

358

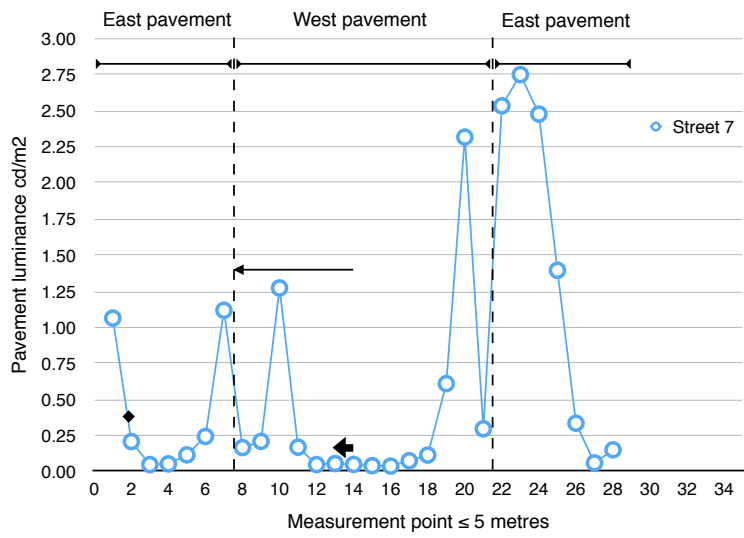Figure D7. Luminance points along route on street 6.

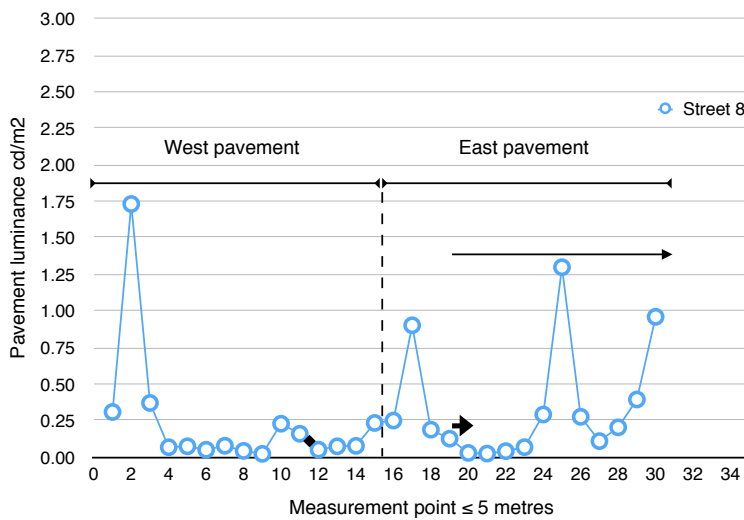Figure D8. Luminance points along route on street 7.

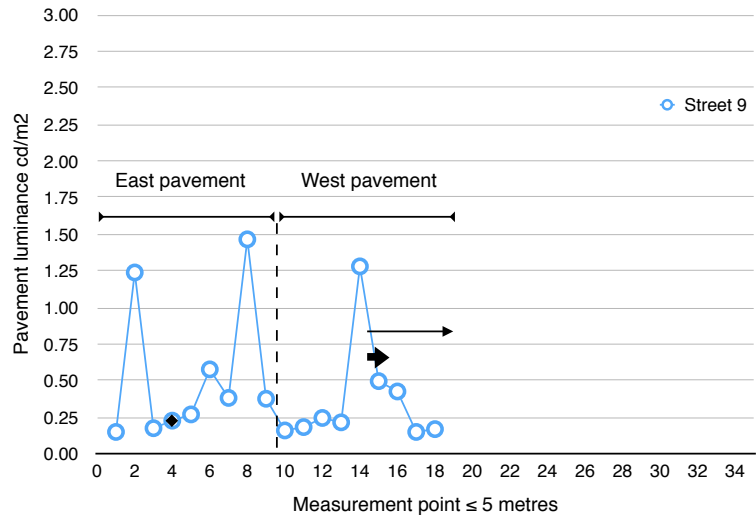Figure D9. Luminance points along route on street 8.

359

Figure D10. Luminance points along route on street 9.

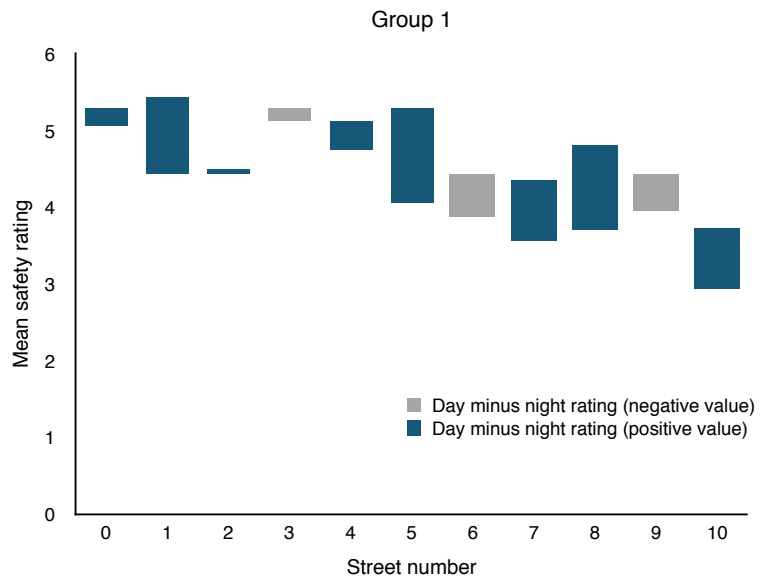## D.4. D-N safety rating on each street by group   3

Figure D11. Group 1 day minus night safety ratings on all streets.

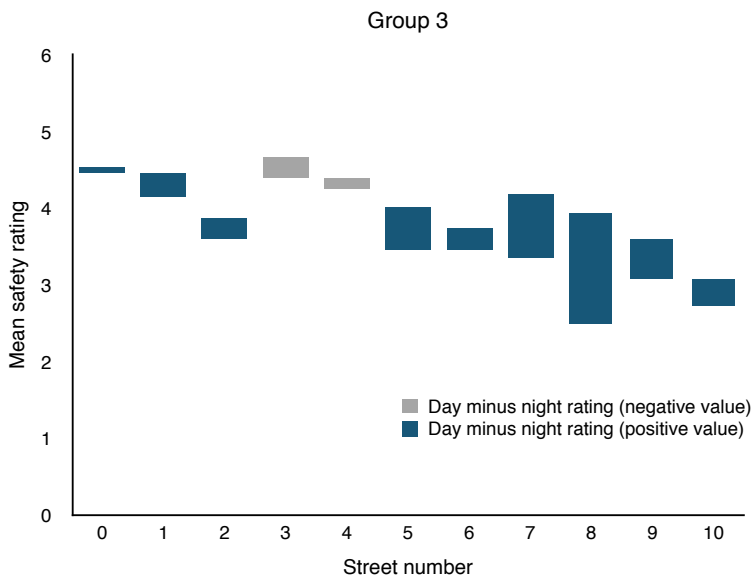*Figure D12. Group 2 day minus night safety ratings on all streets.*

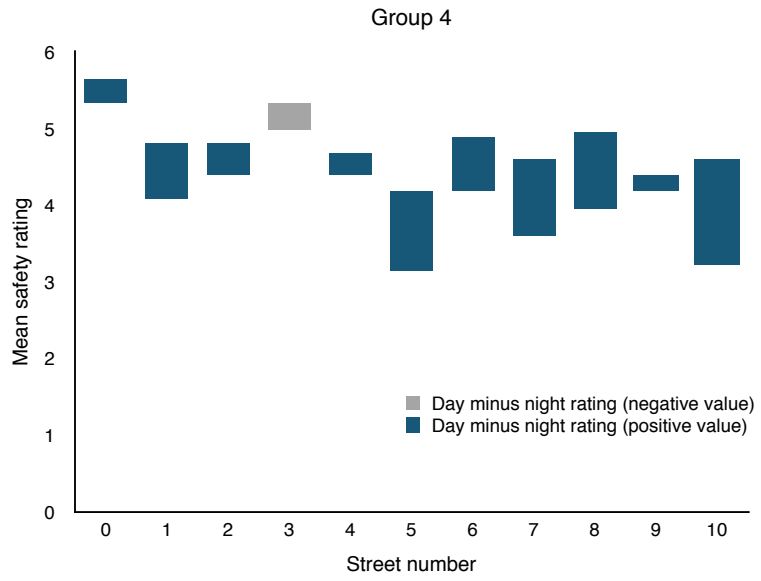*Figure D13. Group 3 day minus night safety ratings on all streets.*

Figure D14. Group 4 day minus night safety ratings on all streets.

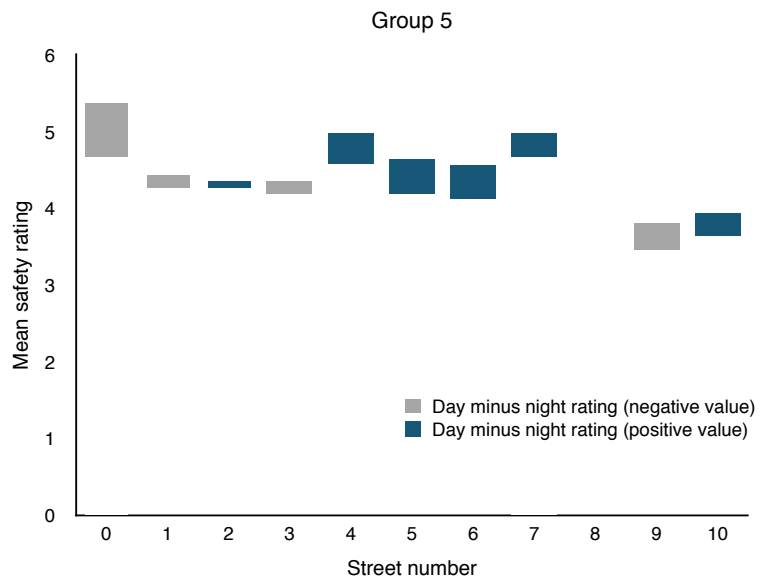
Figure D15. Group 5 day minus night safety ratings on all streets.

Appendix E Publications

Publications which have resulted from this work:

Fotios, S. (2014) Road lighting and pedestrian reassurance after dark. A review of the evidence. (Presented poster 66). In CIE Conference: Lighting Quality & Energy Efficiency. Kuala Lumpur, 23-26 April, 2014.

Fotios, S., Unwin, J. and Farrall, S. (2014) Road lighting and pedestrian reassurance after dark: A review. Lighting Research and Technology 0: 1–21.

Fotios, S. and Unwin, J. (2013) Lighting and pedestrian reassurance at night time. In CIE Centenary Conference: Towards a New Century of Light. Paris, 15-16 April 2013.

Fotios, S. and Unwin, J. (2013) Relative weighting of lighting alongside other environmental features in affecting pedestrian reassurance. In 7th Lux Pacifica Conference: Cultural Lighting. Bangkok, 6-8 March 2013.

Fotios, S., Unwin, J. and Yang, B. (2012) Lighting in Residential Roads: What do we need to perceive? (Poster) In Predicting Perceptions: The 3rd International Conference on Appearance. Heriot-Watt University, Edinburgh, 17-19 April 2012.

Unwin, J. and Fotios, S. (2011) Does lighting contribute to the reassurance of pedestrians at night-time in residential roads? Lighting Engineering Journal: Ingineria Iluminatului 13(2).

Bibliography

Acuña-Rivera, M., D. Uzzell and J. Brown (2011). Perceptions of disorder, risk and safety: The method and framing effects.

Adams, M., T. Cox, G. Moore, B. Croxford, M. Refaee and S. Sharples (2006). "Sustainable Soundscapes: Noise Policy and the Urban Experience." Urban Studies 43(13): 2385-2398.

Akashi, Y., M. Rea and J. Bullough (2009). "Several views of metal halide and high pressure sodium lighting for outdoor applications." Lighting Research & Technology 41(4): 297-314.

Akashi, Y., M. S. Rea and P. Morante (2004). Progress Report: Improving acceptance and use of energy-efficient lighting. Unified photometry: An energy-efficient street lighting demonstration in Easthampton, Massachusetts. Troy, USA., Lighting Research Center.

Alferdinck, J., M. Hogervorst, A. van Eijk and J. Kusmierczyk (2010). "Mesopic vision and public lighting – A literature review and a face recognition experiment." TNO-DV C435.

Alfonzo, M. A. (2005). "To walk or not to walk? The hierarchy of walking needs." Environment & Behavior 37: 808-836.

Altman, D. G. (1991). Practical Statistics for Medical Research, Chapman and Hall.

Appleton, J. (1975). The Experience of Landscape. London, John Wiley.

Atkins, S., S. Husain and A. Storey (1991). The Influence of Street Lighting on Crime & Fear of Crime. Paper 28. Crime Prevention Unit. London, Home Office.

Aviezer, H., R. R. Hassin, J. Ryan, C. Grady, J. Susskind, A. Anderson, M. Moscovitch and S. Bentin (2008). "Angry, Disgusted, or Afraid? Studies on the Malleability of Emotion Perception." Psychological Science 19(7): 734-732.

BBC. (2014). "European Court upholds French full veil ban."   Retrieved 28th October, 2014, from http://www.bbc.co.uk/news/world-europe-28106900.

Bennett, R. (2000). White light reduces fears. The Philips Lamp & Gear Magazine. 3: 14-17.

Berry, R. S. Y. (1999). Collecting data by indepth interviewing. British Educational Research Association Annual Conference. University of Sussex, Brighton.

Blackman, T., J. Harvey, M. Lawrence and A. Simon (2001). "Neighbourhood renewal and health: evidence from a local case study." Health Place 7(2)(2): 93-103.

Bodmann, H. W. (1967). "Quality of Interior Lighting Based on Luminance." Transactions of the Illuminating Engineering Society (London) 32(1): 22-40.

Bodmann, H. W. and H. J. Schmidt (1989). "Road surface reflectance and road lighting: Field investigations." Lighting Research and Technology 21(4): 159-170.

Boomsma, C. and L. Steg (2013). "The effect of information and values on acceptability of reduced street lighting." Journal of Environmental Psychology.

Bouman, M. J. (1991). The "Good Lamp is the Best Police" Metaphor and Ideologies of the Nineteenth-Century Urban Landscape, University of Kansas Libraries.

Box, S., C. Hale and G. Andrews (1988). "Explaining fear of crime." British Journal of Criminology 28: 340-356.

Boyce, P. R. (1985). "Movement under emergency lighting: The effect of illuminance." Lighting Research and Technology 17: 51-71.

Boyce, P. R. (1986). "Movement under emergency lighting: The effects of changeover from normal lighting." Lighting Research and Technology 18(1-18).

Boyce, P. R., N. H. Eklund, B. J. Hamilton and L. D. Bruno (2000). "Perceptions of safety at night in different lighting conditions." Lighting Research and Technology 32: 79.

Boyce, P. R. and J. M. Gutkowski (1994). "The if, why and what of street lighting and street crime: A review." Lighting Research and Technology 27(2): 103-112.

Briggs, C. L. (1986). Learning how to ask - A sociolinguistic appraisal. Cambridge., Cambridge University Press.

British Standards Institution (1931). No. 307 British Standard Specification for Street Lighting. London, British Standards Institution.

Buhr, K. and M. J. Dugas (2002). "The intolerance of uncertainty scale: psychometric properties of the English version." Behavior Research and Therapy 40: 931-945.

Burtt, H. E. (1916). "The effect of uniform and non uniform illumination upon attention and reaction times, with especial reference to street illumination." Journal of Experimental Psychology 1(2): 155-182.

Celesia, G. G. (2010). "Visual perception and awareness: a modular system." Journal of Psychophysiology 24(2): 62-67.

Cheal, C. (2007). Light Source Spectrum, Brightness and Visual Performance in Pedestrian Environments. Doctor of Philosophy, University of Sheffield.

Chiou, W. B. and Y. Y. Cheng (2013). "In broad daylight, we trust in God! Brightness, the salience of morality, and ethical behavior." Journal of Environmental Psychology 36: 37-42.

CIE (1989). Mesopic Photometry: History, Special Problems and Practical Solutions. Vienna, Commission Internationale de l'Éclairage Publication No. 81.

Clarke, A. H. and M. J. Lewis (1982). "Fear of Crime Among the Elderly - An Explanatory Study." British Journal of Criminology 22(1).

Cohen, C. J., F. Morelli and K. A. Scott (2008). A Surveillance System for the Recognition of Intent within Individuals and Crowds. 2008 IEEE Conference on Technologies for Homeland Security. Waltham, MA: 559 - 565.

Cohen, L. and M. Felson (1979). "Social change and crime rate trends: A routine activity approach." American Socialogical Review 44: 588-608.

Cook, F. C., J. F. Colquhoun, C. A. Masterman, W. H. Morgan, C. C. Paterson, E. S. Perrin, L. Rosveare and J. W. T. Walsh (1935). Departmental Committee on Street Lighting. Ministry of Transport. London, His Majesty's Stationary Office.

Cozens, P. M. (2008). Crime Prevention Through Environmental Design. Environmental Criminology and Crime Analysis. R. Wortley and L. Mazerolle. Devon, UK, Willan: 153-194.

Crouch, S., H. Shaftoe and R. Fleming (1999). <u>Design for Secure Residential Environments,</u> Routledge.

Crow, E. L., F. A. Davis and M. W. Maxfield (1960). <u>Statistics Manual</u>. New York, Dover Publications Inc.

Curran, L. C. (1968). "Propertius 4. 11: Greek Heroines and Death." <u>Classical Philology</u> Vol. 63(2).

Cuttle, C. (2003). <u>Lighting by design</u>. Oxford, Elsevier Science.

Cuttle, C. (2009). "Towards the third stage of the lighting profession." <u>Lighting Research and Technology</u> 00: 1-21.

Cuttle, C. (2009). Towards the third stage of the lighting profession presentation. Bartlett , UCL London.

Cuttle, C. (2013). "A new direction for general lighting practice." <u>Lighting Research and Technology</u> 45(22): 22–39.

Davoudian, N. (2009). <u>The impact of background lighting complexity on the visual saliency of urban objects at night</u>. Doctor of Philosophy, University of Sheffield.

Davoudian, N. and P. Raynham (2012). "What do pedestrians look at at night?" <u>Lighting Research and Technology</u> 44: 438-448.

Department of Energy and Climate Change (2014). Quarterly Energy Prices. D. o. E. a. C. Change, A National Statistics Publication.

Electricity Council. (1987). "Electricity Supply in the UK: A chronology."   Retrieved 18.09.2014, 2014, from http://www.etk.ee.kth.se/personal/nt/elecpow/history/ electricity_supply_in_the_uk__a_chronology_ocrnopic.pdf.

Farrall, S., J. Jackson and E. Gray (2009). <u>Social Order and the Fear of Crime in Contemporary Times</u>. Oxford, Oxford University Press.

Farrington, D. P. and B. C. Welsh (2002). Effects of improved street lighting on crime: a systematic review. D. a. S. D. Home Office Research. London, Communication Development Unit.

Feldman-Barrett, L. (2014). What faces can't tell us, The New York Times.

Field, A. (2005). <u>Discovering Statistics using SPSS</u>. London, Sage Publications.

Figueiro, M. G. (2009) "Quantifying Impact of Lighting on K-12 Students' Performance and Well-being." <u>Lighting Research Centre, Rensselaer</u>.

Figueiro, M. G., B. Plitnick, M. S. Rea, L. Z. Gras and M. S. Rea (2011). "Lighting and perceptual cues: Effects on gait measures of older adults at high and low risk of falls." <u>BMC Geriatrics</u> 11(49).

Fisher, B. S. and J. L. Nasar (1992). "Fear of Crime in Relation to Three Exterior Site Features : Prospect, Refuge, and Escape." <u>Environment and Behavior</u> 24(35): 35-65.

Foster, S., L. Wood, H. Christian, M. Knuiman and B. Giles-Corti (2013). "Planning safer suburbs: Do changes in the built environment influence residents' perceptions of crime risk?" <u>Social Science & Medicine</u>(97): 87-94.

Fotios, S. and C. Cheal (2009). "Obstacle detection: A pilot study investigating the effects of lamp type, illuminance and age." Lighting Research and Technology(41): 321-342.

Fotios, S. and P. Raynham (2011). "Correspondence: Lighting for pedestrians: Is facial recognition what matters?" Lighting Research and Technology 43: 129.

Freeston, M. H., J. Rhéaume, H. Letarte, M. J. Dugas and R. Ladouceur (1994). "Why do people worry?" Personality and Individual Differences 17(6): 791-802.

Fujiyama, T., C. Childs, D. Boampomg and N. Tyler (2005). Investigation of Lighting Levels for Pedestrians - Some questions about lighting levels of current lighting standards. Walk21-VI, Everyday Walking Culture. 6th International Conference of Walking in the 21st Century, Zurich, Switzerland.

Furstenberg, F. F. (1971). "Public Reaction to Crime in the Streets." The American Scholar 40(4): 601-610.

Garland, D. (2001). The culture of control: crime and social order in contemporary society. Oxford, Oxford University Press.

Gibson, J. J. (1950). The Perception of the Visual World. Boston; Houghton, Mifflin.

Gifford, R. (2007). Environmental Psychology: Principles and Practice. Colville, WA, Optimal Books.

Gregory, R. L. (1998). Eye and Brain: the physiology of seeing, Oxford University Press.

Haans, A. and Y. A. W. de Kort (2012). "Light distribution in dynamic street lighting: Two experimental studies on its effect on perceived safety, prospect, concealment, and escape." Journal of Environmental Psychology 32: 342-352.

Hall, E. T. (1966). The Hidden Dimension. Toronto, Anchor Books, Random House Inc.

Hall, M. R. and E. T. Hall (1975). The Fourth Dimension in Architecture: The Impact of Building on Behaviour. Santa Fe, New Mexico, Sunstone Press.

Hammersley, M. (2008). Advances in mixed methods research. London, Sage Publications Ltd.

Hankiss, E. (2001). Fears And Symbols: An Introduction To The Study of Western Civilisation. Budapest, Central European Press.

Hanyu, K. (1997). "Visual properties & affective appraisals in residential areas after dark." Journal of Environmental Psychology 17: 301–315.

Hillier, B. and L. Vaughan (2007). "The city as one thing." Progress in Planning 67(3): 205 - 230.

Hopkinson, R. G. (1957). Assessment of Brightness: What We See. 50th Anniversary Convocation, National Technical Conference of the Illuminating Engineering Society. Bosten, Massecusetts., Illuminating Engineering Society.

Houser, K., S. Fotios and M. Royer (2009). "A test of the S/P ratio as a correlate for brightness perception using rapid-sequential and side-by-side experimental protocols." Leukos 6(2).

Institution of Lighting Professionals (2011). Guidance Notes for the Reduction of Obtrusive Light GN01:2011.

International Energy Agency (2006). Lights's Labour's Lost. Paris, International Energy Agency (IEA).

Ishii, J., S. Okuda and K. Fukagawa (2007). Research on the lighting environment in the street at night. Part 2. The effect of the lighting environment in the street on the insecurity feeling. 26th Session of the CIE. Beijing.

Jackson, J., S. Farrall, M. Hough and B. Bradford (2008). Public Insecurities About Crime: A Review of the British Research Literature. http://ssrn.com/abstract=1303610, Social Science Research Network.

Jacobs, J. (1961). The Death and Life of Great American cities. London, Jonathan Cape.

Jacobs, J. (1969). The Economy of Cities. London, Jonathan Cape.

Jansson, K. (2007). British Crime Survey-measuring crime for 25 years. D. a. S. D. Home Office Research. London.

Johansson, M., M. Rosén and R. Küller (2010). "Individual factors influencing the assessment of the outdoor lighting of an urban footpath." Lighting Research and Technology(0): 1-13.

Johansson, M., M. Rosén and R. Küller (2011). "Individual factors influencing the assessment of the outdoor lighting of an urban footpath." Lighting Research and Technology 43(1): 31-43.

Keck, M. E. and H. A. Odle (1975). A field evaluation of pavement luminance and glaremark. Annual Illuminating Engineering Society Conference. San Francisco, California.

Knight, C. (2010). "Field surveys investigating the effect of lamp spectrum on the perception of safety and comfort at night." Lighting Research and Technology 42(3): 313-330.

Koga, Y., R. Tanaka and D. Shibata (2003). Evaluation structure on night streets. A case study in Fukuoka. 25th Session of the CIE: D5 82-85.

Kvale, S. (1996). Interviews - An Introduction to Qualitative Research Interviewing. London, SAGE Publications.

Lane, J. and J. W. Meeker (2003). "Women's and Men's fear of Gang Crimes:Sexual and Non - Sexual Assault as Perceptually Contemporaneous Offenses." Justice Quarterly 20(2).

Lee, M. (2001). "The Genesis of Fear of Crime." Theoretical Criminology 5(4).

Lees, E., W. C. Taylor, J. T. Hepworth, K. Feliz, A. Cassells and J. N. Tobin (2007). "Environmental Changes to Increase Physical Activity: Perceptions of Older Urban Ethnic-Minority Women." Journal of Aging and Physical Activity 15: 425-438.

Lennie, P., J. Pokorney and V. Smith (1993). "Luminance." J. Optical Soc. America(A10): 1283-1293.

Leslie, R. P. and P. A. Rodgers (1996). The Outdoor Lighting Pattern Book, Rensselaer Polytechnic Institute.

Lindquist, K. A., L. Feldman-Barrett, E. Bliss-Moreau and J. A. Russell (2006). "Language and the perception of emotion." Emotion 6(1): 125-138.

Loe, D. L., K. P. Mansfield and E. Rowlands (2000). "A step in quantifying the appearance of a lit scene." Lighting Research and Technology 32(213).

Loewen, L. J., G. D. Steel and P. Suedfeld (1993). "Perceived Safety from Crime in the Urban Environment." Journal of Environmental Psychology 13: 323-331.

Lorenc, T., M. Petticrew, M. Whitehead, D. Neary, S. Clayton, K. Wright, H. Thomson, S. Cummins, A. Sowden and A. Renton (2013). "Environmental interventions to reduce fear of crime: systematic review of effectiveness." Systematic Reviews 2(30).

Lynch, K. (1960). The Image of the City. Cambridge, Massachusetts, The MIT Press.

Lynch, K. (1972). What Time is this Place? Cambridge, Massachusetts, The MIT Press.

Lynes, J. A. (1971). "Lightness, colour and constancy in Lighting Design." Lighting Research and Technology 3: 24-42.

Major, M. (2014). Mean Streets. Lighting Journal. Kettering, Institute of Lighting Professionals: 20-21.

Mansfield, K. and P. Raynham (2005). Urban Lights: Sustainable Urban Lighting for Town Centre Regeneration. Lux Europa the 10th European Lighting Conference. Lighting for Humans., Berlin.

Matsui, T. (2007). A study on a street lighting that makes change illuminance is effective for both reducing fear of crime and saving energy. 26th Session of the CIE, Beijing, China.

Mayhew, C. and R. Simmon. (1994). "Earth Lights." Retrieved 22.9.2014., 2014, from http://earthobservatory.nasa.gov/IOTD/view.php?id=896.

McFadden, E., M. E. Jones, M. J. Schoemaker, A. Ashworth and A. J. Swerdlow (2014). "The Relationship Between Obesity and Exposure to Light at Night: Cross-Sectional Analyses of Over 100,000 Women in the Breakthrough Generations Study." American Journal of Epidemiology 180(3): 245-250.

Meyer, T. J., M. L. Miller, R. L. Metzger and T. D. Borkovec (1990). "Development and validation of the Penn State Worry Questionnaire." Behaviour Research and Therapy 28: 487-495.

Mlodinow, L. (2008). The Drunkard's Walk. New York, Random House.

Morante, P. (2008). Mesopic Street Lighting Demonstration and Evaluation Final Report. Troy, Rensselaer Lighting Research Centre.

Morrow, E. N. and S. A. Hutton (2000). The Chicago Alley Lighting Project: Final Evaluation Report, Illinois Criminal Justice Information Authority.

Mota, S., E. Ros, J. Diaz, S. Tan, J. Dale and A. Johnston (2004). Detection & Tracking of Overtaking Cars for Driving Assistance. E. C. V. Workshop. Isle of Skye, UK.

Nair, G., D. G. McNair and J. Ditton (1997). "Street lighting: Unexpected benefits to young pedestrians from improvement." Lighting Research & Technology 29(3): 143-149.

Nasar, J. L., B. S. Fisher and M. Grannis (1993). "Proximate physical cues to fear of crime." Landscape and Urban Planning 26: 161-178.

Newman, O. (1972). Defensible space. Crime prevention through urban design. London, MacMillan.

Nikunen, H., M. Puolakka, A. Rantakallio, K. Korpela and L. H. L (2014). "Perceived restorativeness and walkway lighting in near-home environments." Lighting Research and Technology 46(3): 308-328.

O'Dea, W. T. (1958). The Social History of Street Lighting. London, Routledge and Kegan Paul.

Okuda, S., J. Ishii and K. Fukagawa (2007). Research on the lighting environment in the street at night. Part 1. Resident's attitude on the safety and security in the street at night. 26th session of the CIE, Beijing.

Owsley, C., R. Sekuler and D. Siemsen (1983). "Constrast sensitivity throughout adulthood." Vision Research 23(7): 689-699.

Owsley, C., R. Sekuler and D. Siemsen (1983). "Contrast sensitivity throughout adulthood." Vision Research 23(7): 689-699.

Pain, R. H. (1995). "Elderly women and violent crime: the least likely victims?" British Journal of Criminology 35: 584–598.

Pain, R. H. (1997). "'Old Age' and Ageism in Urban Research: The Case of Fear of Crime." Journal of Urban and Regional Research 21: 117–128.

Pain, R. H. (2000). "Place, social relations and the fear of crime: a review." Progress in Human Geography 24(3): 365-387.

Painter, K. (1988). Lighting and Crime Prevention: The Edmonton Project. Middlesex, Middlesex Polytechnic.

Painter, K. (1996). "The influence of street lighting improvements on crime, fear and pedestrian street use, after dark." Landscape and Urban Planning 35: 193-201.

Parliament. (1990). "Column 831."   Retrieved 13.07.2014., 2014, from http://www.publications.parliament.uk/pa/cm199091/cmhansrd/1990-11-16/Debate-2.html.

Paulhus, D. L. (2002). The role of constructs in psychological and educational measurement. Mahwah, New Jersey, Erlbaum.

Postlethwaite, S. (2003). Can 'Over Lighting' Increase the Fear of Crime? The Lighting Journal. November/December: 15-21.

Poulton, E. C. (1982). "Biases in quantitative judgements." Applied Ergonomics 13(1): 31-42.

Poulton, E. C. (1989). Bias in Quantifying Judgements. London., Lawrence Erlbaum Association Ltd.

Priede, C. and S. Farrall (2011). "Comparing results from different styles of cognitive interviewing: 'verbal probing' vs. 'thinking aloud'." International Journal of Social Research Methoology 14(4): 271-287.

Quellman, E. and P. Boyce (2002). "The light source color preferences of people of different skin tones." <u>Journal of Illuminating Engineering Society</u> 31(1): 109-116.

Rachman, J. (1978). <u>Fear and Courage</u>. San Francisco, Freeman.

Raynham, P. (2004). "An examination of the fundamentals of road lighting for pedestrians and drivers." <u>Lighting Research and Technology</u> 36.

Raynham, P. and K. Mansfield (2005). <u>Urban Lights: Sustainable Urban Lighting for Town Centre Regeneration</u>. Lux Europa the 10th European Lighting Conference. Lighting for Humans., Berlin.

Rombauts, P., H. Vandewyngaerde and G. Maggetto (1988). "Minimum semicylindrical illuminance and modelling in residential area lighting." <u>Lighting Research and Technology</u> 21(2): 49-55.

Russell, J. A. (1994). "Is There Universal Recognition of Emotion From Facial Expression? A Review of the Cross-Cultural Studies." <u>Psychological Bulletin</u> 115(1): 102-141.

Salesses, P., K. Schechtner and C. A. Hidalgo (2013). "The Collaborative Image of the City: Mapping the Inequality of Urban Perception." <u>PLOS ONE</u> 8(7): 1-12.

Sampson, R. J. (1987). "Personal violence by strangers: An extension and test of the opportunity model of predatory victimization." <u>Journal of Criminal Law & Criminology</u> 78: 327-357.

Sansone, C., C. C. Morf and A. T. Panter (2003). <u>The Sage Handbook of Methods in Social Psychology</u>, Sage.

Sekular, R. and R. Blake (1994). <u>Perception</u>. New York, McGraw-Hill.

Sexton, K. A. and M. J. Dugas (2009). "Defining Distinct Negative Beliefs about Uncertainty: Validating the Factor Structure of the Intolerance of Uncertainty Scale." <u>Psychological Assessment</u> 21: 176-186.

Skogan, W. G. (1990). <u>Disorder and Decline: Crime and the Spiral of Decay in American Neighborhoods</u>. Berkeley, California., University of California Press.

Smith, D. A. and G. R. Jarjoura (1989). "Household characteristics, neighborhood composition and victimization risk." <u>Social Forces</u> 2: 621-640.

Southern Electricity Service. (1939). "Better Light Gives Better Sight." from http://www.simoncornwell.com/lighting/contact/.

Spencer, C. and K. Gee (2011). Environmental Psychology - Chapter 11 - The place of the Environment within Psychology, and Developmental Psychology. Sheffield, University of Sheffield.

Standards Australia (2005). Lighting for Roads and Public Spaces. Part 3 Pedestrian Area (Category P) Lighting - Performance and Installation Design Requirements. <u>AS/NZS 1158.3.1:2005</u>. Sydney, Australia, Standards Australia.

Steenkamp, J.-B. E. M., M. G. d. Jong and H. Baumgartner (2009). "Socially Desirable Response Tendencies in Survey Research." <u>Journal of Marketing Research</u> XLVI.

Steg, L., A. E. v. d. Berg and J. I. M. d. Groot (2012). <u>Environmental Psychology: An Introduction</u>, Wiley-Blackwell.

Steidlea, A. and L. Werth (2013). "Freedom from constraints: Darkness and dim illumination promote creativity." Journal of Environmental Psychology 35: 67-80.

Stevens, D. (2012). Public Perceptions of Security: Reconsidering Sociotropic and Personal Threats. Paper prepared for the annual Elections, Public Opinion and Parties meeting. Oxford.

Stevens, S. S. (1961). The psychophysics of sensory function. Sensory Communication. W. A. Rosenblith. Cambridge, MA, MIT Press.

Sutton, R. M. and S. Farrall (2005). "Gender, Socially Desirable Responding and the Fear of Crime." British Journal of Criminology 45: 212-224.

Tavakol, M. and R. Dennick (2011). "Making sense of Cronbach's alpha." International Journal of Medical Education 2: 53-55.

The Institution of Lighting Engineers (2005). The Outdoor Lighting Guide. Oxon, Taylor & Francis.

The Telegraph (2013). Cost-cutting council 'contributed to death of student' by switching off street lights. The Telegraph, News agencies.

Tien, J. M., V. F. O'Donnell, A. Barnett and P. B. Mirchandani (1979). Street Lighting Projects. N. E. P. P. 1.

Toet, A. and M. G. v. Schaik (2012). "Effects of signals of disorder on fear of crime in real and virtual environments." Journal of Environmental Psychology 32: 260-276.

Tversky, A. and D. Kahneman (1974). "Judgment under uncertainty: Heuristics and biases." Science, New Series. 185(4157): 1124-1131.

Twigger-Ross, C. L. and D. L. Uzzell (1996). "Place and Identity Processes." Journal of Environmental Psychology 16: 205-220.

Valentine, G. (1989). "The geography of women's fear." Area 21: 385–390.

van Bommel, W. and E. Caminada (1982). Considerations for the Lighting of Residential Areas for Non-Motorised Traffic. CIBSE National Lighting Conference. N.V. Philip's Gloeilampenfabrieken, The Netherlands.

Veitch, J. A., G. R. Newsham, P. R. Boyce and C. C. Jones (2008). "Lighting appraisal, well-being and performance in open-plan offices: A linked mechanisms approach." Lighting Research and Technology 40(133).

Viliûnas, V., H. Vaitkevicius, R. Stanikunas, P. Vitta, R. Bliumas, A. Auskalnyte, A. Tuzikas, A. Petrulis, L. Dabasinskas and A. Zukauskas (2013). "Subjective evaluation of luminance distribution for intelligent outdoor lighting." Lighting Research and Technology(0): 1-13.

Waldram, J. M. (1962). Visual Problems in Streets and Motorways. National Technical Conference of the Illuminating Engineering Society. St. Louis, Missouri.

Warr, M. (1985). "Fear of rape among urban women." Social Problems 32: 238-250.

Warr, M. (1990). "Dangerous situations: social context and fear of victimization." Social Forces 68: 891-907.

Webster, T. (2003). Lighting as a Crime Deterrent. The Lighting Journal. May/June: 30-34.

Welsh, B. C. and D. P. Farrington (2002). Crime prevention effects of closed circuit television: a systematic review. D. a. S. D. Home Office Research. London, Communication Development Unit.

Welsh, B. C. and D. P. Farrington (2008). Effects of improved street lighting on crime: A systematic review. B. H. Office, The Campbell Collaboration: 46.

Wilson, J. Q. and G. L. Kelling (1982). "Broken Windows: The police and neighborhood safety." The Atlantic.

Wurff, A. V. d., V. Staalduinen and P. Stringer (1989). "Fear of crime in residential environments -Testing a social psychological model." Journal of Social Psychology 129(2).

Zhang, Y. and W. G. Julian (2011). Towards a Predictive Tool for Gloom. 27th Session of the CIE, Sun City, South Africa, CIE Central Bureau.