Risk and safety on the roads: Perceptions and attitudes

AA Foundation for Road Safety Research

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AA Foundation for Road Safety Research

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The AA Foundation for Road Safety Research

The AA Foundation for Road Safety Research was formed by The Automobile Association in December 1986 as part of its continuing efforts in the road safety field and as a major contribution to European Road Safety Year.

Registered as a charity, the objectives of the Foundation are:

> To carry out, or procure, research into all factors affecting the safe use of public roads;
>
> To promote and encourage the safe use of public roads by all classes of road users through the circulation of advice, information and knowledge gained from research; and
>
> To conceive, develop and implement programmes and courses of action designed to improve road safety, these to include the carrying out of any projects or programmes intended to educate young children or others in the safe use of public roads.

Control of the Foundation is vested in a Council of Management under the Chairmanship of Sir Peter Baldwin.

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Executive summary

Introduction

Using the road involves taking a risk which on any one occasion is likely to be very small indeed. However, there are on average 13 people killed and over 800 injured on Britain's roads each day. Comparison of insurance company and police records suggest that, for every accident in which someone is injured, there are between eight and ten more resulting only in damage. Overall, there is roughly one accident every year for each ten vehicles on the roads.

The vast majority of accidents result from human error and the extent to which road users can identify the risks involved is not well understood. Most drivers see themselves as having above average skill and, like pedestrians, may be inclined to attribute accidents to the fault of others or to circumstances beyond their control. Since people find it difficult to acknowledge their own contribution to an undesired outcome, this can engender a feeling of immunity or a fatalistic acceptance of accidents. Even if they are seriously concerned, people may still feel unable to affect the situation in any clear-cut way.

The general aim of this study, carried out at the University of Newcastle upon Tyne, was to investigate factors affecting judgement of risk and attitudes to road safety. More specifically the objectives of the research were (a) to increase the understanding of peoples' perception of risk and their attitudes as road users; (b) to identify the reasons underlying what determines whether a road safety measure is acceptable or unacceptable; and (c) to suggest ways of changing attitudes through environmental aspects, promotional activities, or different approaches to enforcement.

Size and scope of study

An ambitious and innovative programme of linked surveys was undertaken. The main interview questionnaire made use of well established techniques, whereas the other three surveys were more innovatory in their approach. The use of linked surveys, where the same road locations were used for risk rating in three separate ways (by drivers on the road, by pedestrians from the roadside and by viewing videos) provided an opportunity to examine the validity of the techniques and allowed comparison between direct and indirect forms of assessment.

The physical focus of the study was a 23-mile route in the locality, chosen to include a wide range of traffic conditions. It was defined after consultation with the local authority engineers responsible for road safety and the Northumbria Police. Participants were recruited from all parts of the route or areas close to it. They were divided by age and gender to form twelve groups (male/female, 17-24, 25-34, 35-44, 45-54, 55-64, 65 and over). A good spread of all social backgrounds was obtained and participants were encouraged to take part in more than one stage of the research.

Over a two year period the main stages of the work involved:

- a literature review of available information and discussions with researchers in the field
- definition of the route and collation of related accident data
- a postal questionnaire that yielded an initial sample of 2,205 respondents from which volunteers were drawn for the programme
- 207 drives along the route with drivers giving risk ratings at predetermined locations
- walks by 133 pedestrian participants at six locations along the route
- video filming of seven locations from driver and pedestrian viewpoint
- group testing of 473 volunteers who gave risk ratings on the videos
- in-depth interviews with 319 people that formed the main source of data on attitudes.

Main findings

Although previous studies have made use of live driving situations in order to obtain assessments of perceived risk, the number of drivers combined with the set of locations which each driver was asked to assess, produced a large enough data set to allow further analysis to be made by age and gender of driver and by type of site. Sufficient accidents had occurred in the four years previous to the drives for a reasonable prospect that perceived risk could be correlated with one measure of objective risk (accident numbers) although insufficient traffic flow data were available to calculate accident rates, which are probably a better indicator of objective risk for these purposes. In the event weak, but significant, correlations were found between perceived and objective risk in these terms, as has been found by others.

Whilst there is a statistically valid correlation between drivers' perceptions of risk and overall accident frequencies, these risk ratings bear no relationship with pedestrian accidents. Interestingly, as pedestrians, drivers appeared better able to assess the risk at the roadside during the pedestrian walks survey; and there was a clear difference between the responses of those pedestrians with a driving licence and those without. This perception seems not to carry over to the driving situation; drivers then seem to take little account of pedestrian activity which in turn makes it unlikely that their risk ratings would correlate with the frequency of pedestrian accidents at any one location.

In order to explore further the risk ratings which drivers had attached to particular locations, attributes that may have influenced the ratings were identified. A variety of physical attributes were considered and three were found to contribute very significantly to the rating scores. These were:

- competing traffic flows or lane usage;
- reduced sight distance; and
- an unusual layout.

A location rated as high risk was one where drivers were actively considering competitive or defensive manoeuvres or lacked clear information about which driver had priority. In contrast, it is worth noting that competing pedestrian activity did not contribute to the explanation of drivers' risk ratings and reinforces the findings on drivers' risk ratings as noted above.

In the video testing the driver's perspective was effectively communicated for the locations in question, as confirmed by a clear correlation between the risk ratings given during the drives and during the videos from the driver's perspective for the same locations. This result gives confidence in other aspects of the results from the videos and suggests that the technique has merit as an experimental method, even though it has certain limitations, for example, a single screen can only give a fairly narrow view of the road ahead. However, the technique provided only a limited representation of the pedestrian environment and did not convey the same sense of threat experienced in the pedestrian walks as, for instance, from the speed or the size of vehicles.

The main questionnaire revealed a number of factors of concern to respondents: whilst road safety was not the most important social concern, it did fall in the middle range of issues and was placed as less important than violent crime, house theft, educational standards, social health care and environmental pollution, but more important than drug abuse, unemployment, AIDS, cost of living and traffic congestion. Being a car driver or passenger was considered preferable, overall, to using public transport and, when threat of violence as well as accidents was included, was felt to involve less subjective risk. The analysis suggested that respondents viewed traffic accidents as resulting from one of three causes in the following order: violations and stupidity, errors and slips, and global and external factors.

A subsequent analysis of respondents' attitudes to road safety suggested five main clusters. These were labelled: order oriented; community oriented; youth oriented; self oriented; and unconcerned; with convenience oriented and safety oriented as the less important groups. Phrases that capture the characteristics of the main attitude clusters are as follows:

1 order oriented	people who are rule directed, law abiding and concerned for a well ordered environment
2 community oriented	concerned for the fabric of society and the environment
3 youth oriented	shares the concerns of youth, anything goes outlook
4 self oriented	selfish, kicking against the constraints of social order
5 unconcerned	little or no concern with social issues, does not know and does not care attitude.

Lastly, data from the northern part of the drive route were analysed to look for correlations between risk ratings at groups of locations and the attitude clusters. Three categories from the drive route emerged: (a) stretches of road without significant junctions; (b) complex intersections, such as roundabouts, associated with higher accident figures; and (c) left turns with reduced sight distance and narrow bridges. Different attitude profiles were shown to have significant links to the risk ratings for the different groupings of locations. Younger and more youth oriented individuals perceived the stretches and left turn categories as being less risky. The order oriented group assessed risk as greater where priority was difficult to determine (c), yet lower in locations of more obvious conflict and of higher accident frequency (b). The unconcerned group saw greater risk at the more complex intersections.

In addition, there were strong age-related trends in attitude cluster scores that paralleled accident involvement. Drivers between 17-24 were less concerned with community issues and more self oriented than any other age group. They were also more than twice as likely to have been involved in an accident in the previous five years than drivers aged over 35. Despite having a much lower annual mileage, their accident history was similar to drivers aged between 25-34.

Acceptability of countermeasures

In general, most countermeasures were viewed in a positive light. Participants were receptive to issues of road safety and willing to accept the need for countermeasures. There was a strong correlation between reported effectiveness and favourability in their responses. Only a few of the suggested countermeasures were ranked as more effective than favourable. These all tended to imply high personal costs, such as road humps, bans on vehicles capable of exceeding 70mph, road closures in residential areas and yearly tests for the over 65 year olds.

Opinions tended to strengthen, however, when considering specific types of location. People stated that slowing down traffic outside one's own home and preventing drivers from taking short cuts through residential areas were two of the most favoured aspects of countermeasures. (The highest ranking was for improvement in traffic flow on main road routes.) The majority of opinion favoured road humps being introduced in a variety of locations where traffic speeds threatened pedestrians, for example outside schools, on main roads near shops and crossing points, and in residential streets. This extended to 53% more respondents preferring road humps outside their homes than against them. The vast majority of those preferring road humps outside their homes stated that it would be fair to pay a personal (indirect) cost of £2 per week for the provision. Thus for particular situations there are much stronger feelings of approval than in the general case.

One area which received particular support was that of stricter controls on drinking and driving. Random breath testing was widely supported (by 78% of respondents), whilst measures directed against speeding received high levels of support (79% of respondents agreed that more enforcement of speeding was needed in built-up areas). Furthermore. it was estimated

that 80% of drivers regularly exceed the speed limit in built-up areas and speeding was acknowledged as a regular violation by drivers.

Compared with drink-driving, however, there are clearly different views on speeding. Whereas drink-driving is generally seen as dangerous, speeding is not. Drink-driving is now widely disapproved whereas speeding is widely accepted and in some sub-cultures even encouraged. This traffic violation can be reinforced by a feeling that speeding is necessary to keep up with the traffic, rather than an act of choice. Such factors all tend to reinforce support for countermeasures against drink-driving while militating against speeding countermeasures.

Changing attitudes

Three underlying aspects may be considered. The first is the attitude to the behaviour in question, what will be the effect of the change and how favourable will be that effect. The second is the subjective norm, how will 'significant others' (eg friends or parents) react to the behaviour and how much does their reaction matter. The third is volitional control, ie do individuals believe they have control over the behaviour or not? It therefore becomes very likely that the ways to induce changes in behaviour will vary across the different groups in society. This suggests that the attitude clusters cited above should be taken into account when such changes are planned.

The traditional 3E's of road safety (Engineering, Education, Enforcement) will be relevant in varying degrees to different groups in society. The results show that the risks of using the road are not fully appreciated or understood by drivers, in particular there is little sensitivity to the position of pedestrians, who do not seem to figure in drivers' assessments of risk. Certainly there was substantial overestimation of a pedestrian's probability of survival if hit by a car at a range of speeds. There is clearly a need to bridge the gap here between driver and pedestrian and to raise their mutual awareness.

Another strategy is to target groups of drivers who account for a disproportionate number of accidents. For example, some young drivers appear to view aberrant behaviour as having greater benefits than costs. It is doubtful whether engineering or enforcement measures can offer an effective contribution here and a more fruitful approach would be to find means of reducing the perceived benefits of offending, such as impressing peers or promoting a particular self-image. In the case of older drivers, however, a mix of engineering and educational measures, sensitively offered, would help to extend their continued safe road use.

In a broader sense the study raises the question of whether changing attitudes *per se* is always the best strategy. In any particular instance it may well be an uncertain and potentially expensive objective if there are other alternatives worth considering. Introducing countermeasures can even be counter-productive, if they create targets to be challenged by certain drivers. So if countermeasures can be devised which operate unobtrusively (for example, spiral markings at roundabouts to lead drivers to the appropriate exit), then established attitudes do not have to be overtly challenged.

Potential applications of the research

According to the results, competing for roadspace is a pervasive process. Risky locations, as assessed by the risk ratings given on the drives, correspond to situations where the road user is subordinate to more dominant traffic and is prepared to take evasive action, such as slowing down or rapidly accelerating. Risk is therefore associated with a point of critical decision. In locations which are of unusual design, such as at a double mini roundabout, the layout can appear sufficiently confusing to some for doubt (additional risk) to arise.

A competition model of road user behaviour has been developed from the results and from detailed comparisons with studies of animal behaviour in competitive situations. It proposes that external influences combine with individuals' attributes, as modified by their accumulated knowledge, to shape their perception of road conditions. On this basis they decide whether they have priority to proceed before considering the available options. The model proposes that evaluation is affected by prevailing concerns and values rather than being simply based on estimates of statistical risk. The decision taken therefore may or may not be rational and this will also apply to any subsequent justification of the action taken, especially to avert feelings of guilt in the event of an accident. The risk ratings given in the drive survey predominantly reflect the assessment of relative dominance made at the time, rather that a considered view of risk at a particular location.

Given that the competition model is accepted, then in one sense it underlines what traffic engineers have been trying to do for many years, namely to impose some degree of order and clarity of purpose onto the road network. If road users' priorities can be defined more clearly and the requirement for one party to yield can be made more explicit, then such a location is likely to be safer. Markings, signs, and other visual cues should all point unambiguously to the same conclusion for all road users; one traffic stream has priority, the others do not. Whilst the analysis suggests that this approach will yield positive benefits with order and community oriented people, it may produce unwelcome side effects amongst self and youth oriented individuals. These groups may resent too rigid a set of rules and consciously seek to break them.

Apart from problems posed by this type of individual, it is obvious that such a engineering solution is not complete. There can be a problem faced by a road user in a subordinate position in terms of the immediate hierarchy. If driver or a pedestrian is kept in a waiting position too long, then the temptation to force entry into competing traffic will rise. Traffic in the dominant flow will tend to consider themselves justified in not giving way – and the likely attribution of blame onto the subordinate road user will allow those in the dominant flow to feel justified in their decision. This represents a traffic conflict which can only be avoided by road users, particularly in priority positions, recognising that their real dominance lies in controlling the initiative to give way. Road users who possess this maturity will be safer drivers. In general, therefore, attitudes are as important to consider as engineering countermeasures.

Beliefs about accident causation are subject to influence by education and publicity. The results provide examples of several important beliefs, some general and some very specific. It is widely held that, for example,

accidents are the fault of the driver, yet most drivers see themselves as above average in skill. In other words, accidents are caused by other people. Whilst some inherently risky driving behaviours (eg drink-driving) are accepted as dangerous, others are not (speeding). The wider availability of accurate information about the real risks associated with speeding, and the attribution of accident severity to speed choice, both appear to be important prerequisites to changing attitudes and behaviour.

One important lesson to be drawn from the way in which attitudes to drink-driving have been changed is that of peer group pressure, or subjective norms. It was clear from the surveys that drink-driving was widely condemned and that countermeasures aimed against it were widely supported. If attitudes to other driving offences are also to change, then individual groups in society will have to be targeted specifically, so that the subjective norms of that particular group are altered. But different approaches and materials will be needed for the range of different attitude groups identified by this study.

It is vital that if serious inroads are to be made into current attitudes to speeding, the prevailing view that speeding is neither a crime nor dangerous is changed. One particular difficulty in this context stems from the belief of drivers that they possess above average driving skills. Even if people can be convinced that speeding is dangerous, they may still conclude that it is only dangerous for other people: all drivers need to be convinced that their own inappropriate choice of speed can kill or maim in many circumstances. As for a safer environment for pedestrians who are particularly vulnerable, engineering solutions can be very effective. Physical measures to control speeds at particular locations, such as speed humps, or broader policy-based measures such as extensive use of speed detection cameras offer ways to improve road safety that already receive support.

Finally, this project has demonstrated the value of using multiple measures of risk perception and attitudes to road safety. The combined use of these different measures has provided a range of new insights that could not otherwise have been achieved.

KEY

22/24 Drive Location
No of accidents (1987-90)

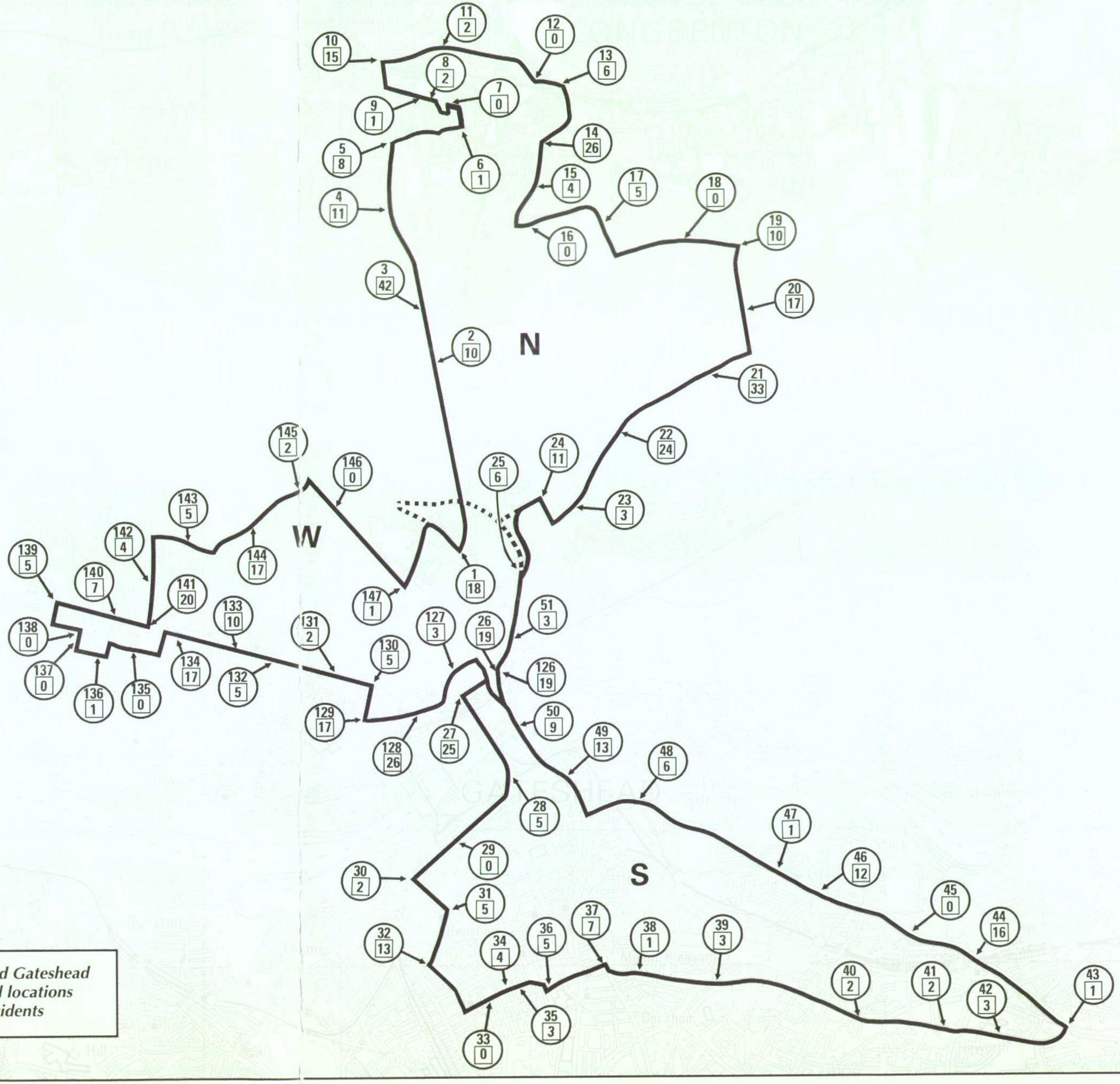


Figure I.1 – The Newcastle and Gateshead drive routes with numbered locations and reported injury accidents

1 What is this study about?

1.1 Introduction

On average, 13 people are killed and over 800 are injured on Britain's roads each day. Comparison of insurance company and police records suggest that, for every accident in which someone is injured, there are between eight and ten more resulting only in damage. Overall, there is roughly one accident for each ten vehicles on the road each year. The Department of Transport (DTp) estimate that these accidents cost the nation £6.7 billion in 1991.

The vast majority of accidents result from human error and the extent to which road users identify the risks involved is not well understood. Most drivers see themselves as having above average skill and, like pedestrians, may be inclined to attribute accidents to the fault of others or to circumstances beyond their control. Since it is difficult for people to acknowledge their own contribution to an undesired outcome, this can provoke a feeling of immunity or a fatalistic acceptance of accidents as the price to pay for the mobility and convenience of motorised transport. It may also be that people feel unable to affect the situation in any way. Perception of risk on the road was the starting point of the study described here.

The second strand of our research investigated attitudes to road safety and the acceptability of countermeasures. If there is a lack of public concern about road accidents, will people comply with measures taken to improve road safety? Evidence is mixed. Encouragement can be drawn from success with the use of seatbelts and the shift away from drinking and driving. Less encouraging is the widespread disregard for speed limits. It may be that attitudes to road safety and to taking risks on the road can explain why some countermeasures are effective and some are not.

There is an important link between perceptions of risk on the road and attitudes to road safety. The interaction between the two takes place in both directions, and the third strand of the research was to explore these links.

1.2 Aims and objectives

The aim of the study was to gain a better understanding of attitudes to road safety, perceptions of risk and the acceptability of countermeasures. Three specific objectives were set:

(a) to increase the understanding of peoples' perception of risk and their attitude to road safety engineering measures;

(b) to identify the reasons underlying what determines whether a measure is acceptable or unacceptable; and

(c) to suggest ways of changing attitudes through environmental aspects, promotional activities, or different approaches to enforcement.

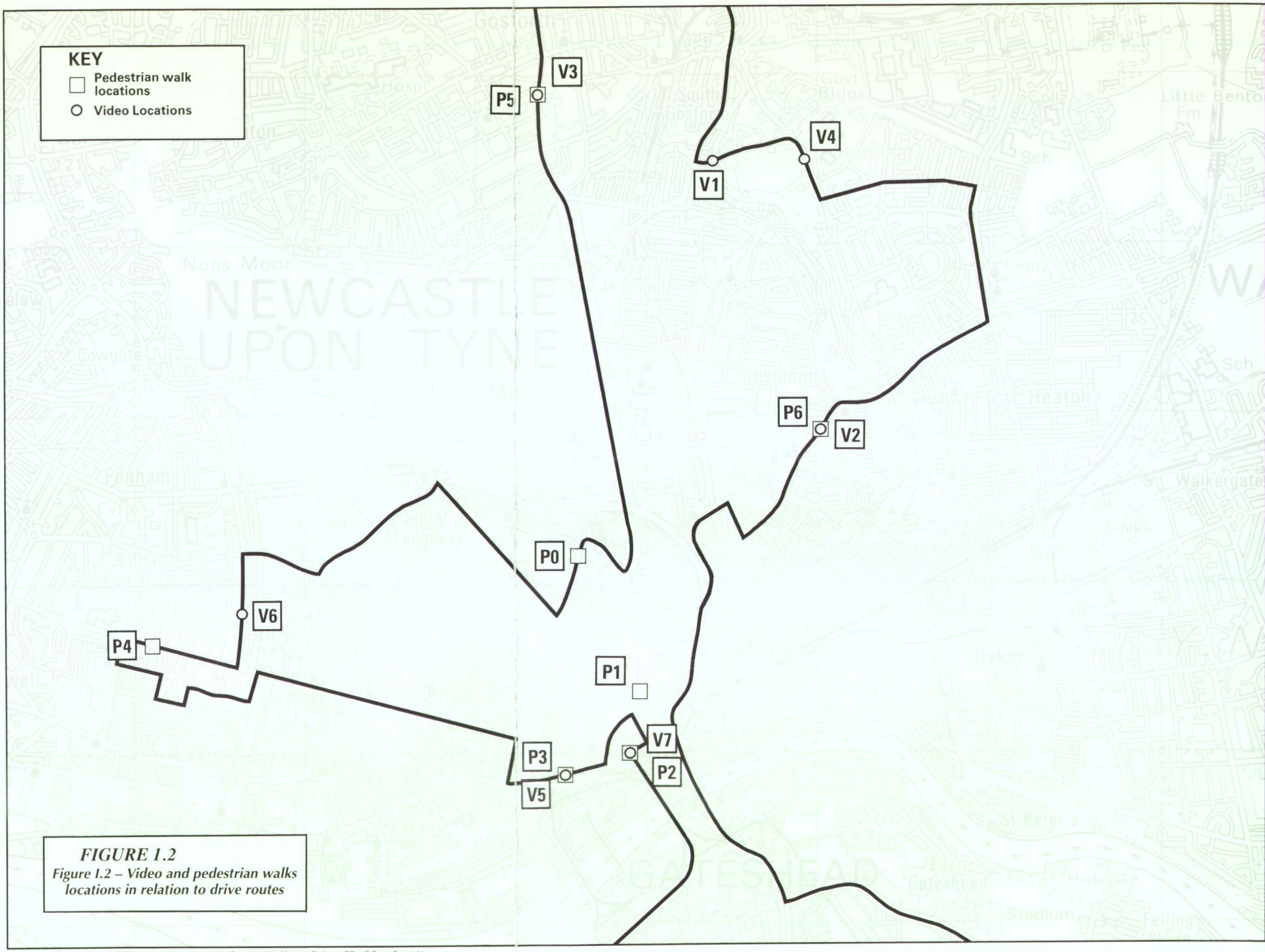


FIGURE 1.2

Figure 1.2 – Video and pedestrian walks locations in relation to drive routes

Where did the study take place?

The study took place in the City of Newcastle upon Tyne and the Borough of Gateshead, local authorities in the North-East of England (Fig I.1, page 2). Its focus was a route of about 23 miles in length, ranging across both sides of the River Tyne. The route was chosen to include a wide range of traffic conditions and road environments, deliberately to represent the range of conditions found on Britain's urban roads. Every resident and many businesses along the route formed the population from which participants were drawn. Those interviewed lived adjacent to the route; drivers and pedestrians were asked to give risk ratings of specific locations on the route and participants responding to videos were shown scenes taken from the same locations. The intention was to provide a common basis for the collection of data and, if possible, to have some volunteers participate in two or more surveys.

The choice of city followed from the research being directed from the University of Newcastle upon Tyne. Whilst cities differ in many respects, the choice of route was deliberately made to be representative of conditions on many urban roads, of all types. The sample of people responding to the surveys covered a wide range of socio-economic groups and we are reasonably confident that the results have a wider applicability than solely to the North-East of England.

1.3 Conduct of the Study

Over a two year period we undertook the following main stages of work:

- a literature review of available information and discussions with other researchers involved in similar fields;
- definition of the route, in discussion with local engineers and traffic police, and collation of accident data along the route;
- group discussions to establish broad perceptions of road safety issues and to help in formulation of the questions to be included in the surveys;
- an initial postal questionnaire of residents and small businesses along the route, to form the sample of 2205 from which respondents would be drawn (this required supplementation at various stages, as described in the main body of the report);
- a main interview questionnaire comprising in-depth interviews of 319 residents along the route, which formed the main source of data on attitudes;
- 207 actual drives along the route, with drivers giving risk ratings at predetermined locations to form one of the main source of data describing perceived risk;
- pedestrian walks at six locations along the route, (Fig I.2, page 4) with 133 participants giving risk ratings from a pedestrian viewpoint and commenting on the acceptability of countermeasures;
- video filming of seven locations along the route, (Fig I.2) from both drivers' and pedestrians' viewpoints, and then obtaining 473 respondents risk ratings for the locations, to form the second main source of data describing perceived risk;
- analysis and interpretation of the results of the surveys, leading to this report.

2 Survey of previous work

2.1 Introduction

It is a commonplace to indicate that a road traffic accident is the result of many interacting factors but this has many research implications. Thus, while it is necessary to refer to local accident figures, a straightforward relationship between these data and individuals' risk ratings is not to be expected nor in most cases will the causation be clear. Indeed, road safety practitioners generally regard accidents as "random, multifactor events" (DTp, 1986) and speak of contributory factors to accidents, rather than of causes.

There are models of subjective safety that seek to comprehend the whole picture (notably that of Brown, 1989 and 1991, discussed in Chapter 6) but initially, studies that have focused on particular aspects of road safety or have introduced concepts relevant to this investigation are reviewed so as to provide an immediate context.

Technical Annexe 1 to this report provides a detailed review of the literature.

2.2 Perception of risk at the time

The perception of risk is of interest because it provides a potential link between the actual risk and the explanation provided after an accident. Drivers can adjust their rating of risk in line with events as they occur, though it does not follow that they are only being influenced by the changing likelihood of a collision. Previous studies (eg Quimby & Watts, 1981; Rolls, Hall, Ingham and McDonald, 1991) have shown that the ability to anticipate and identify hazards does contribute to making fewer driving errors, as defined by specialist observers, and there is at least a moderate positive correlation between drivers perceiving a higher level of risk and their involvement in fewer accidents (Risk & Shaoul, 1983).

However risk may not be an appropriate concept to describe subjective decision making as it seems likely that factors only loosely related to the actual risk can influence judgement. Groeger & Brown (1989) make the distinction between selection of alternatives, which they regard as a conscious decision making process, and the assessment of risk, which they consider a largely "automatic" activity. It is therefore necessary in their view to consider the short-term and long-term goals of the driver. The difficulty of working through these inter-relationships can be seen by considering approaches from differing viewpoints.

Wilde (1982) has proposed that drivers have an inbuilt level of risk on the roads that they find acceptable and that subsequently they will vary their behaviour to keep this level approximately constant, known as ***risk homeostasis*** (See Glossary). Given a choice of cars for instance, they may view the same manoeuvre in a different light.

Other conditions of driving may override or interact with risk perception. In the Rolls *et al* study the youngest age group (17-24 years) were most affected by the company of friends as passengers and had a higher number of "at fault" accidents. Nevertheless, in a follow-up specifically on younger male drivers (Rolls & Ingham, 1992), the presence of parents, adults or girlfriends generally led to safer driving, whilst some unsafe drivers felt

An explanation of phrases in bold italics can be found in the Glossary on page 97

encouraged to drive fast by the presence of their peers. A similar investigation by Baxter, Manstead, Stradling, Campbell, Reason and Parker (1990) suggested the presence of younger male or older women passengers could influence behaviour, since they may be regarded as representing the extreme opposites of the social norms of driving, ie encouraging and discouraging speeding respectively. It therefore appears important to link attitudes with the assessment of risk at the time and in the prevailing circumstances. The complex decision making involved in driving has been extensively analysed and linked to error analysis in comparable skills (Lourens, 1990). This approach has applications outside the range of this study, eg in developing systems for the early detection of error, but also raises the issue of how far awareness of an increased chance of making an error is embodied in assessing risk on the road. Lourens (1990) would prefer to abandon the concept of risk altogether because of its confusing role in explaining actions. While the present adequacy of the concept can be challenged, there are few practical alternatives as clearly understood by the general public. If it can be demonstrated that participants operate on instructions to rate risk in broadly the same way across locations, then the justification for its use lies in providing data not otherwise available. In this study we go a step further and seek to differentiate the rating of personal risk at the time of taking the driving decisions from an overall assessment of risk of making that same manoeuvre by the generality of drivers. It parallels Rolls and Ingham's (1992) distinction of "objective risk in a situation and the perception of subjective risk to oneself in that situation". Their concern is that young people may lack the necessary skills to reconcile the two and our data allow for a comparison across six age groups.

While the classification of errors has become much more sophisticated over the last decade, it is still not possible to give a precise account of how a particular error arose. There remains a range of possible sources at different levels of cognitive analysis, including sensory registration and attention, memory and reasoning up to the selection and control of strategies. There are also complex interactions with underlying motivation and current emotional state. The latter will probably be assuming increasing importance as the influence of mood on cognition and action is elucidated by current laboratory studies.

In addition to considering levels of cognitive complexity in decision making, we have also found it instructive to view the road in quite a different context: as providing situations of fluctuating dominance for drivers and pedestrians. For both dominance can be relatively clear cut, as when moving from a minor to a major road or at a pedestrian crossing. Alternatively, there can be situations of psychological uncertainty, eg in changing from three lanes to two or in negotiating a junction on foot without the benefit of signal control. Here the observation and analysis of animal behaviour, with a history of more than a century (Klopfer & Hailman, 1967), offers provocative analogies in terms of the competition between animals for the limited supply of resources, such as food, and the influence that hazards to be encountered from predators have on their behaviour. It is conceivable then that the road is considered in terms of territory and that competition from other users is construed as risk. In our analysis of locations on the route, the extent to which the manoeuvres completed there involved natural priority or competing traffic flow are quantified and then linked to drivers' ratings of personal and general risk.

2.3 Assessing risk in general

The previous section considered factors that may operate at a specific time on the road. However, road users can also identify by a process of reflection their general concerns and thereby indicate an overall level of risk which they are prepared to accept.

This difference parallels the distinction between studies that ask participants to monitor ongoing events and those remote from the behaviour that often ask for responses to questionnaires.

Expressed preference is a commonly used method to elicit these judgements and it consists of three stages – hazard elicitation, scale elicitation and scale analysis. Thus Brown (1982) has used specially prepared pictures depicting a hazard, while others (Fischoff, Slovic, Lichtenstein, Read and Combs, 1978; Vlek & Stallen, 1981) have prepared lists for participants to assess. One approach is that individuals should define for themselves those situations they regard as hazards (Hale & Glendon, 1987). Though this may be an ideal solution, Armsby, Boyle and Wright (1985) found that non-directive interviews were very time-consuming, yet unsuccessful in eliciting coherent data. Responses were ambiguous and, for example, confounded inconvenience and frustration with risk.

An ordinal scale is often employed where people are asked to place themselves or specific locations with respect to a target group (same age/gender or type of road junction). Svenson (1981) used a percentile range in his study of drivers' estimation of their skill relative to others. At a more complex level Kelly's Repertory Grid technique, which provides a range of constructs for comparison in pairs or triplets, has also been applied to hazard perception (Green & Brown, 1977). This procedure can involve lengthy and complex comparisons and may require forced choices that do not reflect real distinctions.

The analysis of scaled data is largely dependent on earlier decisions regarding questionnaire design but in many cases factor analysis in one form or another will be employed to try to identify groups of constructs or hazard dimensions. In our study the requirement to make ratings while driving meant that it was essential to keep the task relatively simple and so the scales involved at most a 1 – 10 range for the assessment of risk.

Another variant that we briefly included in relation to attitudes to road safety countermeasures is the ***stated preference*** approach. This has been used to determine the extent to which people trade off time, financial advantage and convenience in their decision making about safety issues. For example, Jones-Lee, Hammerton and Philips (1985) have estimated the value of a life using this technique. Their findings illustrate a recurrent difficulty, *viz* that attitudes about abstract situations in which the individual is not personally involved have to be separated from those occasions where personal emotions and values predominate.

2.4 Dimensions in decision taking

Different dimensions can affect the taking of specific risks and general decisions about road safety. Commentators vary in their labelling but Hale & Glendon's (1987) four-way classification is a typical one:

(a) choice – whether the victim has a choice about avoiding danger or not, or about leaving the situation once exposed. This category also includes in it the equity of the situation, ie whether a potential victim stands to gain or lose from continuing along the same path;

(b) control – whether the outcome is under the control of the potential victim, another person or group, or whether it is outside human control altogether;

(c) foresight – there may well be uncertainty about whether future states will present danger; for example, some circumstances may seem too implausible or too unlikely for danger to occur, and so can result in it being discounted; and

(d) severity of consequences – the extremes of this dimension can be characterised as (i) where the individual perceives that the consequences of his or her involvement would be of nominal concern, and (ii) dramatic incidents and those involving high personal cost or even death.

While it is useful to be able to focus on separate sources of influence, in practice they interact and there is also a need to identify cases where motivational pressures can have an overriding effect. *Ad hoc* pressures to complete a journey quickly can emerge from various sources and can become a more or less chronic condition. Part of this study examines the extent to which a distorting effect is mediated by the individual's attitudes to road safety and how in turn they may interact with the level of risk perceived.

2.5 The relevance of attitudes

Quimby and Drake (1989) emphasised the importance of trying to reduce Road Traffic Accidents (RTA's) by utilising a social perspective. When individuals sit behind the wheel of a car they do not just become 'drivers'. They bring to the driving situation the many complexities that being human entails. As many countermeasures to RTA's depend directly on the road user for their success, it is vital that the attitudes of the road user are understood. This will enable the introduction of successful and cost-effective countermeasures. Policy makers have acknowledged how limited their understanding of drivers' attitudes are; "We do not know anything like enough about public attitudes to road safety, or about the means of influencing these attitudes" (DTp, 1987).

Reason, Manstead, Stradling, Baxter and Campbell (1990) suggested that there are two different types of aberrant driving behaviour that are potential causes of RTA's. The first type can be defined as "slips and mistakes in the highest risk category". The second type are violations, which can be defined as "deliberate . . . [and] involving a definite risk to others". Both types can be reduced by countermeasures. For example, Quimby and Drake (1989) found that 89% of respondents thought that people were the

most likely cause of accidents, and most thought inattention was the most important single factor. Transverse bar lines before hazardous areas have been shown to increase attention and could therefore reduce the number of accidents. So even potential slips can be forestalled.

However, the area where a social perspective would appear to have most to offer is in investigating why some drivers are prepared to commit deliberate and dangerous violations. Statistics on RTA's have consistently shown that young drivers are involved in a disproportionately high number of accidents. The study by Rolls and Ingham (1992) suggested that this may be due to a subgroup of young drivers with a particular, and dangerous, attitude to driving. This underlying attitude has many different manifestations, eg admit to taking more risks, discuss cars more with friends, more likely to socialise at night with same-sex friends rather than a partner. This demonstrates that attitudes are manifested in a variety of ways and suggests that the driver should be viewed as an entity if a full understanding of their driving behaviour is to be attained.

The challenge facing researchers investigating the attitudes of road users is twofold. The first is to attain a full understanding of how the attitudes of road users influence their driving behaviour. To this end the next section will detail previous research which has investigated how attitudes influence behaviour. The second challenge is to discover effective ways of influencing the attitudes of road users to ensure a reduction in RTA's. Section 2.7 will detail the possible effects of road users' attitudes to countermeasures, with particular emphasis on why some countermeasures have been successful, whilst others have not.

2.6 Predicting behaviour – the theory of planned behaviour

A pervasive problem for psychologists concerns the uncertainty of how an individual will behave. Research on the effect of attitudes on behaviour suggests that the attitude-behaviour discrepancy can be reduced if certain guidelines are followed:

(a) that both attitudes and behaviour are measured with the same specificity in respect to behaviour, time, object and situation;

(b) that multiple-act criteria be used;

(c) that normative cognitions be included as predictors; and

(d) that facilitating and constraining conditions be considered as well.

These four stipulations have been generated by the proficiency of Ajzen's (1985) theory of planned behaviour in predicting behaviour. This theory is an updated version of the theory of reasoned action (Fishbein and Ajzen, 1975). The ***theory of planned behaviour*** has been shown to have the ability to predict behaviour in a variety of settings. The theory holds that behavioural intention, and therefore behaviour itself, can be predicted from combining the scores of three factors. The first factor is the individual's attitude towards their performance of the behaviour. This is determined by

the individual's belief about the consequences of performing the behaviour (called behavioural beliefs), weighted by the individual's evaluation of these outcomes (outcome evaluation). The second factor is the individual's subjective norm, or their perception of the normative pressure on them to perform the behaviour. This is determined by the individual's perception of whether significant others would think they should perform the behaviour (normative beliefs) and is weighted by their motivation to comply with the wishes of these significant others (motivation to comply). The final factor is the degree to which the individual perceives the performance of the behaviour to be under their volitional control.

Although the model has predictive validity, it is doubtful whether it has descriptive validity (ie whether the processes described by the model accurately reflect the processes that the individual actually experiences before initiating behaviour). It seems unlikely within the short time available for decision making that road users employ such a complex process, although they may well make use of quick and reasonably accurate calculations, termed heuristics.

However, it is difficult to determine in a specific situation how much any one factor can determine the initiation of behaviour. Research on the effects of the presence of a passenger on driving behaviour, suggests that it can be strongly influenced by situational variants (Baxter *et al*, 1990). For example, the driving behaviour of young drivers is very different if the passenger is a same-sex friend of a similar age, compared to when the passenger is their mother. This is because the salience of the normative beliefs of the passenger dominates the subjective norm measure and exerts a strong influence on behaviour. Ajzen's theory acknowledges that the salience of significant others' normative beliefs may fluctuate, but does not seem able to incorporate the overwhelming impact that this may have on behaviour.

Although the theory of planned behaviour has certain flaws, it has many merits. The following section will highlight its utility and, in particular, the work of Parker and her colleagues (Parker, Manstead, Stradling and Reason, 1992a; Parker, Manstead, Stradling, Reason and Baxter, 1992b) demonstrates how useful this approach can be in investigating driving behaviour.

2.7 Counter-measures – will they be supported?

As we have already stressed, road safety seems to generate little concern among the general public, even though around 13 people die every day due to RTA's. The lack of concern may be due to individuals perceiving their own personal risk from traffic accidents as relatively small, especially as most people consider accidents to be the fault of the driver (Quimby and Drake, 1989) and most drivers consider the standard of their driving to be above average (Rolls and Ingham, 1992). Another factor identified in the same study, and which appears to contradict the previous point, is that many drivers consider accidents to be random, chance events that are unavoidable (Rolls and Ingham, 1992).

Quimby and Glendinning (1990) found that many respondents were in favour of many of the countermeasures in their questionnaire, even though many of them involved 'costs' for the road user (eg, increased journey time, restricted personal freedom, increased taxation to pay for the measures). However, it should also be noted that some of the stricter countermeasures (eg, random and 'automatic' speed cameras) were unpopular, even though respondents thought that their introduction would be effective in reducing RTA's. This is probably due to the respondents considering the personal costs of introducing the measures greater than the perceived personal benefits of having safer roads.

Encouragement can also be drawn from the success in requiring the use of seat belts and, more recently, from the shift away from drinking and driving. When the law on seat belts was introduced in 1983, there was considerable public support for its introduction. Quimby and Glendinning-(1990) report that over 90% of drivers comply with this law. Mittal (1988) suggests that this is because there was a favourable attitude to the countermeasure and this, allied with the behavioural inducements to comply (ie, the desire to avoid a fine), resulted in the behaviour becoming a habit.

Over the period 1980-90 the number of fatal casualties in accidents involving alcohol levels almost halved, from 1,570 to 800 (DTp, 1991). The total number of accidents involving illegal levels of alcohol fell from 19,300 to 13,600. This occurred during a period when the vehicle km travelled increased by 50%. It appears that the package of measures involving (a) legislation and enforcement; (b) publicity and information; (c) education in school; and (d) improvement programmes can prove successful (Sabey and Everest, 1986). Parker *et al* (1992a; 1992b), using the theory of planned behaviour, investigated attitudes towards four violations, one of which was drink-driving. Their results show that young drivers believed they had greater control over drinking and driving in comparison to other violations. They further believed that it would generate greater disapproval from significant others. They were therefore relatively less likely to drink and drive than to commit the other violations.

Less encouraging is the widespread disregard for speed limits. Surveys carried out by the Department of Transport between January and June of 1991 (DTp, 1991) on various motorways reveal that the average speed of private cars was 75 miles per hour (mph), with 72% of cars exceeding the limit of 70 mph. 58% of light goods vehicles and 22% of buses and coaches were also exceeding the 70 mph limit. Between 41% and 47%, by type, of heavy goods vehicles were exceeding their lower limit of 60 mph. Stradling, Manstead and Parker (1992) found that disregarding speed limits was reported by participants as being their most common aberrant driving behaviour and was associated with the least personal regret and perceived as being unlikely to cause an accident. Parker *et al* (1992a) found that of the four violations investigated (drink-driving, speeding, close following, and dangerous overtaking), speeding was the violation that the respondents had the highest behavioural intention to commit. Respondents' attitudes to speeding was less negative compared to the other violations, and they perceived significant others to be more in favour of them committing this violation than the other three.

It is in problem areas such as this that a social approach can show its worth. Quimby and Glendinning (1990) suggest that road users' favourability towards a countermeasure is dependent on (a) how effective they believe the countermeasure would be in reducing RTA's, and (b) the personal costs they believe they would incur from its introduction. Their survey showed that three of the five countermeasures, with a discrepant favourability rating compared with effectiveness, were related to speeding. An example was the countermeasure of using radar and automatic cameras leading to detection and prosecution of speeding drivers. Of the 40 countermeasures it was ranked the fifteenth most likely to reduce RTA's. However it was ranked twenty-sixth in terms of favourability towards its implementation, a discrepancy of eleven. This suggests that respondents thought the personal costs of its implementation were too high.

One possible explanation of why speeding does not seem to concern most road users may be that people do not consider speeding particularly dangerous. The Quimby and Glendinning (1990) survey found that people did not consider reducing the speed limits in built up areas as a particularly effective way of reducing RTA's. (It was ranked the joint twenty-eighth most effective countermeasure.) The Stradling *et al* (1990) study mentioned earlier, also supports this view.

Other possible explanations for the general lack of concern about speeding was shown by the Parker *et al* studies. They found that drivers considered themselves to have little control over committing speeding violations. This suggests that drivers may consider speeding inevitable, in which case publicity campaigns should concentrate on ensuring that the driver accepts that they can refrain from speeding and that they are completely responsible for any accident that may result from this violation. If so, this has to be counteracted as accidents, though not necessarily caused by speeding, invariably have more serious consequences at high speeds.

3 Size and Scope of the Study

3.1 Introduction

Perceptions of risk were assessed in a variety of road traffic situations and these perceptions were subsequently compared with attitudes to the road environment. A range of methods was employed. The main experimental studies involved drivers in actual traffic situations, pedestrians while they engaged in road crossing activity, and viewers responding both as driver and as pedestrian, when they observed specially prepared video sequences. This was supplemented by information obtained from respondents in an extensive questionnaire. Details of the sample size and methods of assessment are provided below.

The data gathered from these sources can be divided initially into two main categories: individuals' perception of risk, versus their attitudes to road safety. Perception of risk can be further divided into direct ratings of risk on site versus indirect ratings from filmed video presentation and questionnaire ratings. The last information can then be further sub-divided into that obtained from drivers and that obtained from pedestrians.

The attitudes to road safety were obtained from two main sources: an initial questionnaire, and the main interview questionnaire, which will be described in Section 3.5.

3.2 Initial questionnaire

To obtain our volunteer pool from the Newcastle upon Tyne area, we initially distributed 6,800 letters and questionnaires to residential addresses and to 894 commercial premises along the drive route, (see Fig I.1). This yielded 1,888 responses, 86% of the total sample from which respondents to the main surveys were drawn. Other participants were also obtained from separately advertising and canvassing for volunteers, University staff and a subject panel of the North East Age Research group, where it became necessary to supplement the initial sample in order to achieve an adequate number of participants.

From the questionnaires returned, which will be referred to as the Initial Questionnaire, a sample totalling 2,205 people was obtained. A diagram of their source distribution is set out in the two Figures below:

Figure III.1 – Distribution of the volunteer sources for the initial questionnaire

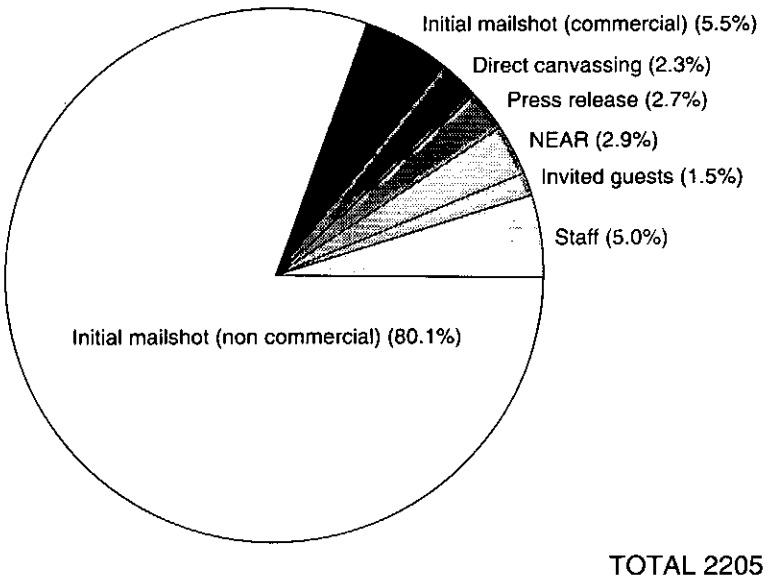
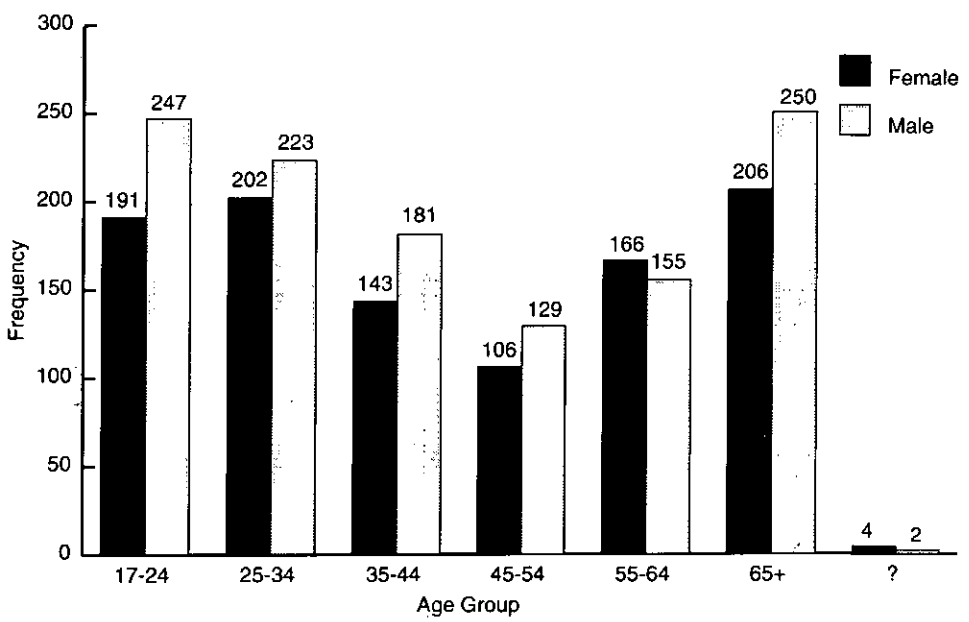


Figure III.2 – Distribution by gender and age for the initial questionnaire



3.3 On-site perception of risk: the drives

3.3.1 The drive route

The route selected for the drives, covering both Newcastle upon Tyne and Gateshead, is shown in Fig I.1 and described in detail in Technical Annexe 2 to this report. In total, it is some 23 miles long and takes approximately 1 hour and 30 minutes to drive its complete length. We considered that for practical purposes only one hour was the most that we could ask of our volunteers to complete their task and retain sufficient interest and concentration. Accordingly the drive route was divided in three sections: a northern loop (N), a western loop (W) and a southern loop (S), identified in the map provided. The drive route consisted of the core element, the northern route in Newcastle, plus either the western or southern section with an estimated drive time of 60 minutes. All volunteers drove the north route and half the volunteer participants drove one of the subsidiary routes (W) or (S). The route director at the outset of the drive could therefore choose one of these alternatives: north plus south or north plus west as appropriate.

The drive route was defined after consultation with engineers from the local Traffic and Accident Data Unit (TADU, Department of Engineering Services, Borough of Gateshead) and the Northumbria Police. TADU provided accident data for the four years to December, 1990 together with any traffic counts and speed surveys that had been carried out over the route over the same period. We also had access to records of complaints received from the public by TADU and the Northumbria Police. The accident data used were compiled from STATS 19 documentation, a record of those accidents which are compulsorily reported to and recorded by the police. (A summary of the accident data relating to site location can be found in Table 3.1.) The final drive route chosen included a wide mix of frontage land uses, sites of recent high accident numbers, locations of recent engineering improvements, and areas which had been identified after complaints about speeding, parking offences, and road safety factors.

Table 3.1 – A simple classification of drive locations with speed limits above 30 mph and cumulative accident data, where the route (A) merges into priority traffic stream, (B) has priority over merging or entering traffic, (C) gives way to crossroads with priority control, or (D) gives way at tee junction with priority control

Location type		Total number	Speed limits above 30 mph	Accidents (1987-90)
Stretch		29	5	129
Junctions:				
Roundabout		12	4	210
Traffic Signals		14	5	170
Merge	(A)	2	2	7
Priority	(B)	8	1	34
Crossroads	(C)	4	–	17
Tee	(D)	4	1	14
Total		**73**	**18**	**581**

The drive route included as wide a range as possible of different street types, environments and traffic conditions. All classes of route were present, and all current speed limits (with the one exception of the recently introduced 20 mph zones since none had yet been introduced in this region). The final route included many different features encountered by drivers and pedestrians, to cover most situations that drivers encounter on the roads.

3.3.2 Assessing the drive route locations

Along the drive route our volunteer drivers were asked to rate a series of locations in terms of their perception of the degree of risk. These locations can be classified in a variety of ways. As is the custom with accident records the primary division was between junctions and what we termed 'stretches': sections joining two junctions but not necessarily the complete length between them. Typically a location contained a single feature, such as a pedestrian crossing or a bend. Table 3.1 presents a simple classification of all locations: with stretch and junction groupings, based on the type of control, together with data under prevailing speed limit and accident frequency.

A subjective evaluation was also carried out at these locations to assess levels of traffic and pedestrian activity. This groups together the final four categories of Table 3.1 (A,B,C, & D) into a single "OTHER" category. This additional assessment is shown below in Table 3.2.

Table 3.2 – Classification of locations by traffic and pedestrian activity, with three levels of high, medium and low traffic activity and two levels of low (L) and high (H) pedestrian activity

Traffic levels	Round -about		Traffic signals		Other junction		Stretch		Total	
	Pedestrian activity									
	L	H	L	H	L	H	L	H	L	H
High	9	–	6	3	2	1	6	6	23	10
Medium	3	–	5	–	7	–	10	1	25	1
Low	–	–	–	–	8	–	6	–	14	–
Total	**12**	**–**	**11**	**3**	**17**	**1**	**22**	**7**	**62**	**11**

From Tables 3.1 and 3.2, we see that locations with roundabouts and traffic signals have the highest traffic levels, as might be expected. High pedestrian flow is also associated with signal control in some form; this provides few locations with a combination of simple (priority) control, high traffic levels and with pedestrians also present at the same time.

3.3.3 Volunteer participants

Our 207 drivers were all recruited from those volunteering to participate in the initial questionnaire phase. They included residents and employees of commercial premises from along the drive route. Contact was made by telephone or, in some cases, by letter. Details of their age and gender distribution are provided in Table 3.3.

Table 3.3 – Age and gender distribution for the* Drive Survey *participants

	Age Band						
	17-24	25-34	35-44	45-54	55-64	65+	Total
Gender							
Male	19	25	22	20	19	21	126
Female	16	24	19	13	3	6	81
Total	**35**	**49**	**41**	**33**	**22**	**27**	**207**

The only group substantially under-represented from our target figure of about 20 per cell was women drivers over the age of 55 years. Although the survey attempted to reach all initial questionnaire respondents with a driving licence in this age group, irrespective of their willingness to volunteer, the sample remained small. We must conclude that this is because there are so few drivers in this category in the targeted population.

3.3.4 Drive vehicles

Volunteers were given the choice either to use their own cars or a Ford Escort which was hired for the purpose. An expense fee was offered to those using their own vehicles and the initial pick-up was arranged depending on the driving arrangements. If it was more convenient to use the hire car, then a convenient pick-up point was arranged, otherwise the driver met the project team at the University.

3.3.5 Drive procedure

The driver was met by two members of the project team: the route director and an observer. Before the drive started, the route director outlined some initial instructions from a prepared script and tested the driver's understanding of the rating system to be used with a prepared exemplar set of site location photographs. The drivers were instructed to rate the riskiness of each location on a scale from 1 (low risk) to 10 (high risk) for the "average" driver and then to rate their own feeling of personal risk. They were then prompted to state whether the location was familiar to them. (The instruction script can be found in Appendix A.)

During the actual drive, the route director acted as navigator, giving directions, and operated the buzzer. A single buzz signalled the beginning of each road section to be rated by the driver, and a double buzz marked the end. The observer was seated in the rear of the car and recorded each of the drivers' spoken ratings of riskiness and personal familiarity for each location. It was also in the observer's remit to record the ongoing activity at each location such as traffic density, pedestrian activity and presence of cyclists, etc. (For further details, see Appendix B.)

At the conclusion of the drive, drivers were asked about their accident and offence history over the previous five years and thanked for their participation.

3.4 On-site perception of risk: the pedestrian walks

3.4.1 Selection of sites

Two considerations lead us to restrict these sites to the area of Newcastle upon Tyne:

(a) The city has two-thirds more pedestrian casualties per 100,000 population compared with Great Britain as a whole and (b) the feasibility of visiting at least six sites within the allotted time of one hour and a half. For the exact location details, the reader is referred to the marked reference map (see Fig I.2) and to Appendix C.

3.4.2 Volunteer participants

A total of 133 participants volunteered (See Table 3.4), consisting of 75 people either working or resident along the route, and 58 university staff. They were taken in groups of five or six to each crossing location in turn, where they were asked to rate each site, as pedestrians, for personal risk.

Table 3.4 – Age and gender distribution for the* Pedestrian Walks Survey *participants

	Age Band						
	17-24	**25-34**	**35-44**	**45-54**	**55-64**	**65+**	**Total**
Gender							
Male	10	11	11	9	11	14	66
Female	10	13	13	7	15	9	67
Total	**20**	**24**	**24**	**16**	**26**	**23**	**133**

3.4.3 Pedestrian walks procedure

Each volunteer group was instructed to report to the university before their excursion, where they were given some preliminary information and training with photographs (though not of the sites they were to visit) about the nature of their rating task so that any queries could be satisfactorily dealt with in advance. Before being bussed to the first site they were also taken through the rating procedure, which they were later to perform, on an actual crossing location adjacent to the university precinct. The participants were requested not to confer and encouraged to record their immediate impressions without pondering too long.

A team of three researchers accompanied each group: a driver in charge of the vehicle at all times and two observers, who managed the group and made separate assessment notes of the time of day, site location, and any particular features of traffic activity at each site during the visit. On reaching each site, the group participants were provided with a questionnaire form that was filled in at the site crossing and handed back to the researcher on their return to the bus. Before completing their questionnaire, the group alighted from the bus and walked to an exact location point where they were requested to cross the street and to return back again before filling in the form. (For details of the response form, see Appendix D.)

3.4.4 Pedestrian walks rating response form

The response form consisted of three parts, as follows. In Part 1, participants rated the particular location in terms of the risk that they felt as pedestrians on a rating scale from 1 (low risk) to 10 (high risk). In order to encourage them to use the whole range of the scale in making their ratings, they had been asked in the previous training session to think of two pedestrian locations: the safest rated as 1 and the most dangerous, that could be rated as 10; sites to be assessed were then rated by comparison with these two reference limits.

In Part 2, they were asked to assess which particular attributes of the location had affected their rating by ticking an appropriate box on the response sheet. The ten attributes were: (a) width of road to cross; (b) amount of traffic; (c) view of oncoming traffic; (d) crossing facilities; (e) speed of traffic; (f) standard of driving; (g) signs and road markings; (h) parked vehicles; (i) large vehicles and (j) pedestrian behaviour. After evaluating this pre-selected list of attributes, they were also given the opportunity to add any other omitted attributes of their own suggesting, which they considered important.

Part 3 of the response form provided a list of possible changes to improve road safety for pedestrians. In three Sections A, B and C, the volunteers were requested to record their attitudes to these proposals; additional space was provided for suggestions for their own safety improvements if they so wished. In Section A, they were asked to rate, in their opinion, each potential improvement on a scale of effectiveness for improving road safety for pedestrians for that location. In Section B they rated how favourable, or not, they felt about the implementation of each pre-selected improvement for that particular site. In Section C, they were asked to select three from the list of measures that they would personally recommend for that location in rank order of importance.

3.5 Indirect assessment: attitudes to road safety

The main source of information about the attitudes towards road safety of our participants was derived from the main interview questionnaire, although some information was also obtained from the initial questionnaire. The main interview was more conventional in terms of methodology and was aimed deliberately at finding out about attitudes to road safety, rather than perception of risk. Nevertheless several of its questions were directed to risk and how it was perceived, because one of the reasons for these interlocking surveys with the same population was to explore the extent to which attitudes and perceptions may be related.

3.5.1 Main interview questionnaire sample

These respondents were recruited from those people resident or working on the main drive route, who had indicated their willingness to volunteer in returning their initial questionnaire. Both drivers and non-drivers were invited to participate in the survey, which normally took between forty minutes and an hour to complete. The interviews were conducted on a one-to-one basis by an interviewer, either at the university or at the

interviewee's own home. Prior appointments were arranged by telephone or letter, and subsequently confirmed by letter, with an enclosed map with directions to those who were able to come to the university. No fee was offered but travel expenses were refunded.

The complete interview population of pedestrians and drivers with age and gender distribution is provided in Table 3.5.

	Age Band						
	17-24	**25-34**	**35-44**	**45-54**	**55-64**	**65+**	**Total**
Gender							
Male	22 (18)	29 (28)	27 (24)	18 (14)	25 (17)	32 (22)	153 (123)
Female	22 (16)	36 (30)	34 (22)	22 (16)	27 (7)	25 (7)	166 (98)
Total	**44 (34)**	**65 (58)**	**61 (46)**	**40 (30)**	**52 (24)**	**57 (29)**	**319 (221)**

3.5.2 Main interview materials

Our participants were interviewed in depth with questions designed to assess their knowledge of road safety issues, their attitudes to traffic law enforcement and countermeasures, and their general attitude to road safety issues. For example, respondents were asked about the risks they themselves took on the roads, the causes of blame for accidents, how these accidents could be reduced, possible countermeasures in terms of their favourability versus the effectiveness, and so on. In order to generate appropriate questions for this in-depth interview, a number of preliminary discussions were carried out by different groups, drawn from representative sections of the public, to obtain their views and attitudes to road safety. The complete set of final questions for the main interview questionnaire is provided in Appendix F.

The questionnaire was actually presented on a card format so that interviewees were able to read each question as well as hear it. When asked to complete a task such as, "Please rate the following factors to indicate how much influence you feel they have had on your transport preferences", they were required to set out the factors, presented as a shuffled pack of previously printed cards, under various response category headings, such as: VERY STRONG, STRONG, MODERATE, and so on, in a distribution pattern that they felt to be most appropriate. Other questions that did not require an ordering or a rating response were also printed on cards so that they could be read as well as heard. Responses to these printed questions were noted by the interviewer onto a prepared record sheet.

3.5.3 Main interview procedure

All volunteers were individually interviewed after being introduced to the task by a set of general instructions beforehand (See Appendix E). The main interviewing technique consisted of sorting tasks, as outlined above, so the interviewer's role was mostly restricted to presenting the questionnaire and recording the interviewee's responses although interviewees were able to voice their thoughts aloud during the interview if it helped them to complete the task.

After completing the questionnaire, volunteers were asked if they knew of one particular traffic location, or locations, where some improvement could be made to reduce the risk of an accident. Given an affirmative, they were asked to specify what that risk element was and, in their opinion, what accident countermeasure might be appropriate. Finally, they were asked to give details of any road accidents in which they had been involved or road traffic offences for which they had been convicted, which had occurred over the previous five years. This information is provided in Table 3.6. As can be seen, about one in three of both males and females had been involved in an accident in the previous five years. To conclude the interview, interviewees were thanked for their help and participation in the project.

***Table 3.6 – Road accident history (5 years) by age and gender obtained from drivers in the* Main Interview Questionnaire**

Gender	Number of accidents	Age Band 17-24	25-34	35-44	45-54	55-64	65+	Total
Male	0	12	15	16	11	13	20	**87**
	1	4	10	7	3	3	2	**29**
	2	1	3	1	0	1	0	**6**
	3	1	0	0	0	0	0	**1**
Female	0	11	18	16	11	7	6	**69**
	1	3	12	5	5	0	0	**25**
	2	1	0	1	0	0	1	**3**
	3	1	0	0	0	0	0	**1**

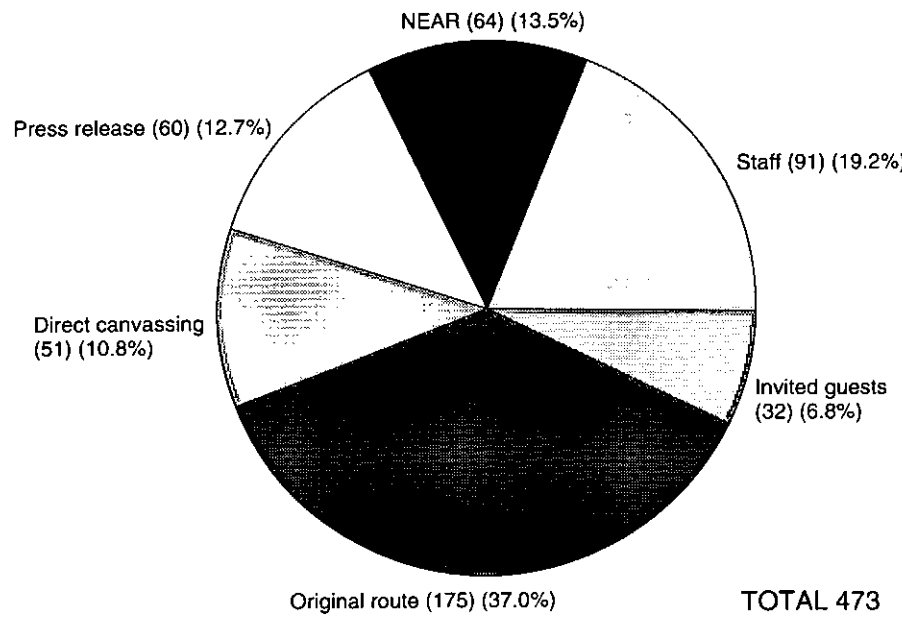
3.6 Indirect assessment: the videos

The main aim of this part of the research was to analyse the use of video presentation as a supplement, or alternative, to the drives and walks to elicit measures of risk perception from the perspective of driver and pedestrian, and to allow us to gain further insights into those aspects of the perceptual environment which contribute to the feeling of risk. Participants were shown video film of particular locations on the route, asked to give a general risk rating and to assess the contribution made to that rating by a set of attributes. For the exact locations, the reader is referred to the marked reference map, (Fig I.2) and to Appendix G.

3.6.1 Video sample

By the time this survey took place the initial postal survey was nearly twelve months old, and a number of recruitment sources to supplement the response panel were required for this phase of the data collection. These included route residents, their invited guests, volunteers obtained from a press release or from direct canvassing, university staff, and from an established subject panel of North East Age Research (N.E.A.R.) for the long-term study of the psychology of ageing to boost our sampling population for older residents. The distribution of these sources of recruitment for the video session is given in Figure III.3.

Figure III.3 – Distribution of the participant sources for video sessions



Initial questionnaires were sent out, where appropriate, to collect the necessary background information from the supplementary participants. All participants were offered expenses of £3 to attend a 90 minute session as well as the opportunity to win £100 in a prize draw to be selected from those who attended. The final distribution of participants attending the video session by gender and age is given in Table 3.7.

Table 3.7 – Age and gender distribution for the **Video Survey** *participants*

	Age Band							
	17-24	**25-34**	**35-44**	**45-54**	**55-64**	**65+**	**?**	**Total**
Gender								
Male	39	22	33	30	55	57	0	236
Female	35	35	40	28	55	43	1	237
Total	**74**	**57**	**73**	**58**	**110**	**100**	**1**	**473**

3.6.2 Video materials

Video recordings were made of seven locations from the drive route. The criteria for selection were based on their particular features, which were interesting from the perspectives of both the driver and the pedestrian. These included traffic density, pedestrian activity, the presence of traffic controls and pedestrian facilities. Two of these locations (Wingrove Road

and Gosforth High Street) had already been the focus of concern of previous initial group discussions. One location was specifically included because it had become the topic of local controversy about the proposed construction of a bypass in the Jesmond Road-Cradlewell area.
Other locations were chosen to provide contrasts in their facilities and accident record. The recordings were filmed from two perspectives: driver and pedestrian.

(a) Driver's perspective: Special videos were filmed for presentation from the driver's perspective by driving through the locations and recording those sections of the route with a wide-angle view, using a video camera pointing from the centre of the front seat in a minibus. Several drives-through were recorded for a later selection of five recordings per location. During the actual video sessions for each traffic location the viewers experienced five consecutive drives-through from the driver's perspective before they made their ratings, before going on to the next location sequence. The reason for presenting a series for each location was to reduce the effects of any particular recorded event having a distorting influence on the viewer's subsequent judgement. This procedure was desirable since the summarised risk data from the actual drives were also based on a variety of traffic episodes.

(b) Pedestrian's perspective: Video recordings from the pedestrian's perspective were prepared by placing the camera at several viewpoints in the vicinity of the specific locations. These exposures were then edited down to five viewpoint-episodes, which were comparable with the drive-view format described above, and the pedestrian walks data.

In the filming and editing of these sequences, care was taken to avoid any episode that might unduly bias the perceived riskiness of a location and to realise representative examples of the locations "as found". The five views in each perspective sequence were of 15-30 seconds duration.
Slightly shorter durations tended to result from the driver perspective as they were governed by the local driving conditions at filming. The edited video sequences lasted on average for three minutes per location for the pedestrian viewpoint and two and a half minutes per location for the driver viewpoint.

3.6.3 Video equipment

The films were projected onto a 6'x 6' screen. The questions that followed and to which the participants responded were also visually presented from an overhead projector via transparencies onto a second screen to one side. The participants' responses were automatically recorded using the Newcastle Multiple Test Facility within the lecture theatre. This is a system for collecting information from up to 64 people simultaneously (See Figure III.4 and for a technical specification see Technical Annexe 3 to this report). Each has a small keypad and these are all linked to a single computer to record which key each individual presses, and the moment at which they did so. Each keypad provides a choice of six buttons, labelled in this instance from 1 to 6 as illustrated in the accompanying photograph. This configuration allows for the row of six buttons to be used in this instance as a rating scale.

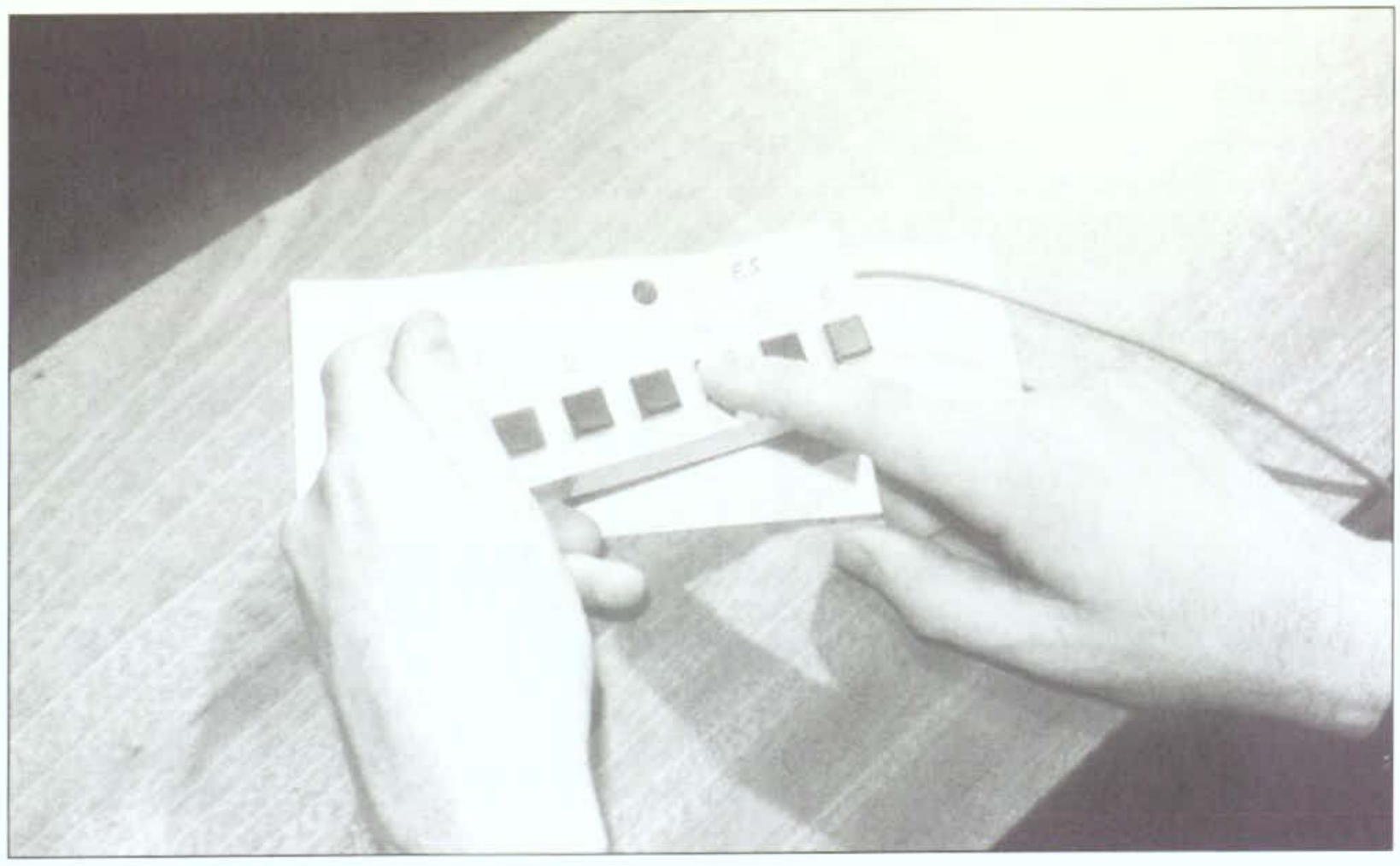


Figure III.4 – (A) push button pad

Figure III.4 – (B) audience's view of video screen

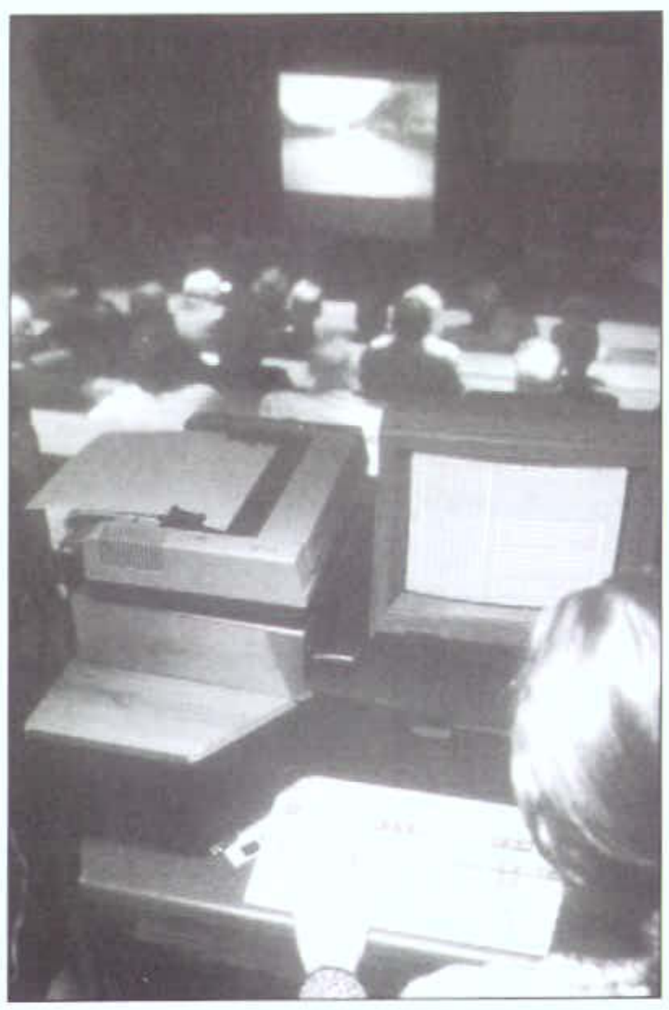


Figure III.4 – (C) audience, plus view of computer display to monitor responses

3.6.4 Video procedure

The formal procedure began after a short film about the university, which allowed time for participants to arrive and also provided an opportunity, before formal testing began, for them to settle in their seats with the appropriate lighting and ambience. A prepared script was read out to explain the procedure for the session. This set out the format of the two perspective viewpoints for driver and pedestrian, and demonstrated the rating response by using the range of push-buttons across the keypad: button number one (low risk) to the other extreme, button number six (high risk). The range across button keys could thus be used to differentiate between locations. At the start of each session everyone filled out a prepared card that was labelled with the appropriate keypad seat position with details of time, date, name and address. These cards were collected at the half-time interval and provided information to link individual participants with their data ratings in the subsequent data analysis. Preliminary test trials were run to ensure that everyone understood which appropriate push button to press for low and high risk. Responses were then pre-tested and checked by the computer operator, situated behind the audience to monitor their response ratings on a computer screen. A similar procedure was repeated for a familiarity rating.

All auditory instructions were duplicated visually by slide presentations. In the test trials the participants were asked to rate each location for two aspects of riskiness after viewing several takes of a filmed sequence. They rated location risk in terms of pedestrian safety in the pedestrian perspective, or with respect to the driver's being involved in an accident if they were watching from the driver's viewpoint. After rating the location sequence for riskiness followed by familiarity, further ratings provided information about how selected attributes might have influenced the participants' risk ratings for a specific location. The selected attributes to be rated were (a) amount of traffic; (b) obstruction to view (either fixed or temporary); (c) ineffective or inadequate pedestrian facilities; (d) speed of traffic; (e) ineffective or inadequate road signs and markings; (f) large vehicles; (g) pedestrian behaviour; and (h) unpredictability of traffic movement.

After each filmed sequence, these headings were presented orally and visually, one at a time, so that the viewers were not obliged to recall any information apart from their visual impressions for that specific location. Participants rated in turn how they felt each attribute, described by the heading, had influenced their judgement of risk on a scale from one to six; the higher the rating, the more that aspect increased their feeling of riskiness.

The whole session lasted about 90 minutes. The order of presentation for the two videos (pedestrian and driver viewpoints) was alternated across sessions to counterbalance any effects of presenting one video viewpoint prior to the other.

4 Evidence on the perception of risk

4.1 Location ratings

Participant drivers rated each traffic location for risk on a ten point scale and the mean (average) ratings of all drivers provided differences between locations. However, part of that variation between mean location ratings could also be attributed to tendencies for individual drivers to prefer higher or lower parts of the scale in their perceptual judgements of risk. In order to remove this unwanted variation, the data for all ratings were standardised (this routine was subsequently implemented on all sets of rating scales). Basically, this routine transforms the mean (average) location risk rating for each person to zero with the different risk ratings given to different locations now expressed in standard deviations from the mean. The term standard deviation in statistics signifies the extent to which a measure deviates from the mean, which in this case has been set to zero. This standardising procedure set the standard deviation for the locations rated to a unit of one. Participants' location ratings could therefore be compared on a common scale. This transformation, by shifting all ratings onto a common scale, effectively eliminated the individual bias and allowed better comparisons to be made between ratings of risk in separate phases of this research.

Whenever the risk ratings have been transformed in this way, they are referred to as Mean Standardised Risk (MSR). All data presented here were analysed using the SAS Package (SAS Institute, 1985). Technical Annexe 4 to this report provides detailed information.

4.2 Drivers' risk ratings

4.2.1 Treatment of data

The ***general risk ratings*** provided by volunteer drivers of the route were converted into MSR scores as described above.

4.2.2 Ordering of locations by standardised risk ratings

Approximately half the drivers completed the north section of the route and then the south section and the remainder completed the north section of the route and then the west section. Nevertheless, the considerable overlap between these two drive routes made it possible to compare all locations by MSR ratings, where the most risk is denoted by the highest mean standard rating and least risk represents the lowest mean standard risk rating. In order to sort the locations according to their MSR ratings, a ***Tukey analysis*** (Tukey,1953) was employed. Using the variation between location risk ratings, the Tukey analysis sorted the locations into groups. In each group of the same letter (eg A) the ratings do not differ from each other in a statistically significant way. The different capital letters ranged vertically to the left in Appendix H2 simply represent the location groups that do differ from one another.

An important fact to bear in mind is that no hypothesis is being imposed on the data at this stage to presuppose how individual locations should be

rated. The results for these MSR ratings are shown in Appendix H2. Here a Tukey analysis, using the standardised general risk ratings, groups the locations into clusters of locations, which can be said with 95% confidence not to be significantly different from each other in terms of their risk ratings. It also indicates significant differences between the groups of location risk ratings (*significance level*, $p<0.0001$).

4.2.3 Relationship between accident injury and general risk ratings

For the driver ratings, the mean standardised risk rating (MSR) was compared for each location with the recorded accident data for a four year period ending December 1990 for each location. In Appendix H1 the number of accidents reported at each location during the four year period is specified.

In Appendix H2 the accident data for each location have been correlated with the mean general (MSR) ratings for each location. For total accidents, the correlation coefficient indicated a moderate level of correlation ($r = 0.42$, $p<0.0002$). A further analysis then selected only those accidents resulting from manoeuvring in the same direction as the drivers on the drive route (thus eliminating accidents from any other drive direction or manoeuvre). This analysis again yielded a similar modest level of correlation ($r = 0.41$ $p<0.0003$). A yet more detailed analysis looked at the accident data in terms of the road users involved, whether motorists, cyclists, or pedestrians. Overall the analysis provided corroborating evidence that MSR risk ratings, made by drivers in-car, do directly reflect the danger of actually driving through these locations as represented by accident data. However, drivers' perceptions of pedestrians and the associated risks are poor. Drivers' risk ratings and pedestrian accidents only yielded low correlations that were non-significant.

Table 4.1 – Correlations between drivers' Mean Standard Risk ratings and accidents

Definitions:
A = Motor vehicles only; B = Pedestrian involvement; C = Cyclist
1 = In the same direction or manoeuvre; 2 = Involved in another direction or manoeuvre

	Total	A1	A2	B1	B2	C1	C2
MSR rating	0.42	0.41	0.37	0.04	0.09	0.30	0.24
Probability	p<0.0002	p<0.0003	p<0.0011	p<0.7276	p<0.4376	p<0.0099	p<0.0334

The analysis of driver observations was extensive. It included amount of driving experience, whether familiar with drive location, and use of own versus hired vehicle, yet no one factor emerged to suggest any strong or consistent relationship with the MSR ratings. However, it was found that high traffic density ($r = 0.22$, $p<0.0001$) or a halt to traffic movement ($r = 0.25$, $p<0.0001$) showed low but significant correlation with general risk ratings.

Therefore, to take investigations further, the particular features or attributes of the drive locations were considered.

4.2.4 Relationship between location attributes and general risk ratings

Investigation of specific attributes and their effects on ratings was directed towards clarifying particular characteristics that might generally have influenced the drivers. After due consideration, five main attributes were selected:

(a) the presence of traffic signals;
(b) the degree of competing traffic flow or lane usage;
(c) competing pedestrian activity;
(d) reduced sight distance; and
(e) atypical road dynamic (unusual design and organisation).

Four professional judges rated each of the above attributes for all locations. They were selected either from the project team or were traffic engineers, with responsibility for overseeing this traffic area. All were familiar with the drive route and its road characteristics. Mean ratings for the attributes (b) to (e) are given in Appendix H3. Correlations were then sought between these attribute ratings and the general MSR risk ratings for locations, and with the recorded injury accidents data; the correlations obtained are listed in Table 4.2.

Note that MSR rating for (d), reduced sight distance, correlates negatively with recorded accidents; this negative correlation thus suggests that this attribute actually promotes estimates of greater risk, which in turn may lead to a reduction in accident numbers.

Then, to establish whether particular features or attributes predominated in determining the perception of risk, a ***multiple regression*** analysis of the MSR ratings data was carried out and it accounted for 83% of the MSR variance. Three of the five location aspects, listed above, were found to contribute significantly:

(b) competing traffic flow or lane usage ($p<0.0001$);
(d) reduced sight distance ($p<0.0001$); and
(e) atypical road dynamic ($p<0.01$).

The emergence of the particular features (b), (d), and (e) as significantly determining the drivers' (MSR) risk ratings, suggested an interesting behavioural explanation for the drivers' perception of risk within a road traffic environment. Behaviourally, we can think of the driver as competing with other drivers within the road space, while at the same time complying with an implicit hierarchy of dominance factors and rules such as those embodied in the Highway Code. Each traffic location offers such a situation of comparative dominance, comprising a variety of potential manoeuvres, including avoidance actions. In this context, the MSR driver ratings can then be interpreted as reflecting the driver's perceived position within that hierarchy of dominance or priority.

A location which drivers rate as associated with high risk appears to be one where they are actively considering manoeuvres of competition or avoidance actions, and thus are especially aware of the road conditions. Such risky locations may be compared with safe locations (which they rate low in risk) where they may be less prepared to react, thus contributing to a traffic situation in which other road users need to be beware.

Table 4.2 – Correlations between drive location attribute ratings, Mean Standard Risk ratings and accident statistics

	Mean Standard Risk (MSR)	Accident Total	Lights or Zebra	Competing Traffic Flow	Competing Pedestrian Activity	Shortened Visibility	Atypical Road Dynamic	Vehicle Accidents in Drive Space	Pedestrian Accidents in in Drive Space	Cycle Accidents in Drive Space
MSR	**1.00**	**0.42** $p<0.0002$	**0.33** $p<0.005$	**0.86** $p<0.0001$	**0.14** $p<0.3$	**0.42** $p<0.0002$	**0.64** $p<0.0001$	**0.41** $p<0.0003$	**0.04** $p<0.8$	**0.30** $p<0.01$
Accident Total	**0.42** $p<0.0002$	**1.00**	**0.45** p<.0.0001	**0.52** $p<0.0001$	**0.26** $p<0.03$	**–0.14** $p<0.3$	**0.23** $p<0.05$	**0.63** $p<0.0001$	**0.43** $p<0.0001$	**0.40** $p<0.0004$
Lights or Zebra	**0.33** $p<0.005$	**0.45** $p<0.0001$	**1.00**	**0.27** $p<0.03$	**0.54** $p<0.0001$	**–0.11** $p<0.4$	**0.27** $p<0.03$	**0.26** $p<0.03$	**0.36** $p<0.002$	**0.19** $p<0.2$
Competing traffic	**0.86** $p<0.0001$	**0.52** $p<0.0001$	**0.27** $p<0.03$	**1.00**	**0.09** $p<0.5$	**0.24** $p<0.04$	**0.55** $p<0.0001$	**0.47** $p<0.0001$	**0.08** $p<0.5$	**0.31** $p<0.009$
Competing Pedest. Activity	**0.14** $p<0.3$	**0.26** $p<0.03$	**0.54** $p<0.0001$	**0.09** $p<0.5$	**1.00**	**0.10** $p<0.5$	**–0.07** $p<0.6$	**0.07** $p<0.6$	**0.53** $p<0.0001$	**0.09** $p<0.5$
Shortened Visibility	**0.42** $p<0.0002$	**–0.14** $p<0.3$	**–0.11** $p<0.4$	**0.24** $p<0.04$	**0.10** $p<0.5$	**1.00**	**0.22** $p<0.07$	**–0.09** $p<0.5$	**–0.09** $p<0.5$	**0.00** $p<1.0$
Atypical Road Dynamic	**0.64** $p<0.0001$	**0.23** $p<0.05$	**0.27** $p<0.03$	**0.55** $p<0.0001$	**–0.07** $p<0.6$	**0.22** $p<0.07$	**1.00**	**0.36** $p<0.002$	**0.07** $p<0.6$	**0.16** $p<0.2$
Vehicle Accidents in Drive Space	**0.41** $p<0.0003$	**0.63** $p<0.0001$	**0.26** $p<0.03$	**0.47** $p<0.0001$	**0.07** $p<0.6$	**–0.09** $p<0.5$	**0.36** $p<0.002$	**1.00**	**0.06** $p<0.6$	**0.29** $p<0.02$
Pedestrian Accidents in Drive Space	**0.04** $p<0.8$	**0.43** $p<0.0001$	**0.36** $p<0.002$	**0.08** $p<0.5$	**0.53** $p<0.0001$	**–0.09** $p<0.5$	**0.07** $p<0.6$	**0.06** $p<0.6$	**1.00**	**0.09** $p<0.5$
Cycle Accidents in Drive Space	**0.30** $p<0.01$	**0.40** $p<0.0004$	**0.19** $p<0.2$	**0.31** $p<0.009$	**0.09** $p<0.5$	**0.00** $p<1.0$	**0.16** $p<0.2$	**0.29** $p<0.02$	**0.09** $p<0.5$	**1.00**

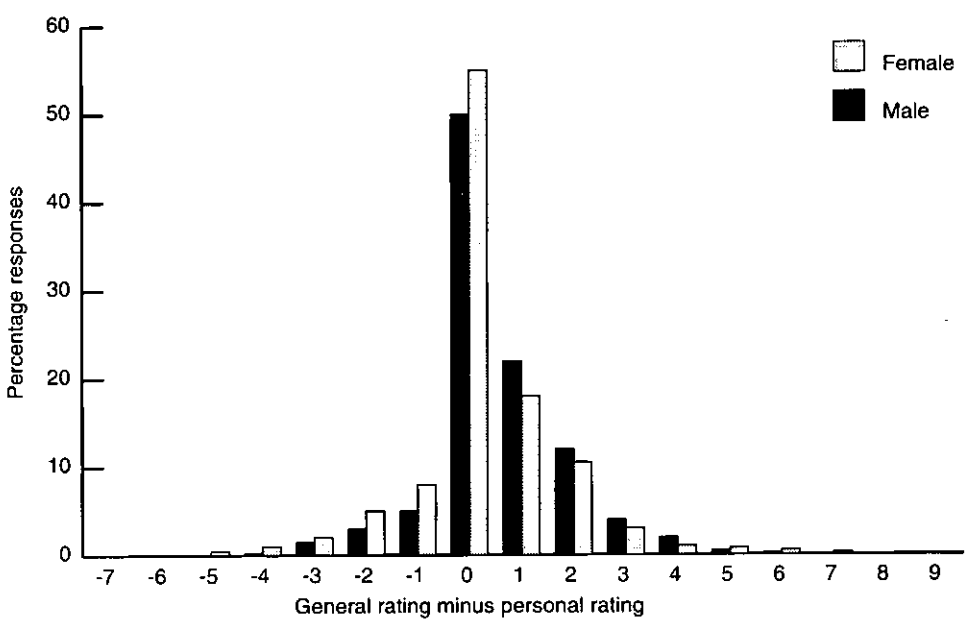
The fact that aspect (c), competing pedestrian activity, was not perceived as significantly determining risk for the "average" driver (see Table 4.2), also provides pedestrians with a cautionary reminder of their relative position within the dominance hierarchy of the road environment. The other remaining attribute, which was not significant in the multiple regression analysis of the driver MSR ratings (traffic signals or zebra crossing) can also fit this overall interpretation in that competitive interaction between both kinds of road users is subordinated, for the most part, to a higher priority of traffic control.

4.2.5 General and personal risk ratings compared

We asked drivers to give two ratings of risk: the first rating was for the "average driver" or drivers in general; the second rating was for the personal risk to the drivers, ie participants, themselves.

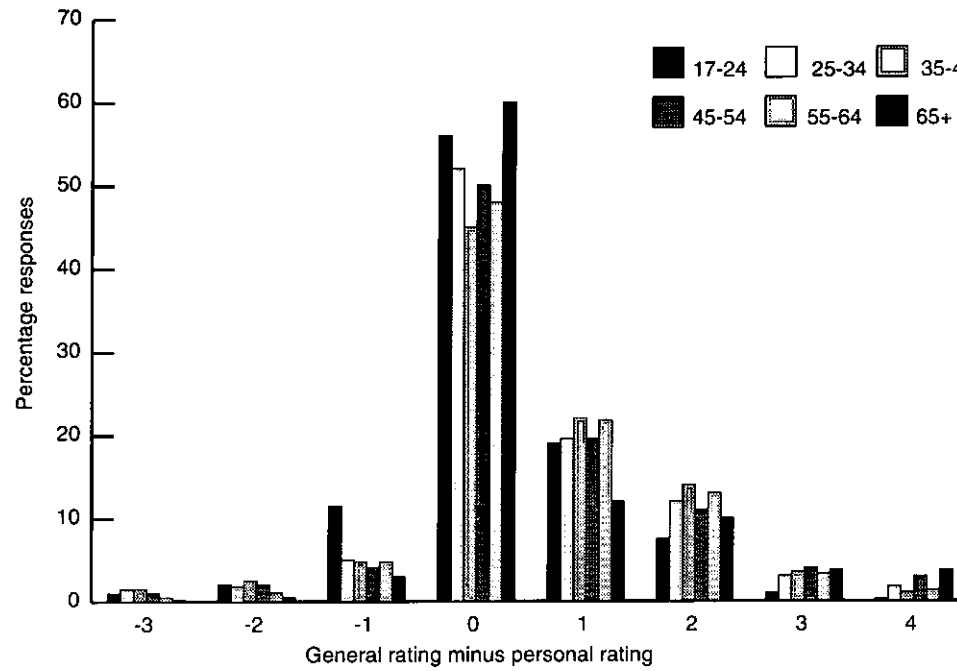
The purpose in asking for both ratings was to see whether any group of drivers rated themselves at more or at less personal risk than the average. The pattern of differences between personal and general risk ratings, separated according to gender, is shown in Figure IV.1, using the non-standardised ratings data. The skewed distribution of the columns to the right indicates that most drivers provided a lower personal risk rating by means of subtracting one, two or more units from their respective general rating. Overall, although the distribution indicates that most individuals perceive their personal risk as no different from the average driver, some gender distinctions emerge. Compared with the average driver, women feel slightly more at risk whereas men feel themselves at rather less risk than women.

Figure IV.1 – Distribution of the difference between the two drive risk ratings according to gender



Perhaps more interesting is the distribution in Figure IV.2 where the same data are analysed by age groups. Here the youngest age group feels at greater personal risk compared with their elders, who are more likely to give a reduced personal risk rating compared with their ratings for the average driver.

Figure IV.2 – Distribution of the difference between the two drive risk ratings according to age



In sum, a relatively close association seems to hold between personal and general risk ratings although differences between the two kinds of ratings tend to emerge as the estimate of risk increases. If the driver is older, male, and the location is familiar to him, then personal risk is rated markedly less than for the average driver (significant at $p<0.0001$ for all three effects).

4.3 Video ratings

4.3.1 Risk rating data

Video ratings were collected from seven road traffic locations for both driver and pedestrian perspectives as set out in Chapter 3 (Section 3.6.2). These data were transformed into MSR ratings as with the previous drive ratings.

4.3.2 Comparisons between locations

As with the drive location data before, the video ratings for the drive and pedestrian perspectives were analysed with Tukey tests. (See Tables 4.3 & 4.4 to provide a hierarchy of risk estimates for the seven locations, illustrated in Figure IV.3.)

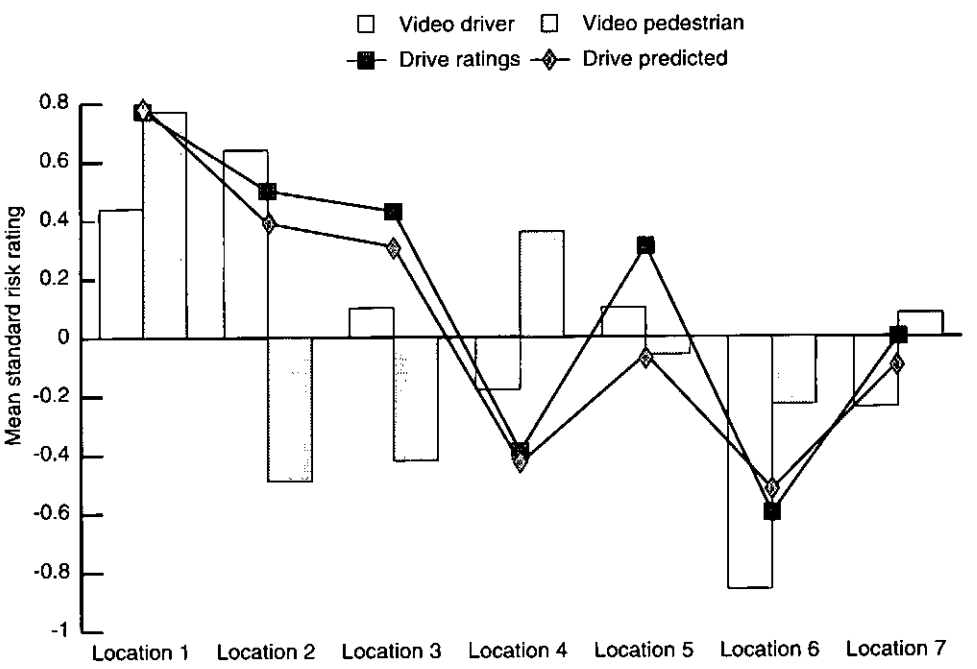


Figure IV.3 – Comparison of MSR ratings between driver and pedestrian video perspectives, actual drive ratings and risk ratings as predicted from location attributes

Also superimposed across the locations of this figure are two other sets of mean risk ratings: actual driver risk ratings (MSR) obtained on the drive route in comparison with the drive risk ratings as predicted from the location attributes, and discussed in Section 4.2.4 above.

Table 4.3 – Tukey's studentized range test: video survey driver perspective

Tukey grouping	MSR rating	No. of subjects	Location
A	0.64	471	2
B	0.44	471	1
C	0.10	469	5
C			
C	0.10	468	3
D	–0.18	465	4
D			
D	–0.24	471	7
E	–0.86	472	6

(For locations, see map Fig I.2)

Table 4.4 – Tukey's studentized range test: video survey pedestrian perspective

Tukey grouping	MSR rating	No. of subjects	Location
A	0.77	470	1
B	0.36	468	4
C	0.09	472	7
C			
C	–0.06	470	5
D	–0.24	472	6
E	–0.42	470	3
E			
E	–0.50	466	2

(For locations, see map Fig I.2)

The video risk ratings from the two perspectives, driver and pedestrian, did not correlate with each other to any extent ($r = 0.07$) as might be expected; whereas the video ratings from the driver perspective alone did correlate at a high level with actual driver (MSR) ratings for the same locations ($r = 0.84$, $p<0.05$); this was reassuring on both counts. The strong correlation matched the close relationship found for these seven locations between actual drive (MSR) ratings and predicted ratings from the drive phase that were based on the regression model ($r = 0.96$, $p<0.01$).

Even more interesting was that the video ratings of risk (from the driver perspective) also correlated highly with the predicted drive ratings based on the regression model for these selected locations ($r = 0.89$, $p<0.01$). Thus, risk estimation for actual drives and drives in the video perspective produced similar rating responses and the regression analysis supported these findings.

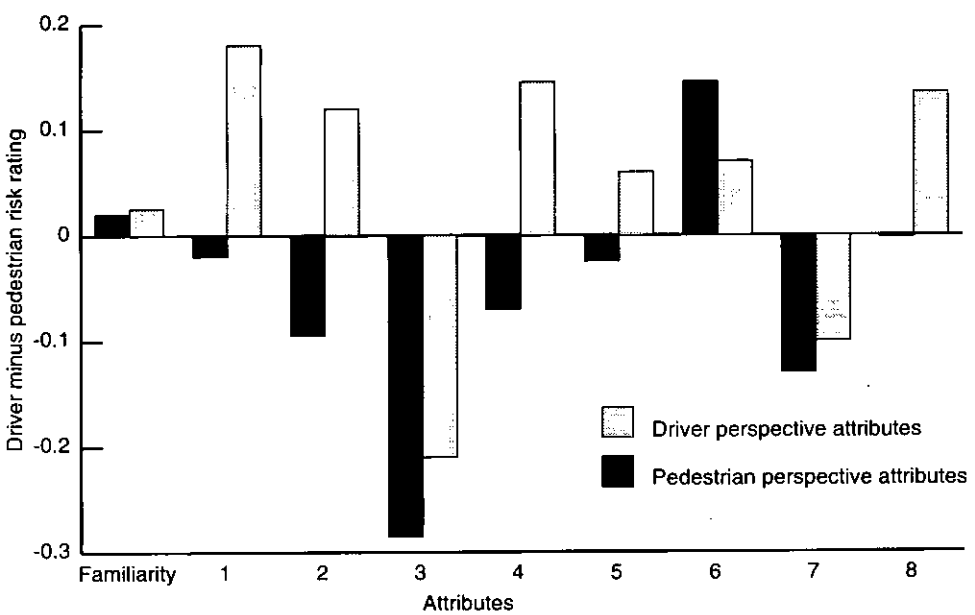
The lack of correlation found in the video ratings between the driver and pedestrian perspectives indicated that our participants' perception of risk was very different, depending on whether they viewed a particular location as a driver or as a pedestrian. In terms of a competition model, this evidence supports an interpretation that a driver's perception of the riskiness of a location takes little account of pedestrian activity.

4.3.3 Location attributes which determine risk ratings

After participants rate a particular location high for risk there is a natural tendency for them to rate the various descriptive attributes as contributing more highly as well in support of their risk rating. (For the eight attributes tested, see Chapter 3, Section 3.6.4.) As a consequence, any aspect which might be particularly associated with either the driver or the pedestrian perspective, could fail to be differentiated. However, since we ensured that viewers provided ratings from both pedestrian and driver perspectives, it was possible to take the difference between risk ratings from each perspective for every location. It was then possible to inspect how multiple regression predicted this difference when based on data from the location attributes, rated from each perspective. This method illustrated the differing influences affecting drivers' and pedestrians' views.

Figure IV.4 illustrates these relative weightings for the eight separate attributes that were measured (together with a familiarity rating) according to whether they were rated from the perspectives of driver (shaded) or pedestrian (non-shaded). The particular attributes to focus on in this figure are those in which both weightings (shaded and non-shaded) extend in the same direction.

Figure IV.4 – Relative weightings of eight attributes in predicting the difference between driver and pedestrian risk ratings



Attribute 1: Amount of traffic
Attribute 2: Obstruction to view (either fixed or temporary)
Attribute 3: Ineffective or inadequate pedestrian facilities
Attribute 4: Speed of traffic
Attribute 5: Ineffective or inadequate road signs and markings
Attribute 6: Large vehicles
Attribute 7: Pedestrian behaviour
Attribute 8: Unpredictability of traffic movement

The figure clearly showed from these weighting distributions that, from a driver's perspective, inadequate pedestrian facilities (Attribute 3) and pedestrian behaviour (Attribute 7) are rated as contributing less to risk compared with their contributions from the other pedestrian perspective. In contrast with this relative unconcern as drivers, large vehicles (Attribute 6)

viewed from a driver's perspective, and to somewhat lesser extent unpredictable traffic movement (Attribute 8), are perceived as affecting driving behaviour more crucially, and consequently these two aspects are rated as contributing more highly to risk than in the pedestrian perspective.

Predictions based on the distribution of the relative weightings in this figure suggest a behavioural environment, from the driver perspective, in which they vie for road space and relative dominance in relation to road factors, such as the amount of traffic, its speed and its predictability of movement. From the pedestrian point of view, risk perception is also strongly influenced by large vehicles but, in terms of competitive interaction, the only means they have to improve their status are those that can facilitate their passage in relation to traffic, such as crossing facilities.

4.3.4 Video (MSR) ratings and road traffic accidents

The MSR ratings for the seven locations featured in the video film are given in Table 4.5 for both driver and pedestrian perspectives together with accident statistics for the four years ending December, 1990. Accidents at the location are tabled in total (a), as those involving motor vehicles only rated for risk (b), and including pedestrians in the immediate vicinity (c).

Table 4.5 – Mean Standard Risk ratings in the video survey for seven locations for both driver and pedestrian perspectives with accident statistics for four years ending December 1990

Location	Mean standard risk rating		Accidents		
	Driver perspective	Pedestrian perspective	a Total	b Vehicle	c Pedestrian
1. Castle Farm Bridge	0.44	0.77	0	0	0
2. Jesmond Road	0.64	–0.50	24	12	10
3. Gosforth High St.	0.10	–0.42	11	4	5
4. Freeman Road	–0.18	0.36	5	4	1
5. Central Station	0.10	–0.06	26	0	26
6. Wingrove Road	–0.86	–0.24	4	1	3
7. St. Nicholas/ Mosley St.	–0.24	0.09	25	1	24

Risk, rated from a driver perspective, provides moderate correlations with vehicle accidents ($r = 0.50$) but very poor correlations with pedestrian accidents ($r = 0.02$). Risk, rated from a pedestrian perspective, correlates negatively with both vehicle accidents ($r = -0.55$) and with pedestrian accidents ($r = -0.23$) notwithstanding the fact that, with only seven locations, the sample size is too few to achieve a level of significance for these correlations. However, it is noteworthy that the correlations for these video ratings, from the driver perspective, are very similar to the correlations between accident data and the MSR ratings made by actual drivers in the drive route phase, which were based on a much larger range of traffic locations. In considering these results, we observe again that, rather than a simple association with accident statistics, the drivers risk ratings, now substantiated by video ratings from the driver perspective, seem more related to the demands of competing for road space.

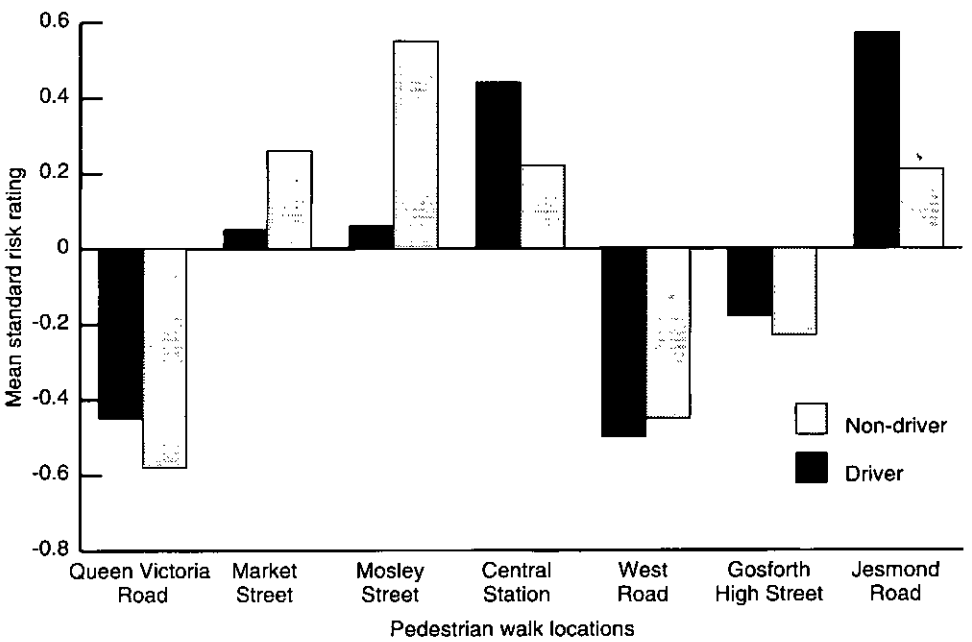
This view is also reinforced by the video ratings from the pedestrian perspective. The extent to which the rated locations characterise relative dominance as between pedestrian versus driver seems to be a main factor and better related to perceptual risk than to accidents *per se*.

4.4 Pedestrian walks ratings

4.4.1 Risk ratings

No correlations of any significance were found for pedestrian MSR ratings with either gender or age. But differences for mean risk ratings did emerge when we examined whether a driving licence was held, a factor which appeared to bias the participants' perception of the hierarchy of risk. In Figure IV.5, MSR ratings for participants in possession of a current licence are compared with MSR ratings for those without a licence. Whether participants have a driving licence, thus allowing them to perceive the location from a pedestrian and driver viewpoint, or whether they view entirely from a pedestrian perspective, significantly affects the perceptual judgement of a location's riskiness. This effect shows up particularly for two locations (2: St. Nicholas/Mosley Street, and 6: Jesmond Road). These perceptions of Jesmond Road also echo its previous ratings by video (see Figure IV.3), which registered the largest disparity for risk ratings between driver and pedestrian perspectives.

Figure IV.5 – Pedestrian walks survey: comparing mean standard risk ratings between drivers and non-drivers



The evidence suggests that those with driving qualifications, even though they are on foot in the walks phase of our testing, nevertheless drew upon their driving experience to assess and to rate the potential dangers of a particular location as well as what they observe as a pedestrian.

4.4.2 Rating attributes for locations

The walks participants rated ten attributes for each location to judge to what extent those attributes had influenced their overall rating of risk for a location. The ratings for all ten attributes for all locations correlated significantly with the ratings for risk at all locations as is shown in Table 4.6. So, in order to establish to what extent a causal relationship existed between the attribute ratings and the final risk assessment rating, a multiple regression analysis was made. This analysis produced a significant fit with a marked contribution from all attributes ($r^2 = 0.37$, $p<0.0001$), except for

three: Attribute 7: Signs and road markings, Attribute 8: Parked vehicles or their absence, and Attribute 10: Pedestrian behaviour.

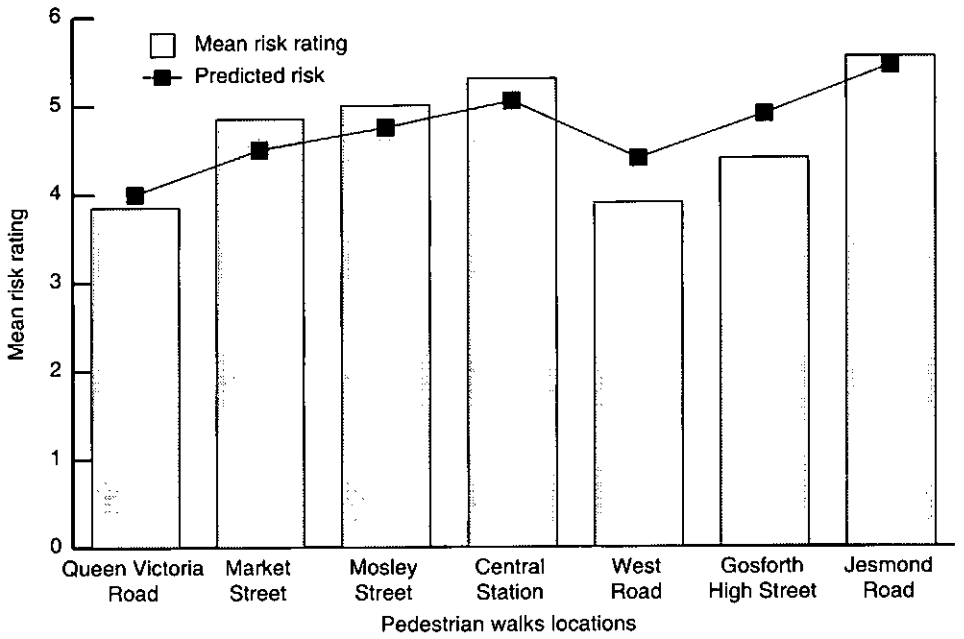
Table 4.6 – Pedestrian walks survey: correlations between location attribute ratings and risk ratings

Attribute	Loc 0	Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Loc 6	General
1 Width of road to cross	.35	.32	.48	.32	.38	.34	.39	.37
2 Amount of traffic	.42	.44	.42	.35	.45	.49	.44	.44
3 View of oncoming traffic	.22	.31	.52	.35	.35	.40	.41	.41
4 Crossing facilities	.20	.36	.52	.23	.22	.37	.38	.37
5 Speed of traffic	.21	.39	.44	.37	.44	.40	.47	.43
6 Standard of driving	.20	.14	.41	.34	.40	.34	.36	.36
7 Signs and road markings	.24	.18	.49	.21	.29	.23	.33	.31
8 Parked vehicles	.33	.28	.32	.16	.31	.39	.33	.22
9 Large vehicles	.28	.29	.33	.33	.37	.46	.52	.37
10 Pedestrian behaviour	.19	.32	.28	.10	.24	.24	.21	.24

The fact that these particular attributes were not independent predictors can be explained as follows. Attribute 7 (Signs and road markings) correlated with all other attributes and most strongly with Attribute 4 (Crossing facilities: $r = 0.43$) so it appears that pedestrians interpreted road signs and markings pragmatically, as crossing facilities, in terms of their immediate requirements, and were not concerned with interpretation in a more general context. Again Attribute 8 (Parked vehicles or their absence) proved not to be an independent predictor, probably because parking restrictions were in force at all the locations, except for some temporary parking and loading, which were a feature of some locations. Ratings for Attribute 8 (Parked vehicles or their absence) were also strongly correlated with those for Attribute 9 (Large vehicles: $r = 0.38$), suggesting that pedestrian observers may have linked these two attributes together by seeing buses at bus stops as representing both attributes simultaneously. Finally, the fact that Attribute 10 (Pedestrian behaviour) did not make any significant contribution to the risk rating for a walks location can be satisfactorily explained by the phrasing of the instructions for their rating: "Rate the risk that you feel yourself at this location as a pedestrian" so how other pedestrians behaved at the location may not have caused individuals to feel at more or less risk in themselves.

While these three attributes, 7, 8, and 10, did not make a unique contribution, the remaining seven attributes might be said to predict the assessment ratings for risk. The prediction from multiple regression parameters, applied to mean risk and the attribute ratings of the locations is shown in Figure IV.6. In addition, if we are to claim these attribute ratings to be independent predictors, we must satisfy ourselves that the attribute ratings, rated after those for risk, were not made as some kind of a justification for the previous risk judgement. (This problem was successfully sidestepped in the video analysis by comparing how well locations aspect ratings from driver and pedestrian perspectives predicted the difference between driver and pedestrian risk.)

Figure IV.6 – Mean risk ratings for pedestrian survey locations compared with predictions based upon the ratings given to location attributes



Notwithstanding these reservations, the analysis presented in Table 4.7 shows the relative importance of each attribute in its contribution to the pedestrian walks assessment of risk, together with the predicted risk from the regression analysis. Given their restricted (traffic) environment, in which traffic was effectively controlled by road crossings and traffic signals, the most dominant perceptions that generate feelings of risk in pedestrians, were the number of vehicles, their speed and size.

Table 4.7 – Relative importance of ten attributes for walks locations contributing to the pedestrian assessment of risk

	Loc 0	Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Loc 6
Risk rating	3.90	4.89	5.02	5.35	3.92	4.41	5.56
Attribute							
1 Width of road to cross	2.63	2.94	2.94	3.27	2.83	3.52	3.34
2 Amount of traffic	3.49	3.98	4.06	3.95	3.82	4.05	4.41
3 View of oncoming traffic	3.43	3.29	3.41	3.05	2.83	2.87	3.27
4 Crossing facilities (zebra, pelican, etc.)	1.80	2.26	2.53	2.62	2.20	2.38	2.69
5 Speed of traffic	3.15	2.90	3.47	4.02	3.27	3.66	4.17
6 Standard of driving	3.06	3.15	3.31	3.59	3.07	3.39	3.69
7 Signs and road markings	2.75	2.87	3.02	3.03	2.76	2.81	3.08
8 Parked vehicles, or the absence of any	2.81	2.50	2.50	3.21	3.50	2.87	2.75
9 Large vehicles (trucks, buses) or absence of any	2.57	3.58	3.04	3.50	3.37	3.55	3.62
10 Pedestrian behaviour	2.78	3.79	3.20	3.37	2.95	2.99	2.98
Predicted risk	**4.02**	**4.56**	**4.80**	**5.10**	**4.42**	**4.94**	**5.49**

4.4.3 Accident countermeasures: their potential effectiveness and favourability

The walks participants considered ten suggested accident countermeasures on two five point scales: a scale that ranged from VERY INEFFECTIVE to VERY EFFECTIVE, and a scale that ranged from STRONGLY AGAINST to STRONGLY IN FAVOUR. For economy in presentation, the results have been summarised in Table 4.8. Margins of favourability and effectiveness were calculated. These express the difference between the numbers for and against as a percentage of the total number of respondents. Some implications of the discrepancies when items are ranked in order of perceived effectiveness and in order of favourability towards them is taken up again in Section 7.1.

Table 4.8 – Effectiveness and favourability margins for accident countermeasures for pedestrian walks locations

	Loc 0	Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Loc 6
1) More space for pedestrians, less for vehicles							
Margin of effectiveness	–10%	–13%	–3%	–4%	–17%	–2%	12%
Margin of favourability	8%	11%	8%	13%	–12%	7%	33%
2) Strict enforcement of existing speed limits							
Margin of effectiveness	30%	21%	26%	58%	28%	52%	65%
Margin of favourability	68%	51%	56%	84%	76%	83%	90%
3) More barriers to protect and direct pedestrians							
Margin of effectiveness	29%	40%	3%	–9%	43%	–11%	60%
Margin of favourability	48%	53%	17%	15%	52%	4%	71%
4) Better driver training							
Margin of effectiveness	26%	25%	28%	39%	30%	32%	51%
Margin of favourability	48%	45%	43%	55%	40%	47%	58%
5) Road humps to slow traffic							
Margin of effectiveness	–5%	–36%	–30%	1%	–27%	–31%	–25%
Margin of favourability	–18%	–25%	–33%	5%	–32%	–27%	–22%
6) More zebra/pelican crossings							
Margin of effectiveness	–15%	–33%	–25%	–1%	–2%	–18%	19%
Margin of favourability	0%	–9%	–14%	11%	3%	–2%	24%
7) More refuges in middle of the road							
Margin of effectiveness	–5%	–20%	–28%	–19%	9%	27%	25%
Margin of favourability	9%	6%	–14%	–9%	17%	29%	39%
8) Pedestrianisation/ban traffic							
Margin of effectiveness	–29%	5%	–5%	2%	–27%	–21%	–17%
Margin of favourability	–39%	10%	–15%	–10%	–38%	–28%	–32%
9) More traffic signals to control traffic							
Margin of effectiveness	–7%	–16%	–20%	18%	–16%	–17%	12%
Margin of favourability	21%	3%	–5%	30%	–2%	1%	24%
10) Lower speed limits							
Margin of effectiveness	12%	–2%	16%	52%	18%	42%	55%
Margin of favourability	35%	34%	39%	68%	38%	55%	59%

For most countermeasures, margins of favourability exceed those for effectiveness, with the possible exception of road humps. The negative margins of effectiveness for tangible countermeasures, such as introducing further pedestrian facilities, road humps or complete pedestrianisation suggest that these effectiveness ratings are strongly influenced by considerations of the practical feasibility of actually introducing particular countermeasures. If feasibility was not considered, pedestrianisation would be an obviously effective countermeasure.

These considerations may alternatively imply a perceptual difficulty in imagining a location in any way other than how it already is, given that walks participants overwhelmingly favoured the behavioural changes, such as the strict enforcement of existing speed limits, further reductions in speed limits, and better training for drivers. The overall results for these scales may reflect the difficulty in setting aside the concrete reality of a location necessary to evaluate a countermeasure as well as a lack of the relevant technical knowledge.

5 The evidence on attitudes

5.1 The main interview questionnaire

A brief description of the content and questions of the main interview are to be found in Chapter 3 (Section 3.5). The complete set of questions together with the data for the response frequencies and their means are provided in Appendix F.

In this interview a more in-depth enquiry was made into the attitudes of our participants to the issues of risk and safety on the roads in order to assess their conditioned and conditional preferences and their knowledge of the relevant facts. Of necessity, the interview could only be limited in its range of inquiry.

After an initial, brief section on the method of analysis, the chapter is divided into reports on attitudes and preferences, views on the causes of accidents, and attitudes to the possible countermeasures that might be taken. A final section reports on the results of a cluster analysis of measures taken from the main questionnaire.

5.2 Methods of analysis

The data required three main methods of analysis. Initially a Tukey analysis was made to investigate relationships within the data; this treatment is similar to that in the previous chapter where it was used to sort the relationships of locations according to their estimate of risk.

Factor analysis was also employed and several variants were available. The method of *Maximum Likelihood* was adopted in this instance because the SAS computing package included the programming facility of factor selection with factors rotated automatically using the Varimax method. In the analysis, rotation served to sharpen up the similarity and dissimilarity between responses to questionnaire items. Items which have significant weighting on the same factor were considered to share common causal or interpretive meaning.

5.3 Perception of the social environment I: basic attitudes

5.3.1 Underlying factors of concern

Initially concern about road accidents (Q1) was considered against a framework of other possible social concerns. One concern that clearly preceded that for road accidents was violent crime ($p<0.05$, Tukey), closely followed by house theft, educational standards, social health care, and environmental pollution, whereas of less concern than road accidents came drug abuse, unemployment, AIDS, cost of living, and traffic congestion. Unhealthy food was placed last, being of lesser concern than any of the other presented items ($p<0.05$, Tukey).

In order to draw out the underlying patterns of response, a factor analysis of the response data was made (See Table 5.1). Two main factors, labelled (1) anti-social behaviour and (2) society and the environment, appeared to account significantly for the different ways in which individuals responded

and to group their main concerns. The main factor, anti-social behaviour, consisted of items relating to violent crime, drug abuse, house theft and AIDS.

Table 5.1 – Road accidents in the context of other concerns (Higher ratings indicate greater concern)

Factor Loadings: Factor 1 (Anti-social behaviour) and Factor 2 (Society and the environment) are shown in terms of the correlation of questionnaire items on these factors.

Issue	Mean rating	Factor loading F1	F2
Violent crime	4.31	**.70**	.17
House theft	4.02	**.53**	.05
Social health care	3.95	.02	**.71**
Standards of education	3.94	.16	**.43**
Pollution in the environment	3.93	.20	**.57**
Road accidents	3.90	**.58**	.30
Drug abuse	3.82	**.67**	.20
Unemployment	3.71	.26	**.43**
AIDS	3.69	**.50**	.31
The 'cost of living'	3.39	.31	.21
Traffic congestion	3.31	.30	.30
Unhealthy food	3.13	.29	**.41**

Concern about road accidents was positively correlated with the anti-social behaviour factor ($r = 0.57$, $p<0.0001$). In passing, it should be emphasised that a factor analysis of this relationship, as with any other item related to this factor, does not imply that these actions are necessarily the result of anti-social behaviour, but only that the analysis has registered an existing social bias to view them in this way. The factor analysis, then, is not stating that road accidents are a necessary consequence of anti-social behaviour although an attitude, or general disposition, prevailed within our sample of participants to see accidents in this light. This result, which related to people's perception of accidents, may usefully be juxtaposed with an observation obtained from the previous analysis of driver perceptions: specifically, that perception of risk was influenced by a hierarchical ranking of the drive manoeuvre applicable to that location. These two results taken together suggested that road traffic accidents can be viewed within the social context as caused by a trespass or transgression of an implicitly perceived hierarchy of common rules perhaps, even in some cases, of rights. This interpretation will be taken up again when the causes of accidents are discussed subsequently (Section 5.3.3).

5.3.2 Transport preferences

Questions of how and when people preferred to travel sought to elicit the underlying reasons for their behaviour. Respondents were questioned about what method of transport they preferred for a regular daily journey of three miles and back (Qs 10-13), what times of day they preferred to travel (Q15), and which times they considered to be most dangerous (Q14). Typically, as Figure V.1 shows, they prefer to travel, given the choice, during the late morning and early afternoon, thus avoiding the peak hours for traffic of the early morning and evening. The times of day when driver, rider or passenger are most, or least, at risk in the opinion of respondents is given in Figure V.2. Perceived to be least dangerous are the very early

hours (when there is least competition for road space from other road users), compared with maximum risk at peak traffic times and pub closing hours. It is worth noting that when exposure (amount of traffic) is taken into account, the accident rate during the early hours is high.

Figure V.1 – Times of day people would avoid or prefer travelling

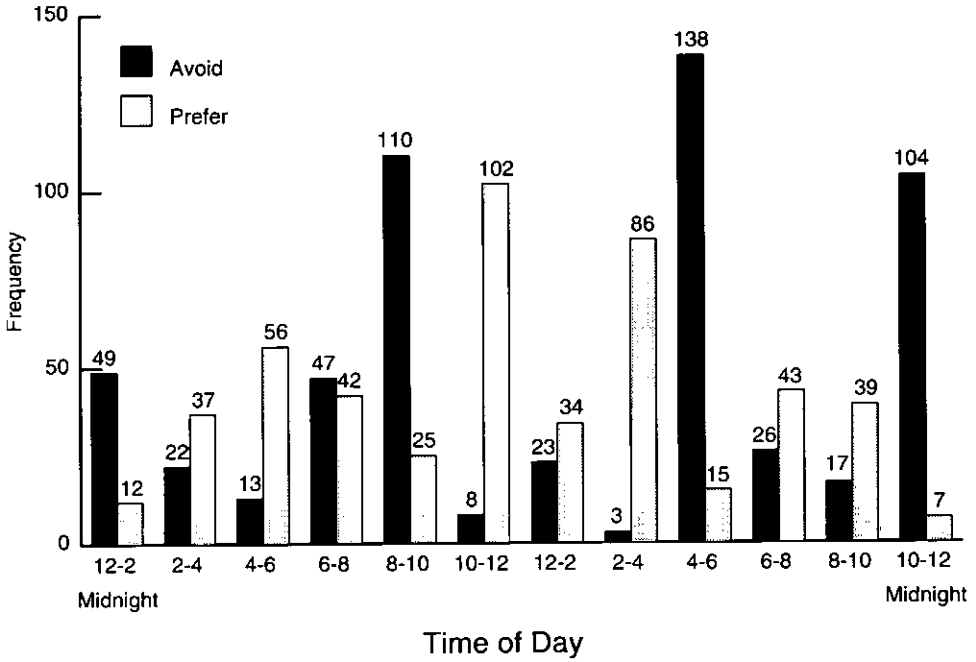
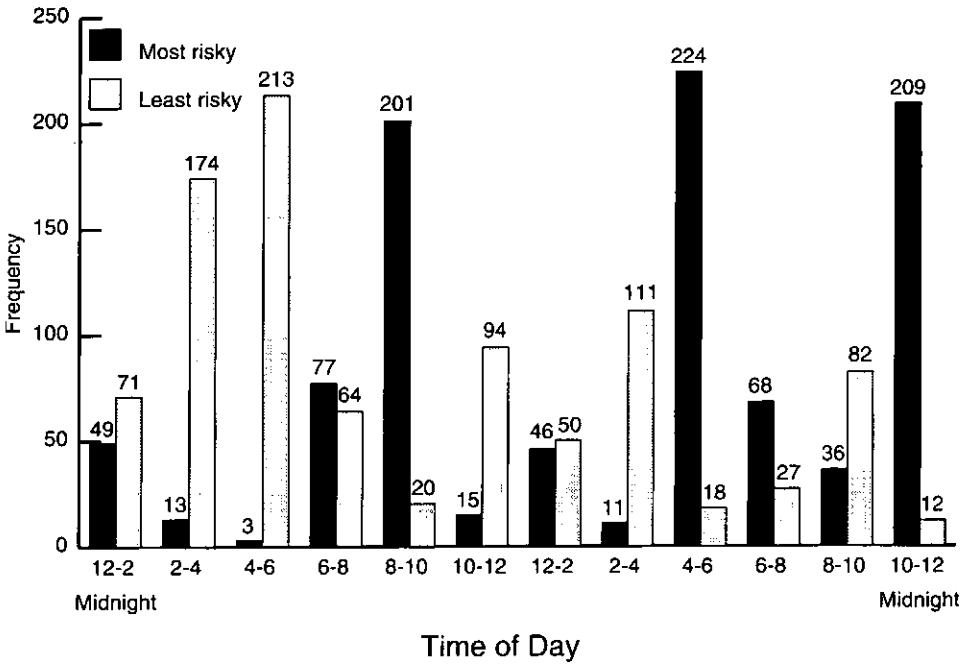


Figure V.2 – Times perceived as most or least risky to travel



It is noted that although these times of day with most and least accidents were indicated by respondents, we cannot conclude that these judgements of risk were necessarily assessed in any relative sense.

In Figures V.3, a to h, various transport options are ranked according to preference, perceived risk of accident, or risk of violence, or total perceived risk of physical injury (Qs 10-13). The evidence suggests that the preference for travelling by private car does not reflect any untoward risk of accident, when compared with the relative risks of walking, cycling or going by motorcycle, and may echo, perhaps, the earlier range of concern (Section 5.3.1), which rated violent crime as of more concern than road accidents. When asked (Q16) to state what influenced their choice of transport, respondents chose as the most important influences, flexibility, convenience and time saving; again the risk of injury or accident was of less concern than the risk of violence.

Figure V.3a – Ranking of preference, perceived risk of accident, risk of violence and total perceived physical risk – walking

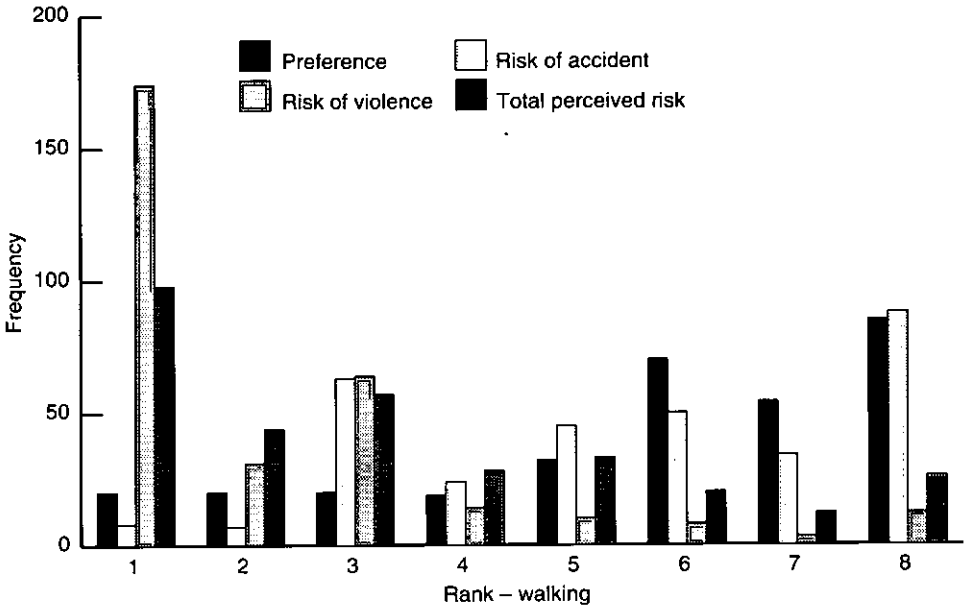


Figure V.3b – Ranking of preference, perceived risk of accident, risk of violence and total perceived physical risk – cycling

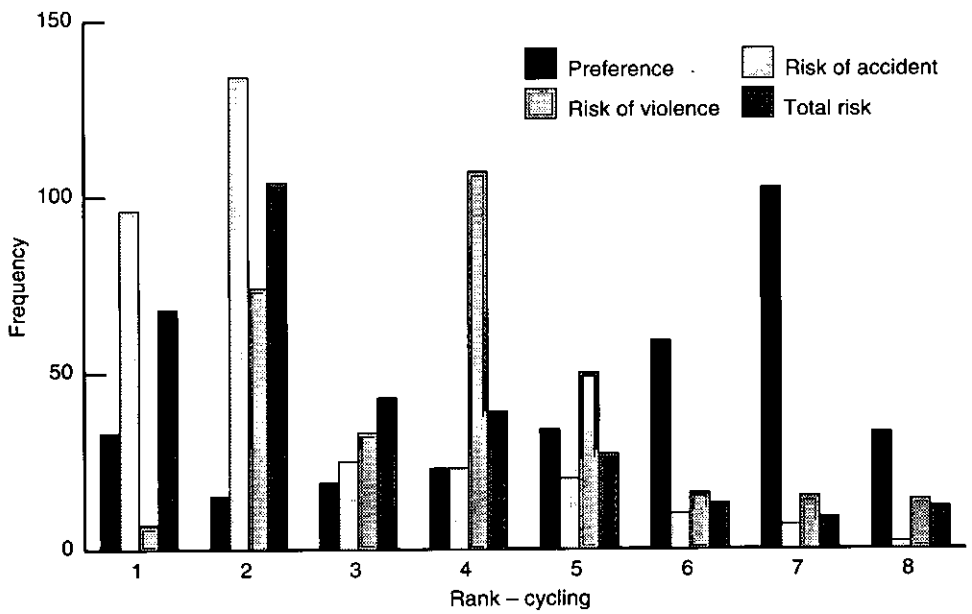


Figure V.3c – Ranking of preference, perceived risk of accident, risk of violence and total perceived physical risk – drive car

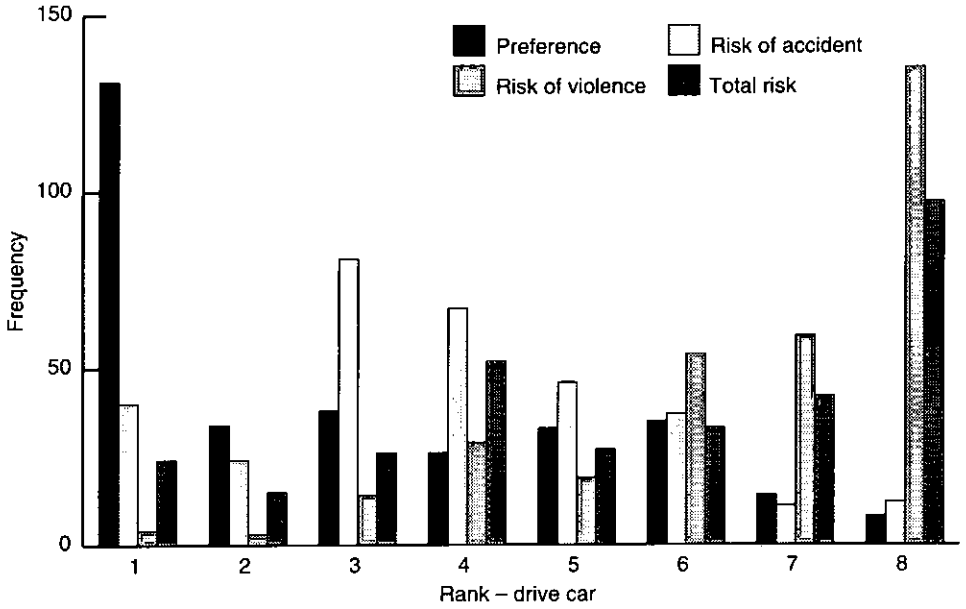


Figure V.3d – Ranking of preference, perceived risk of accident, risk of violence and total perceived physical risk – private car passenger

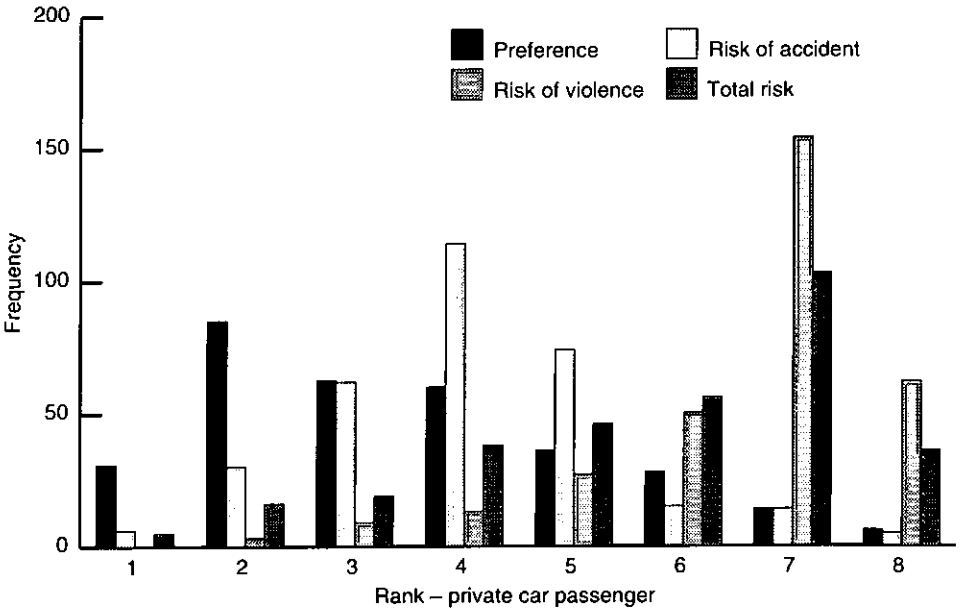


Figure V.3e – Ranking of preference, perceived risk of accident, risk of violence and total perceived physical risk – Metro and train

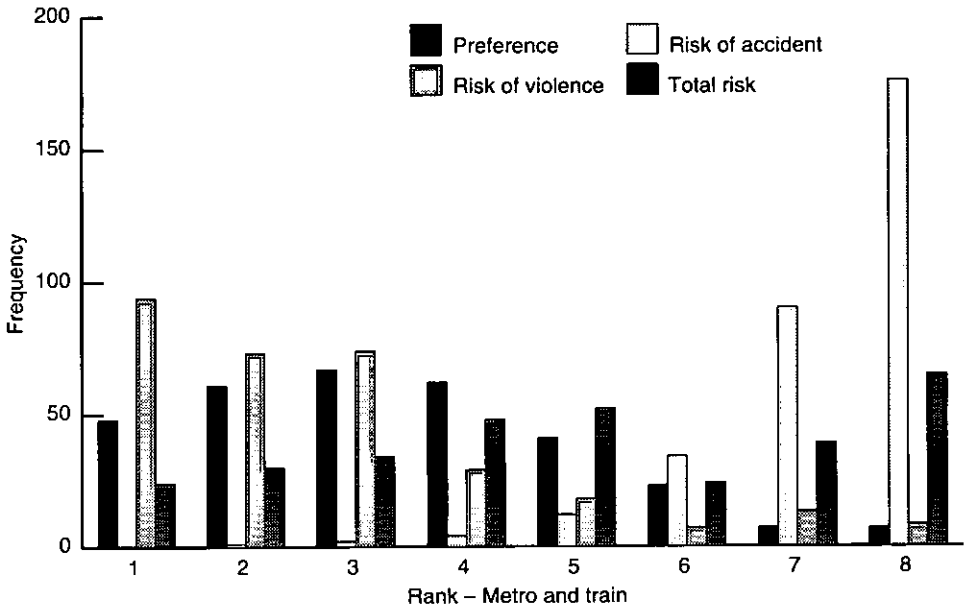


Figure V.3f – Ranking of preference, perceived risk of accident, risk of violence and total perceived physical risk – bus

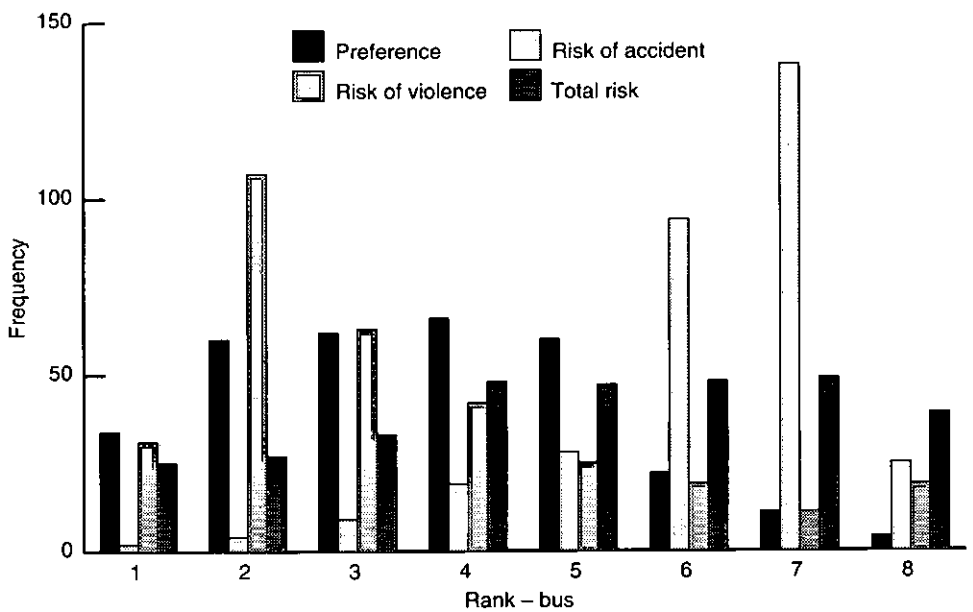


Figure V.3g – Ranking of preference, perceived risk of accident, risk of violence and total perceived physical risk – taxi

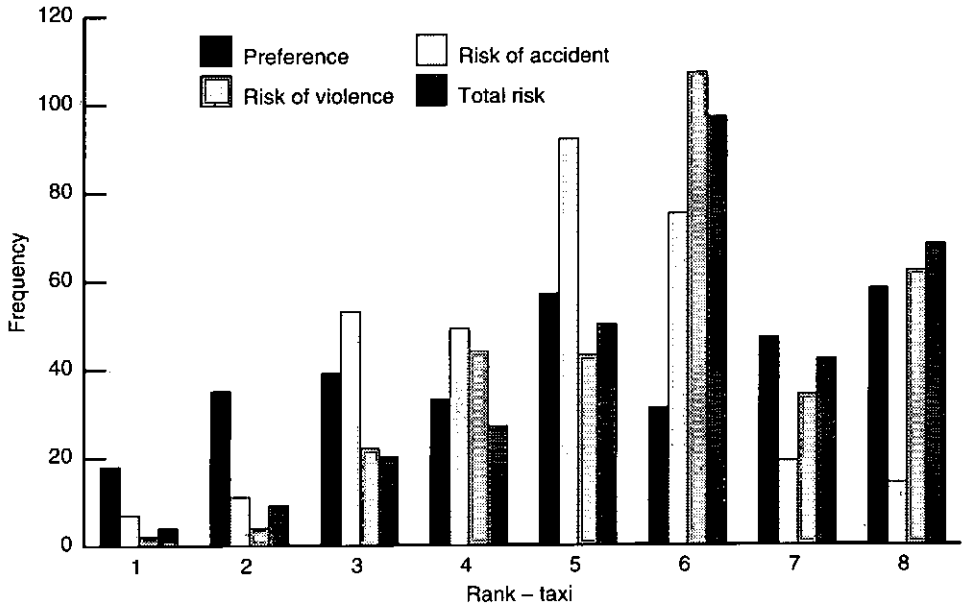
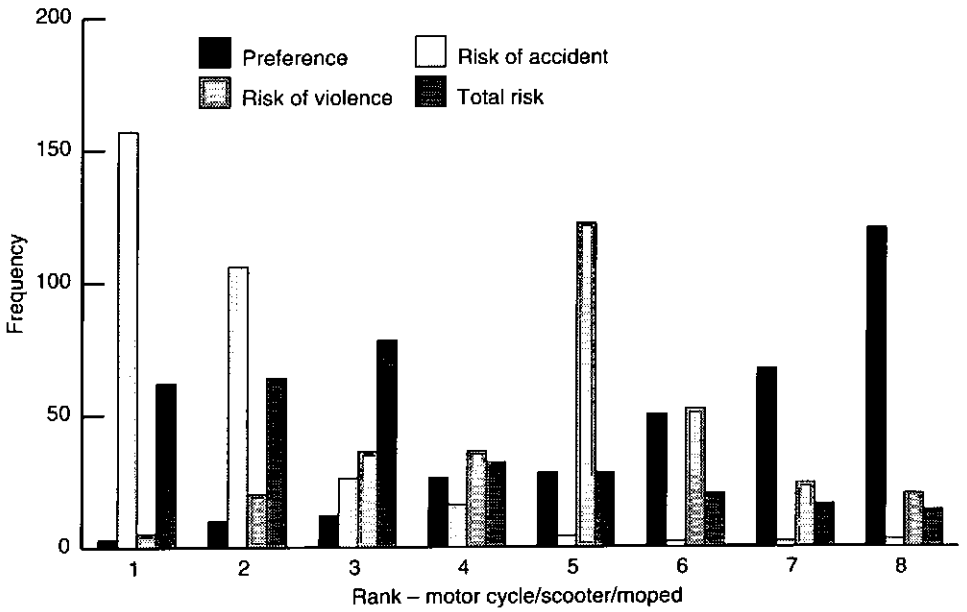


Figure V.3h – Ranking of preference, perceived risk of accident, risk of violence and total perceived physical risk – motor cycle/scooter/moped



After factor analysis, items grouped themselves into three independent sets: (a) risk, (b) status (in the sense of impressing others) and (c) convenience. The summary of answers to Question 16, together with correlation of individual questions with these three factors, are given in Table 5.2, where risk does not appear to be much related to either status or convenience.

Table 5.2 – Influences on transport preference

Factor 1 (Risk) Factor 2 (Status) Factor 3 (Convenience)
Ratings – 1 indicates most influence, 5 indicates least influence

Influence factor	Mean rating	Factor correlations F1	F2	F3
Flexibility	2.22	–.11	–.09	**.50**
Saving time	2.29	–.13	–.07	**.58**
Not having to rely on others	2.31	.08	.05	**.41**
To feel safe from personal violence	2.55	**.52**	.16	.21
Warmth and comfort	2.61	.23	.09	**.51**
To minimise your own financial costs	2.62	.24	.00	.22
Relaxation/enjoyment	2.65	.06	.12	**.44**
The risk of an accident	2.78	**.83**	.10	.05
The risk of injury	2.83	**.93**	.11	–.00
To protect the environment	2.84	.30	.12	–.03
Exercise/fitness	3.27	.05	.06	–.01
To avoid physical effort	3.28	.19	.15	.28
To be able to express personal style and ability	4.05	.12	**.62**	.13
To be able to attract and encourage friends	4.17	.23	**.63**	.02
Excitement	4.24	–.01	**.54**	.05
To demonstrate success	4.31	.13	**.68**	.02

5.3.3 Perceived relative causes of road traffic accidents

Another group of questions can be usefully related to how interviewees perceived how accidents came about. In this part of the questionnaire (Q3), participants rated a series of items according to whether road traffic accidents could be attributed to them as causes.

This attitudinal data linked with the evidence in Section 5.3.1 in emphasising anti-social behaviour, such as violations or lack of due consideration, as the main causes. The hierarchy of summed responses are given in Table 5.3. A summary of the three sources, derived after a factor analysis, yielded: (a) global and external causes, (b) violations and stupidity, and (c) errors and slips as the perceived causes. Measures of how well each item in the question set correlated with these sources is set out in Table 5.3. Interviewees were themselves assessed in terms of the relative emphasis that they placed on each of these three factors, but discussion of the patterns of relationships that emerge from these ratings on individual factors within question sets will be discussed more extensively in Section 5.4.

Table 5.3 – Perceived cause of road accidents

Factor 1 (Global and external causes) Factor 2 (Violating and stupidity) Factor 3 (Errors and slips)
Higher ratings reflect greater perceived cause

Statement	Mean rating	Factor correlations F1	F2	F3
Drinking alcohol or taking drugs	4.44	.03	**.42**	.14
Selfish, aggressive and inconsiderate people	4.02	.05	**.43**	.24
People's hurry and impatience	3.96	.07	.13	**.47**
People who show off by risk taking	3.88	.09	**.70**	.21
Individual carelessness and lapses	3.81	–.06	–.02	**.53**
Deliberate rule breaking by individuals	3.73	.03	**.50**	.25
People falling into bad driver and pedestrian habits	3.61	.12	.09	**.48**
People who feel that riskier behaviour is stimulating	3.53	.09	**.73**	–.05
The frustration of being held up by heavy and congested traffic	3.41	.18	.07	**.34**
Vulnerable users such as cyclists and pedestrians having to compete for priority against the motor car	3.39	**.33**	.17	.24
Inexperienced drivers/riders	3.35	.20	.17	**.40**
Lenient penalties for drivers/riders	3.31	**.31**	.28	.17
Traffic volumes	3.24	**.42**	–.10	.08
Unaccompanied and unsupervised children	3.23	.15	.21	**.43**
Temporary road conditions due to weather or road works	3.15	.12	.11	.17
Unforeseen events and uncontrollable events	3.10	–.01	.08	.21
Insufficient road safety training and testing	3.10	**.38**	.08	**.33**
Drivers/riders and pedestrians who are old and do not react so fast in an emergency	3.03	.21	.20	.29
Roads designed to encourage fast traffic	3.02	**.33**	.15	.06
Confusing road design or markings	2.76	.25	.16	.27
Poor national and local government policy	2.57	**.64**	–.01	–.00
Insufficient policing of road traffic	2.57	**.58**	.05	.16
The inconvenience, discomfort and cost of public transport	2.21	**.55**	.02	.03
Accidents are an inevitable consequence of a free society	2.11	**.33**	.21	.08

5.3.4 Risking injury as pedestrians and drivers

Inquiry was made (Q20) of the potential risk of injury that respondents actually invited on the roads by undertaking risky pedestrian activity. Their responses are summarised in Table 5.4. When their responses were subjected to factor analysis, all items loaded significantly on a single dimension or factor. By scoring individuals on this factor and then correlating these scores with age and gender, we see in Table 5.5 that risky pedestrian activity was reported significantly more by young adults, and by men rather than by women respondents.

Table 5.4 – Mean ratings and factor correlations for pedestrian behaviours

Ratings – 1 indicates most often, 5 indicates least often

Behaviour	Mean rating	Factor correlation
As a pedestrian, cross at the quickest point rather than using crossing facilities	3.21	.69
As a pedestrian, while crossing at busy pedestrian lights which are against you, dash across when you see a slight gap in the traffic	3.68	.71
When crossing at pedestrian lights cross on the green man without checking that cars/vehicles are actually stopping	3.89	.50
As a pedestrian, follow the lead of others across the lights without checking	4.03	.45
Walk or cross on a part of the road where barriers have been placed to keep pedestrians off	4.13	.62

Table 5.5 – Correlation of factor for pedestrian behaviour with age and gender

	Factor correlations
Age	.62 (p<.0001)
Gender	.22 (p<0001)

Given such potential risk taking as pedestrians, we considered it relevant to enquire (Q19) how realistically people perceived the risk of injury if they were actually hit by a car. Their assessment of damage suffered if hit by a car travelling at various speeds is set out in Table 5.6. Their perception was highly unrealistic and optimistic about the extent of injury and their chances of survival at a speed of, say, 45mph – given that a vehicle will almost certainly kill at 40mph, while even at 30mph the chance of death is fifty percent.

Table 5.6 – Perceived extent of injury if directly hit by a car (percentage responses, respondents = 316)

Car speed (mph)	Uninjured	Superficially injured	Temporarily incapacitating injuries	Serious & long term injuries/ disability	Killed
10	14.6	59.5	20.9	3.8	1.3
20	1.3	23.4	55.1	16.8	3.5
30	0	3.2	34.5	48.1	14.2
45	0	0	5.7	39.2	55.1
60	0	0	0	4.7	95.3

To the drivers interviewed, similar enquiries (Q21) were made about the extent they were prepared to undertake hazardous driving manoeuvres. Their replies are summarised in Table 5.7, with speeding or accelerating to beat a traffic light being the most commonly reported behaviour.
Factor analysis indicated three main variables as influencing their behaviour: competitiveness, drinking, and seatbelt awareness.
Correlations between each item and these factors are given in Table 5.7.
Younger drivers appear to relish competition ($r = 0.39$, $p<0.0001$), and gender differences are revealed in that young women tend to eschew drinking when driving ($r = 0.23$, $p<0.001$) and are more inclined to use their seatbelts ($r = 0.19$, $p<0.01$).

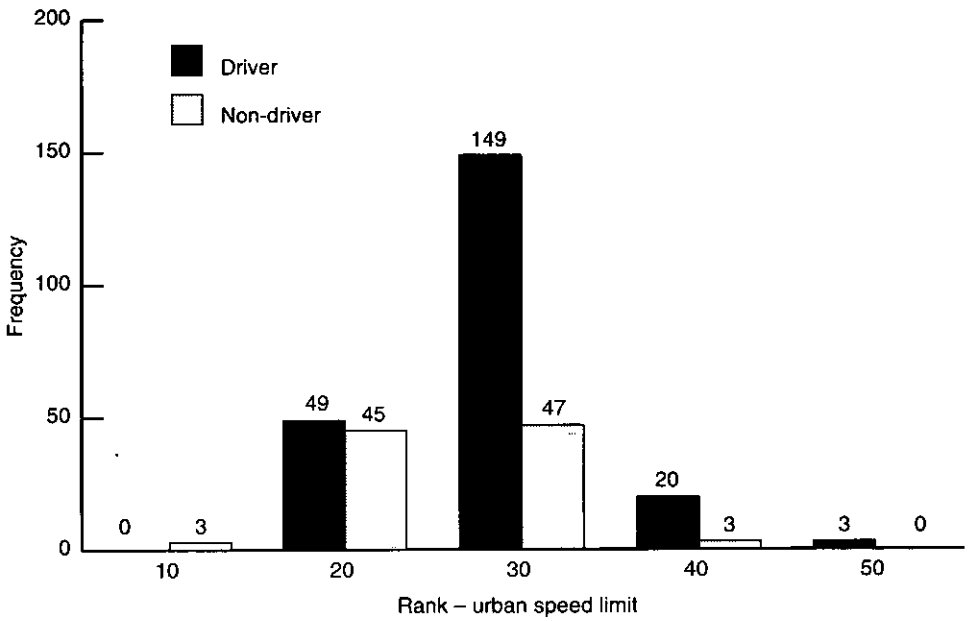
Table 5.7 – Mean ratings and factor correlations for driver behaviours

Factor 1 (Competitiveness) Factor 2 (Drinking)
Factor 3 (Seatbelt awareness)
Ratings – 1 indicates most often, 5 indicates least often

Behaviour	Mean rating	Factor correlations F1	F2	F3
Check that all passengers have fastened their seat-belts	2.04	–.17	.15	**–.76**
Exceed the speed limit when the road is quiet and clear	2.77	**.61**	.19	.03
If you are approaching traffic lights which you think are about to turn red, accelerate to pass them before they change	3.66	**.66**	.13	.08
Take your car when you are going out and know you might be drinking alcohol	4.24	.18	**.85**	–.01
Race other vehicles away from traffic lights	4.42	**.78**	–.05	–.01
If you have taken the car and had a drink, drive it back uncertain whether you might be above the limit	4.50	.06	**.90**	.06
On a short journey, leave your seat-belt unfastened	4.55	–.05	.19	**.79**
Show off a bit by demonstrating your skill at handling the vehicle when driving with friends	4.55	**.74**	.05	.07

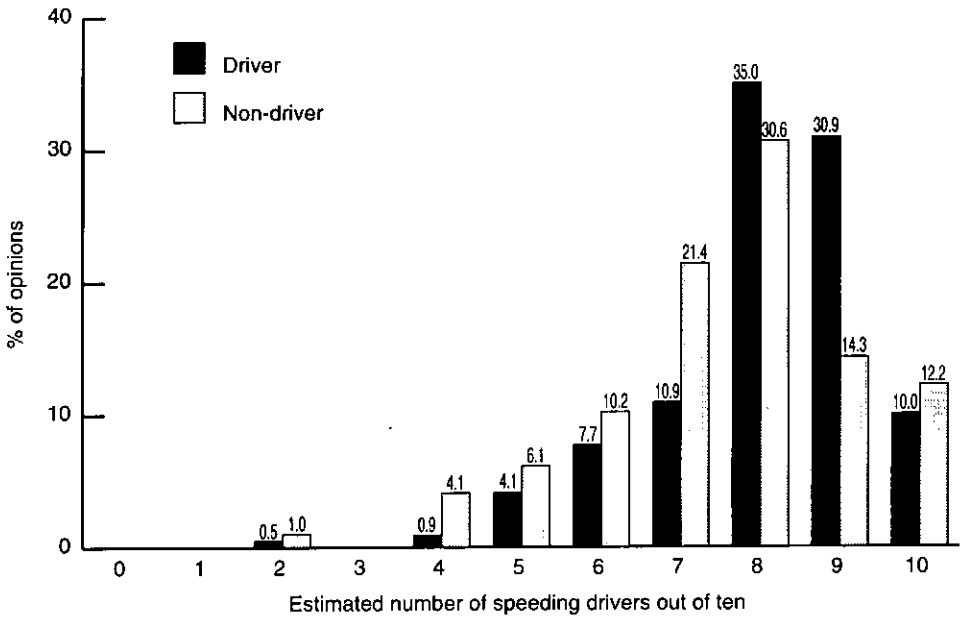
When asked (Q8), drivers are overwhelmingly in favour of 30mph speed limits in urban areas, whereas non-drivers seemed to be equally undecided whether to plump for a 20 or 30mph speed limit. Figure V.4 sets out their responses, according to age, gender and driving status.

Figure V.4 – Preference of urban speed limit according to driver status



Yet at the same time, when enquiry was made (Q9) of the perceived incidence of speeding – and particularly of drivers, who regularly exceeded the 30mph speed limit, it is clear that speeding is a relatively common practice, see Figure V.5. When drivers and non-drivers were asked to estimate just how common, some eighty percent of drivers are reckoned to exceed the speed limit regularly. Moreover, a significant number of drivers (43%), presumably based on their own experience, suggested that as many as nine out of ten drivers, or more, regularly break the speed limit in urban areas.

Figure V.5 – Perceived number of drivers (out of ten) who regularly exceed the urban speed limit, according to driver status



5.3.5 Accident countermeasures

A number of questions were devised to investigate respondents' views about various countermeasures that could be taken to reduce road traffic accidents. These questions attempted to gauge how well the public might accept and favour them as countermeasures.

Initially, participants were presented with a range of accident countermeasures (Q4), and asked to assess how effective these measures were. In measuring ratings of effectiveness (bearing in mind that effectiveness here means people's perceptions of its presumed effectiveness, sometimes in ignorance of the facts), it is self-evident that responses are loaded by other opinion, such as feasibility, which in turn is coloured by opinion of personal and more general acceptance and favourability. Judgements of effectiveness, it can be argued, are thus the best measure of overall opinion.

The set of accident countermeasures were rated for their perceived effectiveness, which produced the ordered countermeasure list set out in Table 5.8. Further grouping by factor analysis reduced these items to five factors:

(a) reduction, restriction of access, of private vehicles
(b) improvement of roads, signs & markings, and pedestrian discipline
(c) focusing on young drivers and pedestrian discipline
(d) against drinking and dangerous driving
(e) restriction of motorway speeds.

These headings summarise what were perceived to be the main effective countermeasures. To see how each question related to each countermeasure factor, specific correlations are set out in Table 5.8. In order to gauge how favourable these countermeasures were to the respondents, they were also asked to rate their feelings on this dimension (Q5). From the data provided by their responses, a margin of favourability measure was calculated as already described in Section 4.4.3.

These measures are shown against those for perceived effectiveness in Table 5.8. In general, they indicate signs of a general pragmatism in that, for the most part, they are closely related to effectiveness ratings.

Table 5.8 – Believed effectiveness of some accident prevention measures (percentage margin of favourability shown in brackets)

Factor 1 (Reduction, restriction of access, of private vehicles)
Factor 2 (Improvement of roads, signs, markings and pedestrian discipline)
Factor 3 (Focusing on young drivers and pedestrian discipline)
Factor 4 (Against drinking and dangerous driving)
Factor 5 (Restriction of motorway speeds)
Higher ratings reflect greater believed effectiveness, figures in brackets are margins of favourability (%)

Accident countermeasure	Mean rating	Item correlations on factors F1	F2	F3	F4	F5
A total ban on drinking and driving	4.33 (74.6)	–.02	.10	.07	**.69**	.20
More severe laws and punishments to deter dangerous driving	4.12 (83.4)	–.19	.25	.22	**.33**	.13
Random breath testing	4.03 (76.2)	.11	–.04	.17	**.59**	–.03
Greater use of warning signs at accident black spots	3.82 (86.2)	.03	**.41**	.07	.05	.04
Introduce more cycle paths and cycle priority lanes	3.72 (76.2)	.21	.23	–.05	.23	–.22
Stronger discipline in the training of drivers and young pedestrians	3.68 (75.9)	.09	**.31**	**.51**	.12	–.05
More stringent driving tests	3.67 (64.9)	.15	.13	**.33**	.17	–.08
Improve main road systems to handle the growing volume of traffic	3.63 (70.5)	–.11	**.42**	.09	.01	.06
Humps in the road (sleeping policemen) to slow vehicles	3.55 (48.6)	**.37**	.12	.05	.08	–.06
Enforce the testing of drivers yearly after the age of sixty five	3.53 (53.0)	.18	.22	.16	.11	.08
Improved and better subsidised public transport	3.50 (73.3)	.30	.11	.10	.03	–.02

Table 5.8 – Believed effectiveness of some accident prevention measures (continued)

Accident countermeasure	Mean rating	Item correlations on factors F1	F2	F3	F4	F5
The fitting of non-skid (anti-lock) brakes to all vehicles	3.45 (65.1)	.11	**.35**	.13	.02	.08
Closure to through traffic in residential areas	3.42 (36.1)	**.34**	.04	.10	.03	–.04
Ban the use of vehicles capable of exceeding the 70 mph speed limit (ensuring that speed limiting devices are fitted)	3.23 (7.2)	.11	.03	.09	.07	**.56**
More frequent marked pedestrian crossing points	3.22 (63.1)	.28	.29	.01	.28	–.00
Reduce the speed limit in residential and shopping areas from 30 to 20 mph	3.20 (28.8)	**.44**	.13	.04	.18	.13
Simplify road designs and make road markings and directions clearer	3.19 (63.5)	.14	**.39**	–.02	.04	–.03
Tougher laws and enforcement against pedestrians who wander or run across main roads, putting themselves and the motorist at risk	3.08 (48.9)	–.07	**.40**	**.45**	.08	.13
Advertising and publicity aimed at correcting the public's failings concerning road safety knowledge and practice	2.88 (50.5)	.15	.25	.25	.01	.08
Restrict drivers under twenty one, or with less than a year's experience, from carrying passengers unless accompanied by a qualified driver	2.79 (7.8)	.30	–.05	**.58**	.05	.16
Raise the legal driving age	2.57 (–6.9)	**.45**	–.05	**.41**	.02	.16
Reduce the maximum speed limit on motorways and dual carriageways from 70 to 60 mph	2.56 (–12.9)	.05	.20	.01	.08	**.62**
Make car use/ownership more difficult and expensive	2.12 (–38.2)	**.50**	–.20	.07	–.01	.16
Ban motorcycles and mopeds	1.80 (–61.1)	**.45**	.04	.03	.12	.08

There can be various effects resulting from the introduction of accident countermeasures. For example, some measures might add several minutes onto a journey. A margin of favourability was calculated for some possible effects of taking accident countermeasures. The results are tabulated in Table 5.9.

Table 5.9 – Favourability of effects of road accident countermeasures

Factor 1 (Potential restrictions on the motorist)
Factor 2 (Inconvenience to the pedestrian)
Higher ratings reflect greater favourability of effects, figures in brackets are margins of favourability (%)

Effect	Mean rating	Factor correlation F1	F2
When it improves traffic flow on main road routes	4.25 (81.8)	.10	.14
When it prevents the motorists from taking short cuts through residential areas to avoid traffic congestion	4.08 (63.3)	**.45**	.09
Slowing down traffic outside your own home	4.07 (68.9)	**.46**	.14
When the measure is experimental and is being tried out in the area	3.55 (43.3)	**.40**	.19
When it makes going by car less convenient than public transport	3.39 (27.6)	**.48**	–.04
When it prevents the motorist stopping to drop someone off or pick them up just where he/she wants	3.39 (24.8)	**.40**	.04
When it causes the addition of several minutes onto your normal journey	3.18 (9.1)	**.47**	.28
When the measure would worsen the established appearance of the location – such as traffic lights distracting from the old fashioned character of a place or parkland being reduced so that a bypass can relieve local congestion	2.93 (–7.5)	**.48**	.14
When it might re-route traffic and reduce business to local traders	2.83 (–15.0)	.23	.34
When the measure would worsen the established appearance of your area – such as traffic lights distracting from the old fashioned character of a place or parkland being reduced so that a bypass can relieve local congestion	2.76 (–20.40)	**.49**	.12
When people have further to walk to bus stops	2.68 (–26.3)	.18	**.60**
When pedestrians have to go out of their way to to cross the road	2.53 (–37.0)	.09	**.74**
When pedestrians are inconvenienced instead of the motorist	2.39 (–43.3)	–.04	**.62**

The effects least favoured appear to be those that involve the greatest inconvenience to the pedestrian, such as taking an extended detour to cross the road. To a lesser extent, many objected to measures that would damage the aesthetic amenities of the neighbourhood, such as using parkland to build a bypass to relieve traffic congestion. Strongly favoured were measures to prevent motorists from cutting through residential areas to avoid traffic congestion, or slowing traffic along residential streets while improving traffic flow on the main routes.

A factor analysis yielded two main factors here, related to (a) potential restrictions on the motorist and (b) inconvenience to the pedestrian with question item correlations provided in Table 5.9.

Given the participants' preoccupations with restrictions on the motorist in residential areas – particularly in relation to speed – questions relating to road humps became especially relevant. Two questions (Qs 6 & 7) focused on this countermeasure for more detailed opinion seeking.

Table 5.10 – The margin of favourability towards road humps in selected locations

Location type	Margin of favourability
Within suburban housing estates	79.0%
On main roads near shops and crossing points	46.7%
In the vicinity of schools	87.1%
On urban residential streets	58.6%

Table 5.10 provides evidence about the margin of perceived favourability of road humps in different kinds of locations. The majority opinion favoured such traffic calming measures in a variety of locations, wherever traffic speeds threatened pedestrians. Further questioning (Q7 i-iv) elicited more specific opinion measures as illustrated in Table 5.11. Positive benefits were seen in terms of general speed reduction and the opportunity of constructing safer pedestrian crossing points. In so far as the jolting of innocent parties and hindering of emergency vehicles were viewed as disadvantages, these, on balance, seemed outweighed by advantages. The notion that road humps present a greater hazard to wilful risk takers (drink drivers, racers or joyriders, for example) found some favour and provided evidence for a marginal attitude of rough justice towards the deliberate violator.

Table 5.11 – The margin of favourability of some suggested attributes of road humps

Attribute	Margin of favourability
Lower speed reduces the severity of accidents	85.5%
The speed of traffic on the road is reduced	77.7%
The amount of traffic on the road could be reduced since through traffic may prefer another route	59.1%
If placed at traffic lights, they would reduce the temptation for drivers to accelerate to beat lights changing to red	58.2%
They can act as pedestrian crossing points if properly marked	42.3%
They can present greater risk to the deliberate risk taker such as the drunk driver, 'racer' or joyrider	19.2%
It takes longer for motorists and passengers to travel through such areas	6.0%
They may increase traffic on alternative routes	–2.8%
They can severely jolt the car if the driver fails to be prepared for them	–12.6%
Passengers in buses may be jolted if the driver crosses too fast	–21.1%
They can cause extra traffic noise (eg bottles rattling as the milkman's lorry crosses or the sound of cars braking/accelerating)	–22.3%
Pedestrians may assume that it is safe to cross among flowing traffic and increase risks	–41.2%
They can hinder emergency vehicles such as Fire/ Police/Ambulance	–64.5%

Given the opportunity to reflect on both the positive and negative effects of road humps, when these effects were spelled out (Q7 ii), they failed to bring about any significant alteration in the respondents' opinion ratings. General feelings of favourability extended to having them installed outside their homes by a margin of favourability of 17.6% although these respondents lived in generally well-used traffic routes. Furthermore, when faced with a question of whether they would actually contribute financially for the installation of such a traffic calming measure, the evidence was affirmative. Of 132 respondents who were in favour of road humps, 127, or 96%, were prepared to accept the possibility that it should be paid for (even if indirectly). Only 17 or 12.9% stated outright that they were unwilling to pay an indirect weekly sum. Whereas it is not plausible that those against this countermeasure would contribute financially, even indirectly, to support their opposition, those who did favour the measure were supportive to the extent of paying £2 per week as a stated median average.

Finally, the question was posed whether participants felt the need for more enforcement of the rules (Q23). Less than four percent responded that levels of enforcement should remain the same as at present, or be reduced.

There appeared to be strong feeling for certain items. Stricter enforcement of drink-driving legislation was supported by 84%, while 87% backed stronger enforcement against driving without a valid licence, and even more respondents, 92%, wanted to clamp down on taking vehicles without consent (see Appendix F). This strong consensus against joyriders matches the rough justice with relation to road humps, mentioned previously. Speeding was another area that provoked a call for stronger countermeasures, although modified by circumstance: 79% of respondents saw the need for enforcement of speed limits in built-up areas, but this number dropped to 58% when applied to speed limits on motorways.

Across the range of countermeasures, specific items were strongly endorsed although enforcement appear to be mitigated by circumstance and a commonsense pragmatism. Three dimensions of description emerged from a factor analysis: related to (a) social responsibility, (b) measures of personal safety and (c) concern with vehicle speed limits. The percentage levels of response to each item and its degree of correlation with each factor dimension are provided in Table 5.12.

Table 5.12 – Concerns about the need for enforcement of traffic laws

Factor 1 (Social responsibility) Factor 2 (Personal safety)
Factor 3 (Vehicle speed limits)
Ratings – 1 indicates need for much more enforcement, 5 indicates need for much less enforcement

Traffic law	Mean rating	Factor correlations F1	F2	F3
Drinking and driving	1.20	.27	.18	.14
Taking a vehicle without the owner's consent	1.31	**.42**	.02	–.04
Driving without a valid licence	1.50	**.58**	.17	.06
Use of a car telephone while driving	1.61	–.05	.11	.25
Seat belt laws for child passengers	1.74	.15	**.63**	.18
Laws requiring motor vehicle drivers/riders to have appropriate insurance	1.79	**.57**	.10	.08
Speed limits in built-up areas	1.83	.18	.09	**.75**
Vehicle roadworthiness	1.83	**.56**	.13	.17
Laws relating to motorists not entering a zebra crossing while pedestrians are crossing	1.92	**.43**	.18	.26
Laws requiring vehicles to signal before a manoeuvre	1.97	**.39**	.23	.13
Laws relating to obeying traffic signals	2.00	**.53**	.21	.21
Driving with undeclared disability	2.00	**.61**	.16	.03
Speed limits on motorways	2.18	.26	.12	**.55**
Seat belt laws for front seat car passengers and drivers	2.21	.21	**.81**	.15
Crash helmet laws for motorcyclists	2.23	**.37**	**.47**	.16

5.4 Perception of the social environment II: attitude clusters

Thus far, evidence has been presented for specific responses to individual questions of the main questionnaire, with some investigation of how specific items in a single question or sets of questions can be grouped under a descriptive labelling after the data have been submitted to factor analysis. These group headings provided tantalising glimpses of more generally prevailing attitudes which characterised our sample of respondents.

At this juncture, a more extensive analysis was undertaken. In order to form such an overview of the main questionnaire and to define more specifically how its different parts interrelated, a different method was adopted. Throughout the analysis so far for each part of the questionnaire, attitudinal factor scores have been used as variables because they were able to elucidate more general descriptions of the individual responses. Here, however, it was necessary to group factors into descriptive sets and *cluster analysis* was appropriate for this function. In other research fields, such as medicine, cluster analysis has proved valuable in showing how symptoms of illness or outcomes from treatment can be interrelated (and for analogous uses in education, see Egan, 1985). In the SAS program, the VARCLUS procedure sorts variables into sets which, in turn, can be used to compare participants in relation to other variables such as age, gender and accident history.

5.4.1 Cluster analysis results

The cluster analysis produced seven groups or clusters of variables from the main questionnaire response data, accounting for 48% of the variance. It is worth noting for those unfamiliar with this technique that these cluster attitudes were derived from the data, rather than being imposed although some labelling is inevitable. To provide some preliminary labelling of this second-order analysis, the clusters of variables are listed below:

1) order oriented: rule directed, law abiding, and concern for a well-ordered environment.

2) community oriented: concerned for the fabric of society and the environment.

3) youth oriented: shares the concerns of youth, anything goes outlook.

4) self oriented: selfish, everyone for themselves, anarchic, kicking against social constraints of order and discipline.

5) unconcerned: disengaged, little or no concern with social issues compared with immediate needs, does not know and/or does not care.

6) convenience oriented.

7) safety oriented.

Further details of the Varclus cluster results are given in Table 5.13.

Table 5.13 – Cluster analysis of factor scores within the main questionnaire

Cluster 1: Order oriented
Cluster 2: Community oriented
Cluster 3: Youth oriented
Cluster 4: Self oriented
Cluster 5: Unconcerned
Cluster 6: Convenience oriented
Cluster 7: Safety oriented

Correlation refers to the correlation of the item with the central component of its cluster.

MQ number refers to item on Main Questionnaire, F refers to factors.

Cluster 1	**Correlation**	**Order oriented**
MQ1/F1	0.62	Concern over antisocial behaviour.
MQ3/F3	0.61	Rates slips and errors highly as major cause of accidents.
MQ4/F2	0.84	Rates road improvements, signs markings, vehicles or pedestrian discipline, effective as countermeasures.
MQ5/F3	–0.76	Tends to be more in favour of road discipline, design and markings measures.
Cluster 2	**Correlation**	**Community oriented**
MQ1/F2	0.63	Concern over social and ecological issues.
MQ4/F1	0.62	Considers restricting private vehicles and their access an effective approach.
MQ5/F4	–0.76	Favours stricter anti-alcohol measures, more severe laws and punishments.
MQ22/F1	0.64	Tolerates or favours accident countermeasures inconveniencing the private motorists.
MQ7I/F2	–0.64	Does not play down positive aspects of road humps.
Cluster 3	**Correlation**	**Youth oriented**
MQ23/F1	0.63	Shows bias against more enforcement of social responsibility issues.
MQ4/F3	–0.83	Does not consider targeting young drivers and careless pedestrians an effective approach.
MQ5/F1	0.86	Does not favour restricting young drivers.
Cluster 4	**Correlation**	**Self oriented**
MQ4/F4	–0.46	Does not suggest anti-alcohol measures and more severe deterrents and punishments.
MQ3/F1	–0.64	Global/external factors seen as relatively unimportant causes of accidents (eg policy, traffic).
MQ5/F2	0.76	Is against reducing speed limits.
MQ7I/F1	0.46	Focuses upon negative aspects of road humps.
MQ23/F3	0.70	Does not favour increased enforcements of speed limits.

Table 5.13 – Cluster analysis of factor scores within the main questionnaire (continued)

Cluster 5	Correlation	Unconcerned
MQ4/F5	–0.50	Does not consider reducing motorway speeds and fitting speed limiting devices effective ways of reducing accidents.
MQ16/F2	0.62	Does not tend to consider social effect in choice of transport (eg to demonstrate success or encourage friends).
MQ23/F2	0.73	Does not tend to recommend more enforcement of personal protection measures (eg seat belts).
MQ3/F2	–0.64	Does not feel that violating and stupidity is a major cause of accidents.
Cluster 6	**Correlation**	**Convenience oriented**
MQ16/F3	1.00	Is not strongly influenced by forces of convenience in transport preference.
Cluster 7	**Correlation**	**Safety oriented**
MQ22/F2	0.72	Tends not to mind inconveniencing the pedestrians.
MQ16/F1	0.72	Does not consider risk of injury in transport preference.

5.4.2 Attitudes of mind: cluster analysis of factor scores and their intercorrelations

These cluster patterns of respondents' attitudes can be more extensively defined by setting out their main characteristics as revealed by analysis, which is reported in Table 5.14 and by observing their intercorrelations.

Table 5.14 – Main questionnaire cluster correlations

Cluster 1: Order oriented
Cluster 2: Community oriented
Cluster 3: Youth oriented
Cluster 4: Self oriented
Cluster 5: Unconcerned
Cluster 6: Convenience oriented
Cluster 7: Safety oriented

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Cluster 2	.09 ns					
Cluster 3	–.37 p<.0001	–.17 p<.01				
Cluster 4	–.22 p<.0001	–.46 p<.0001	.29 p<.0001			
Cluster 5	–.33 p<.0001	–.00 ns	.33 p<.0001	.33 p<.0001		
Cluster 6	.02 ns	.08 ns	.01 ns	–.08 ns	–.05 ns	
Cluster 7	–.07 ns	–.09 ns	.06 ns	.08 ns	–.07 ns	–.00 ns

Individuals scoring higher on cluster 1 (order oriented) tended to be more in favour of road discipline, and the perceptual directives provided by road signs and markings. They regard improvements in these road indicators, together with the better discipline of vehicles and pedestrians, as effective countermeasures to accidents. Accidents themselves are viewed as being caused predominantly by slips and errors of behaviour – rather than wilfully committed. Thus, in this ordered context, anti-social behaviour is perceived as threatening.

This cluster correlated negatively with the three others – youth oriented ($r = -0.37$, $p<0.0001$), self oriented ($r = -0.22$, $p<0.0001$), and with the unconcerned ($r = -0.33$, $p<0.0001$).

Those who scored higher on cluster 2 (community oriented) showed concern about social and ecological issues. They view the restriction of vehicles and their access as effective so that any accident countermeasure that necessarily inconveniences the private motorist would be accepted in a positive frame of mind. The introduction of road humps, therefore, is seen as a necessary imposition with a beneficial outcome. Similarly, for the good of the community and the environment, stricter laws against drink-driving and more severe laws and punishments would meet approval. This cluster correlated negatively with youth-oriented ($r = -0.17$, $p<0.01$) and self-oriented ($r = -0.46$, $p<0.0001$).

Cluster 3 (youth oriented) is characterised by attributes which show them to be against stronger law enforcement of any issue that demands greater social responsibility. They do not favour further restrictions on the young, nor consider targeting the young, whether they be drivers or pedestrians, as effective measures to reduce road traffic accidents. This cluster orientation associates positively with those for the self oriented group ($r = 0.29$, $p<0.0001$) and with that labelled unconcerned ($r = 0.33$, $p<0.0001$).

People with higher scores on cluster 4 (self oriented) tend to be averse to any measures involving the banning of alcohol and the setting up of deterrents backed by severe punishments. They tend to disregard the role of external factors, such as traffic density and policy making, as having any significant influence upon accident reduction. They see little point in reducing speed limits or the stronger enforcement of the existing limits, and view road humps negatively as an impediment to motoring, rather than as a safety factor. This cluster correlates positively with that for unconcerned ($r = 0.33$, $p<0.0001$) and negatively with that for order oriented ($r = -0.22$, $p<0.0001$) and community oriented ($r = -0.46$, $p<0.0001$).

Higher scores on cluster 5 (unconcerned) shows little or no concern about social issues, other than immediate requirements. By opting out, they do not appear to support any positive steps to alleviate traffic accidents. The attitude of mind is characterised by not thinking that reducing motorway speeds or other methods of limiting driving speeds would have any effect in alleviating the accident rate. They have no definite views, one way or another, on the social implications of different modes of transport. Nor is there much awareness of effective safety measures, such as recommending and the enforcement of seatbelt use. They do not regard violations or stupidity as a major cause of accidents. This cluster may reflect the individual's view that experience and ability are more important than other factors.

It is not surprising, perhaps, that this cluster is characterised by correlating negatively with that labelled order oriented ($r = -0.33$, $p<0.0001$) and positively with those labelled youth oriented ($r = 0.33$, $p<0.0001$) and self oriented ($r = 0.33$, $p<0.0001$).

The two remaining clusters are relatively smaller than the previous ones and of less importance. They have been labelled as convenience oriented, Cluster 6, and safety oriented, Cluster 7, and are dealt with together. Considerations, which make up these groupings, consist of whether a person considers the possibility of risk or injury in their choice of transport, or whether convenience influences that choice, or whether it is of concern that the pedestrian is inconvenienced. Neither cluster correlates with any other of the attitudes of mind set out above.

The particular results, based on these two clusters, suggest two general conclusions. The first is that the perception of risk (here interpreted as the chances of being involved in an accident) is not a main component in the way people regard the road situation. Secondly, the attitudes of mind expressed here are relatively independent of the influences of convenience upon behaviour.

5.4.3 Attitude of mind, age, gender and driving status

The cluster sets from analysis of the main questionnaire were further investigated by a correlational investigation of the association between cluster scores and other variables, exploring their potential relationships with characteristics such as age, gender, possession of a driving licence, and previous accident history since the SAS program allowed for each respondent to be scored on each cluster grouping, which will be dealt with in turn.

Cluster 1 (order oriented) correlated with age ($r = 0.23$, $p<0.0001$) implying that this attitude is more prevalent in older respondents, and correlated positively with gender, being an attitude associating more with women than men ($r = 0.25$, $p<0.0001$). A positive correlation with driving status ($r = 0.27$, $p<0.0001$) indicated that non-drivers score higher on this order oriented approach.

Cluster 2 (community oriented) correlated moderately with gender ($r = 0.11$, $p<0.05$), suggesting that women tend to score more highly on this attitude of mind.

Cluster 3 (youth oriented) unsurprisingly correlated negatively with age ($r = -0.31$, $p<0.0001$) with younger respondents scoring more highly, but also slightly negatively with gender, indicating that women are somewhat less likely to have this attitude of mind ($r = -0.12$, $p<0.05$). Scores on this cluster were also negatively correlated with driver status, showing that drivers score higher on this dimension ($r = -0.24$, $p<0.0001$).

Cluster 4 (self oriented) correlation indicated that younger people tend to score higher than their elders since it is negatively associated with age ($r = -0.30$, $p<0.0001$), and particularly so if they are men in that their scores are higher than those for women ($r = -0.1589$, $p<0.01$). A further negative correlation shows drivers scoring more than non-drivers ($r = 0.41$, $p<0.0001$).

Cluster 5 (unconcerned) correlates with age, showing younger respondents scored higher than older respondents ($r = -0.19$, $p<0.0001$) and these high scores characterising men rather than women ($r = -0.24$, $p<0.0001$), and drivers over non-drivers ($r = 0.24$, $p<0.0001$). In this case, cluster 5 correlates positively with the number of miles that those respondents with a licence had driven ($r = 0.21$, $p<0.0001$). The intercorrelation of this cluster with those of cluster 3 (youth oriented) ($r = 0.33$, $p<0.0001$) and cluster 4 (self oriented) ($r = 0.33$, $p<0.0001$) leads to the interpretation that young male respondents predominantly do not associate wilful and violating behaviour directly with the consequences of road traffic accidents.

The forces of habit occurred in both the remaining two attitude clusters. Driven annual mileage correlated negatively with cluster 6 (convenience oriented) to indicate that the forces of habit operate in that greater mileage driven predisposed a person to rate convenience more highly in the choice of transport. Cluster 7 (safety oriented), which was defined as giving less importance to considerations of risk, correlates negatively with both age ($r = -0.15$, $p<0.01$) and driver status ($r = -18$, $p<0.002$). Older drivers are less likely to take consideration of risk or injury into account when opting for transport.

5.4.4 Attitudes of mind and accident involvement

A follow up analysis investigated whether any of the attitudes, outlined above, related to the respondents' reported accidents in the previous five years.

The cluster scores revealed no correlations with accident involvement for men, but the case for women yielded a different outcome where there was a positive correlation between accidents and cluster 4 scores. That is for those women scoring more highly on the self oriented cluster, a significant relationship with self reported accidents was found. Also women drivers who had reported being involved in a road traffic accident in recent years showed that they were alert to the possibilities of injury in their choice of transport. This is indicated by the negative correlation ($r = -0.32$, $p<0.002$) of accidents with cluster 7 (safety oriented).

5.5 Attitudes of mind and driving behaviour

For the sample of drivers that were interviewed, one particular question was selected from the main questionnaire (Q9: How much risk do drivers take?) to correlate with their attitude cluster scores. Table 5.15 sets out the correlations between these two measures. Three factors emerged for driver behaviour, based on how drivers responded to this question:
(a) competitiveness; (b) proneness to drink; and (c) seatbelt awareness.

Table 5.15 – Correlation of driver behaviour factors with driver characteristics and cluster scores

Factor 1 (Competitiveness) Factor 2 (Proneness to drink)
Factor 3 (Seatbelt awareness)
Higher factor scores relate to less of the typified behaviour.

	F1	F2	F3
Age	.39 p<.0001	–.08 ns	.03 ns
Gender	.08 ns	.24 p<.001	.19 p<.01
Accidents	–.14 p<.06	.02 ns	–.07 ns
Annual mileage	–.10 ns	–.23 p<.002	–.02 ns
Cluster 1	.16 p<.03	.06 ns	.11 ns
Cluster 2	.20 p<.01	.02 ns	.15 p<.05
Cluster 3	–.24 p<.001	–.17 p<.02	–.11 ns
Cluster 4	–.28 p<.0001	–.13 ns	–.13 ns
Cluster 5	.00 ns	–.19 p<.01	–.08 ns
Cluster 6	.18 p<.02	.09 ns	–.07 ns
Cluster 7	–.11 ns	.04 ns	–.03 ns

In the scoring system employed, a low score indicated a greater measure of that behaviour type and so the correlations set out in Table 5.15 must be interpreted accordingly. Younger respondents reported that they were more competitive. Men were more likely than women to drink and drive and were less conscientious about using seatbelts.

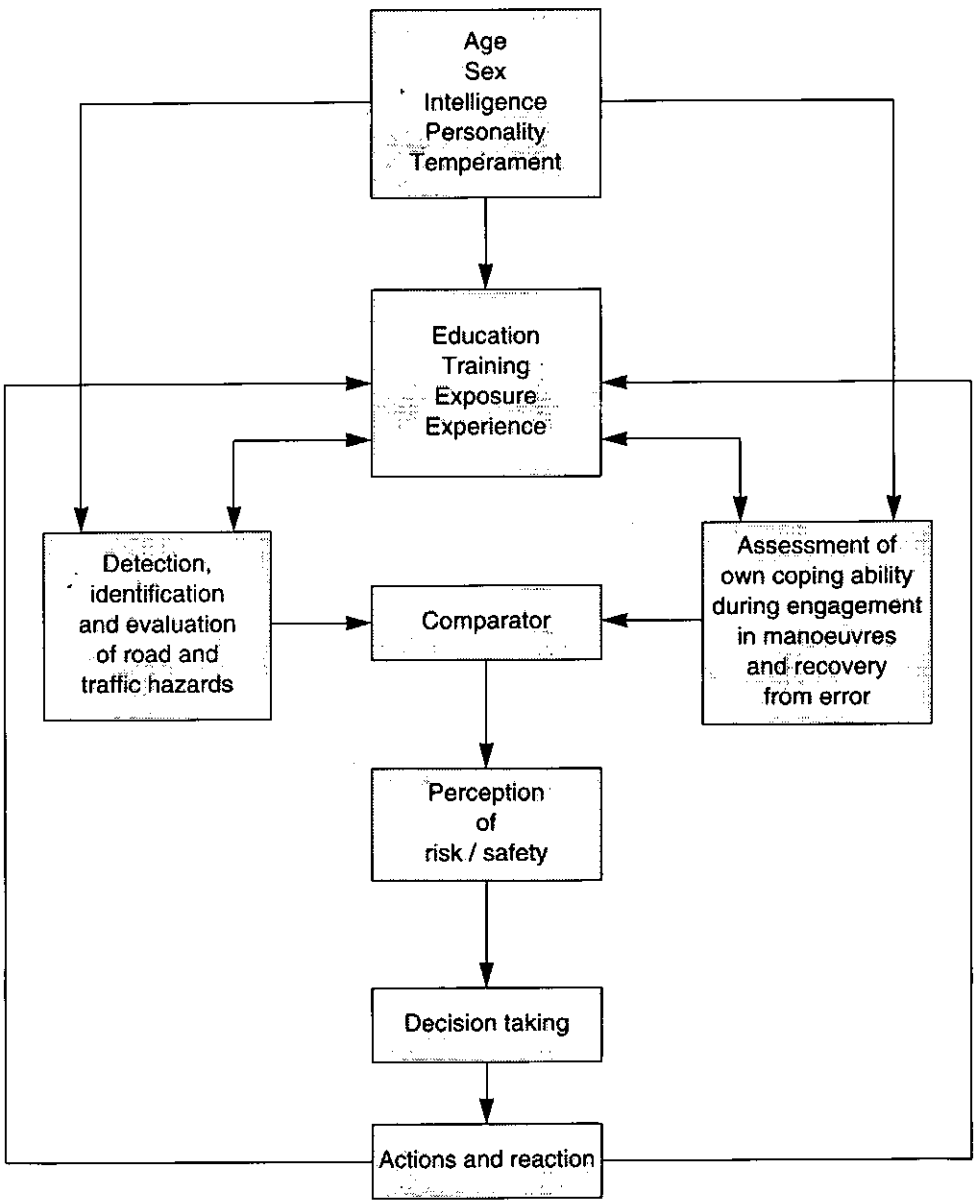
More competitive driving behaviour tended to be associated with accidents and with cluster 3 (youth oriented) and cluster 4 (self oriented) dispositions. Those reporting a higher mileage driven were more likely to use their vehicles after having a drink, and this was also the case for those scoring more highly on cluster 5 (unconcerned); these were respondents, incidentally, who considered that violations and stupidity had little influence on road traffic accidents. The positive correlation between cluster 6 (convenience oriented) and Factor 1 (competitiveness in drivers) revealed the tenuous link between describing behaviour, such as red light running, as either competitive or convenient. It may equally reflect lack of self-discipline or control.

6 Linking risk perception, attitudes and accidents

6.1 Subjective safety

Having thus far considered the data on perception of risk and the holding of attitudes separately, we now move on to the more complex and speculative task of integrating these two areas. To do so it is necessary to have a framework in mind and Brown (1989, 1991) has recently put forward a model of subjective safety that is sufficiently comprehensive to use for this purpose (see Figure VI.1). His analysis of the interaction of contributory factors in primary and secondary safety provides a clear basis for the discussion of our approach, summarised in the competition model of road user behaviour in Chapter 8.

Figure VI.1 – Brown's model of subjective safety



Three aspects of Figure VI.1 are now developed in relation to other evidence, leading to further analysis of results in Section 6.2.

(a) separation of exposure and experience, considered below, from education and training which relates more to the changing of attitudes, the focus of the next chapter;

(b) distinguishing between awareness of risk and subsequent report by participants after the event; and

(c) ways in which the comparator can be overridden.

6.1.1 Exposure and Experience

For drivers it is commonly assumed that the frequency of encountering hazards increases linearly with the number of miles driven and such figures can be related to national statistics eg the Department of Transport's Index of Vehicle Mileage. It must be noted, however, that this is a very broad generalisation, as not all miles driven are the same; type of road, frequency of junction, day/night and many other factors also influence risk. For pedestrians, exposure is even more difficult to quantify. A 6m walk across a road can involve substantially more risk than a 6km walk alongside it! (The problem of quantifying pedestrian exposure is the subject of a current study supported by the AA Foundation for Road Safety Research.)

Errors may also emerge from a complex interaction of physical and human factors. Locations can give rise to perceptual distortions; some may cause the driver to overestimate risk and drive well within safety limits, whereas others look deceptively straightforward. Individuals can more or less seek out risk in their behaviour on the road and this tendency will affect the margin for error. At one extreme are drivers who commit wilful violations "involving a definite risk to others" (Reason *et al*, 1990) and joyriders are the obvious example. However, global errors of judgement, such as failure to yield to other road users in familiar situations, are a major cause of accidents involving adult drivers and riders, as well as adult and child pedestrians, according to Carsten, Tight, Southwell and Blows (1989). Similar considerations operate for pedestrians although, because of the unequal momentum between person and vehicle, their risk of direct personal injury by making hazardous judgements is much greater, eg crossing the road between a slight gap in the traffic. Three groups of pedestrians have been identified as especially vulnerable (a) the elderly because of the time taken to cross the road (b) intoxicated pedestrians since they are unable to make the requisite judgement of speed and distance and (c) children, as their attention is often focused elsewhere, and they may overestimate their visibility to others.

6.1.2 Awareness, assessment and self-report

Lourens (1990) believes that risk assessment should be viewed as self-report of a person's knowledge state but this presupposes a high degree of self-awareness. Moreover, the time interval elapsing between the initial awareness of the event itself and subsequent elements of assessment creates more difficulties of interpretation as the period increases.

There is good evidence for not accepting these retrospective judgements at face value. The meaning derived and the reasons advanced after an event relate as much to the expectation of what should have happened and what was intended as to the actual circumstances. Even when there is no direct emotional involvement, it is notoriously difficult to recollect accurately (ie not biased by knowledge of the outcome) from a pre-outcome state – see Fischoff's (1977) study of the knew-it-all-along effect and the series of experiments by Loftus using traffic contexts, the memory for which can be biased by post-event questioning (Loftus, 1979).

Apart from errors, there are issues as to whether individuals may be asked to report more than they know about their complex cognitive processes (Nisbett and Wilson, 1977). Furthermore, Jones and Nisbett (1971) uncovered an important difference in the way people explain events that happen to them as opposed to others. Happenings to others tend to be attributed to their motives and carry responsibility (risk taking, carelessness) whereas the role of external circumstances (unpredictable events, temporary aberration) is emphasised more in relation to oneself. The more serious the outcome, the more demanding the need to shift blame. Thus Hale and Glendon (1987) emphasised that attribution for accidents to others may depend on the extent of possible involvement by the observer. In specifying causation there are usually ways of avoiding criticism oneself and it may seem necessary to establish a difference from the other person and to stress the salience of that difference. Drivers who are "at fault" are therefore unlikely to focus on the same characteristics as "blameless" witnesses and, in particular, it may well be the norm in accidents to find fault in the perpetrator or victim for the purposes of self-reassurance, let alone in order to try and avoid other negative consequences.

6.1.3 Overriding rational assessment

It is flattering to assume that decision-making on the road is the product of rational processes and Brown's model presents a plausible logical sequence. He does also accept that training "may be overridden by competing demands, such as those arising from trip motivation or the desire to behave at a higher target level of risk" (Brown, 1991, p.328), and presumably this takes place by distorting the process carried out by the comparator (Figure VI.1). This distortion will vary according to actual requirements, real or self-generated, from extreme emergency to casual convenience. Attitude to other road users is likely to play a contributory role in setting the parameters for the comparator, except in the most extreme cases.

Our analysis suggests that other non-rational factors can predominate in the sense that assessment of dominance and submission relationships occur and in the absence of clear cues to resolve the ambiguity, the outcome can be failure to yield which in many instances (Carsten *et al*, 1989) leads to accidents.

A brief example from the field of animal behaviour is provocative. As part of their study of asymmetric contests, Maynard-Smith and Parker (1976) consider separately the information acquired immediately before (sizing up) and that acquired during a contest. In asymmetric contests a clear cue beforehand, such as size difference, will normally avoid any escalation.

However, if the two contestants are evenly matched, their model predicts that 28% of the individuals retreat after one round but 72% will continue for four rounds. Empirical evidence that generally supports this analysis can be found in several species. In red deer, roaring contests between males seldom occur between unequal competitors and escalation to the parallel walks that precede fighting are significantly more frequent between well-matched opponents (Clutton-Brock and Albon, 1979). Lazarus (1982) raises a further consideration to the general rule of giving way if in the weaker position, namely that the system is vulnerable to cheating. Individuals can benefit by trying to signal a more dominant position than they actually possess. Many animal displays prior to fighting (eg erecting hair) would fit such a purpose.

To elaborate the analogy to the road environment, let us consider the interactions between (a) drivers only and (b) drivers and pedestrians. Though Carsten *et al* (1989) report only a low level of attitudinal error contributing to the accidents they investigated, this obscures the attitudinal implications in choices such as speed and tailgating. Driving too fast was implicated in 29% of accidents and was typical of those involving younger drivers. As shown in Table 5.7, exceeding the speed limit is a symptom of competitiveness. Competitive behaviour could similarly be implicated in failure to yield which accounted for 16% of the factors they coded for adult drivers and riders. In addition, there is a frequently observed tendency for drivers to pose a threat to pedestrians about to use a designated crossing, ie where the balance of priority is unclear or more likely rather in the pedestrian's favour, thus illustrating Lazarus' point.

In Section 4.2.4 the discussion of major effects on mean standard risk ratings distinguishes between the extent of competition and the complexity of the road environment. The former measure accounts for a large proportion of the perceived risk and can be interpreted as drivers' apprehension that some form of escalation may occur. Thus re-design of particular sites from this standpoint deserves serious consideration. More specifically, competitiveness can be shown to vary with attitude. Table 5.15 shows lower competitiveness with increasing age and with greater social and ecological concern. On the other hand, there is a higher level of competitiveness among those who are more youth oriented and more self oriented.

6.2 Illustrative linking of drive, attitude and accident data

From this study, three examples have been chosen from the many combinations of the locations and attitudes sampled so as to show how the detailed statistical analyses that can be implemented using the SAS package help to specify further the interactions discussed above (see Appendix I – technical annexes to this report for additional information).

6.2.1 Attitude cluster scores and risk ratings for specific sites

The analysis of risk ratings suggested that participants used perceived difficulty as a heuristic for providing these ratings. By considering measures of road design and competing traffic at particular locations, it can be argued that the hierarchy of dominance thus produced operates so as to

devolve difficulty and responsibility onto the road user in the most subordinate position, such as the driver turning right from a side road onto a busy main road. It is often the case that rough heuristics are sufficient for decision making. They have the advantage of utilising cues that can be immediately recognised. However, people are limited in their ability to predict change. Take the case of the motorists following too closely. Not only do they believe they can react abruptly when necessary but those in front are judged as unlikely to vary their speed or direction. Since individuals differ in their feeling of certainty about assessing the hazards on the road, they may seek different solutions. The less confident may rely on and request more rules (linked to cluster 1, order-oriented) while others may adopt a more dissociated pattern of behaviour, being sensitive to others only in the most obvious instances, such as a busy or complex roundabout system (linked to cluster 5, unconcerned).

A cross comparison between attitude cluster scores and site risk ratings reveals examples of these patterns. Thus the drivers favouring an orderly environment (cluster 1) give significantly higher risk ratings than others to narrow bending roads crossing small bridges. These drivers contrast with the more youth oriented (cluster 3) and they seem also more threatened by the unpredictability of others, eg the possibility of someone turning right across their path, whereas those strongly youth oriented appear more confident of others' intentions. Cluster 2 (community oriented) scores correlate negatively with cluster 4 (self oriented) scores with the former more concerned about risks at crossroads in residential areas and more in favour of traffic calming and restriction.

The relationships apparent in the overall data encouraged us to undertake a more detailed analysis of the northern part of the route (driven by all volunteers) that is reported below.

6.2.2 Location cluster scores and attitude cluster scores

Since all of the drive volunteers completed the north loop of the route, their general risk ratings for these locations (1 – 25) were subjected to a cluster analysis. This allowed an unbiased check as to whether there were risk perceptions or associations common to sets of locations. A strong correlation emerged between the risk ratings for all twenty five locations so that a single cluster accounted for 47% of the variance. The cluster programme, however, produced further divisions into three clusters. These accounted for 58% of the variance in total although they were strongly correlated with each other.

The location cluster content is shown in Table 6.1. Location cluster 1 contains six locations that may simply be described as stretches without manoeuvre complications. Location cluster 2 contains fourteen locations that are more complex and comprise roundabouts, right turns, signal controlled areas and a motorway merge. Location cluster 3 contains five locations, including left turns with poor sight lines and the two narrow bridges.

Table 6.1 – Location clustering of north route drive locations

Location	Correlation*	Description: Stretches
Location Cluster 1		
9	0.79	Christon Rd stretch
11	0.83	Hollywood Avenue stretch
15	0.84	Haddricks Mill stretch
17	0.72	Freeman Rd stretch
18	0.89	Dovedale Gardens stretch
23	0.83	Sandyford Rd stretch
Location Cluster 2		
Location	Correlation*	Description: Roundabouts, right turns, lights controlled areas and motorway merge
1	0.71	Barrass Bridge roundabout
2	0.70	North Rd (Forsyth Rd traffic lights)
3	0.67	Blue House roundabout
4	0.70	Gosforth High Street
5	0.72	Gosforth High St/Church Rd T-junction
10	0.72	Asda roundabout
13	0.64	Salters Lane right turn
14	0.74	South Gosforth double roundabout
19	0.71	Right turn into Benton Rd
20	0.81	Benton/Etherstone Rd roundabout
21	0.71	Corner House Crossroads
22	0.76	Jesmond Rd (Cradlewell)
24	0.71	Jesmond double roundabout
25	0.72	Merging with southbound motorway
Location Cluster 3		
Location	Correlation*	Description: Left turns and narrow bridges
6	0.83	Left turn into Hyde Terrace
7	0.82	Left turn into Beaumont Terrace
8	0.83	Left from Wolverton Terrace into Christon Rd
12	0.80	Salters Bridge
16	0.78	Castle Farm Bridge

**Note: Correlation onto principal component of cluster.*

The drivers' risk ratings were then used to generate their individual scores on the three location clusters. There were no significant correlations between cluster scores and age, gender or accident history. Location cluster 2 was correlated positively ($r = 0.21$, $p<0.06$) with attitude cluster 5 (unconcerned) and with attitude cluster 1 (order oriented).

Because of the high correlation between drive location clusters, their correlations with other variables were investigated in turn by partialling out the effects from the other two in order to derive the unique contribution from each cluster as follows:

(a) Location cluster 1 was positively correlated with age ($r = 0.33$, $p<0.04$), suggesting that older drivers were more aware of risks on simple stretches (and perhaps less inclined to speed there).

Attitude cluster 4 (self oriented) was negatively correlated,($r = -0.25$, $p<0.04$) indicating the opposite effect for this group. Gender also correlated negatively ($r = -0.31$, $p<0.01$) which shows that women considered stretches less risky than men. However, caution is necessary in interpretation here because of the small numbers of older women participating in the drives.

(b) Location cluster 2 scores correlated negatively with age ($r = -0.23$, $p<0.06$), negatively ($r = -0.30$, $p<0.02$) with attitude cluster 1 (order oriented) and positively ($r = 0.29$, $p<0.02$) with attitude cluster 5 (unconcerned). Thus order oriented individuals tended to consider these locations less risky, whereas those who considered safety as more related to skill and experience perceived them as relatively more risky, suggesting they are more involved by obvious environmental demands.

(c) Location cluster 3 scores correlated positively ($r = 0.37$, $p<0.002$) with attitude cluster 1 (order oriented) and negatively ($r = -0.25$, $p<0.04$) with attitude cluster 3 (youth oriented). The former correlation can be seen as linking preference for external control with the rating of risk in locations where there is a requirement for the individual to negotiate right of way with other road users. The order oriented group feel this negotiation to be uncertain because of the lack of clear rules. In contrast the youth oriented experience no such difficulty. Attitudinal measures are thus shown to have significant links to risk ratings elicited by different drive locations. Younger and more self oriented individuals perceive less risk in locations such as stretches, left turns with poor sight lines and narrow bridges. Order oriented individuals perceive greater risk in the left turns/narrow bridge category but less risk than others in more complex locations associated with the highest number of accidents. Those who are unconcerned see greater risk in these same locations that are obvious sources of conflict and competition between traffic. Although the accident data collected from participants failed to show any significant relationship between risk perception and accident involvement, it should be borne in mind that this study, like many others, did not collect and code data relating accidents to specific circumstances and environments. Information on accident totals alone is insufficient if there are differences between individuals in the assessment of risk in different types of road environment.

6.2.3 Cluster scores, age and accidents among drivers and non-drivers

The analysis of factor scores reported in the last chapter revealed significant differences between the attitudes of drivers and non-drivers on all the major clusters as follows:

Compared with drivers, non-drivers significantly

Cluster 1	prefer a more ordered environment
2	are more community oriented
3	are less youth oriented
4	show less self orientation
5	are more concerned about accident causation

Other outcomes are not surprising, eg differences for clusters 6 and 7 where non-drivers could be more easily inconvenienced and are more vulnerable than drivers. Overall, however, these attitudes reflect the effects of very different experience as a pedestrian as compared with being a driver.

Accident involvement correlated positively with annual mileage ($r = 0.27$, $p < 0.0001$) and negatively with age ($r = -0.21$, $p < 0.002$). For females only accidents were significantly correlated with cluster 4 (self oriented) scores and, unlike males, their accidents were not so clearly related to annual mileage. The lack of a clear attitudinal link in the case of males may imply other more potent factors combine in producing their rule-breaking.

There were, however, strong age-related trends in cluster scores which parallel accident involvement. Table 6.2 shows the data in terms of mean scores for drivers and (in brackets) non-drivers. Drivers between 17-24 were less concerned with community issues and more self-oriented in attitude than any other age group. They were also more than twice as likely to have been involved in an accident in the previous five years than drivers aged over 35. Their accident history was similar to drivers between 25-34 even though their annual mileage was much lower. As will now be apparent, the differing relationships between measured attitudes, gender and age influences and their potential effects on behaviour are difficult to disentangle and our analysis has to remain tentative. However, we are clear that different appeals to safety should be considered for different groups. But this is less than straightforward as competitive behaviour, for example, may be a veneer for uncontrolled or convenient actions that increase risk for road users in general.

Table 6.2 – Cluster scores by age for drivers and non-drivers

Age	Clus. 1	Clus. 2	Clus. 3	Clus. 4	Clus. 5	Clus. 6	Clus. 7
17-24	–0.25	–0.52	0.54	0.61	0.08	0.00	0.26
	(–.20)	(.02)	(.51)	(–.11)	(–.23)	(.12)	(–.05)
25-34	–0.45	0.16	0.29	0.31	0.34	–0.24	0.12
	(.21)	(.14)	(–.05)	(–.48)	(.12)	(.28)	(–.15)
35-44	0.04	0.10	0.01	0.11	0.14	0.03	0.10
	(.58)	(.39)	(–.53)	(–.69)	(–.20)	(.60)	(–.08)
45-54	–0.16	0.03	0.19	0.17	0.21	0.00	0.13
	(.45)	(.52)	(–.61)	(–.45)	(–.09)	(.02)	(–.18)
55-64	0.08	–0.18	0.16	0.02	0.04	–0.31	–0.16
	(.51)	(.03)	(–.34)	(–.51)	(–.57)	(–.28)	(–.13)
65+	0.09	–0.19	–0.22	–0.05	–0.17	0.15	0.13
	(.21)	(.01)	(–.35)	(–.63)	(–.28)	(.31)	(–.57)

7 Changing attitudes

7.1 Overview of countermeasures

The two most important influences on people's attitudes to road safety countermeasures are, (a) how effective they believe they will be in improving road safety and, (b) what personal costs will be incurred as a result of their implementation. The main questionnaire shows the influence of both these variables. Respondents tended to be more in favour of the countermeasures that they perceived as being most effective.
This relationship is most clearly shown by the fact that the five items that were considered least effective in improving road safety were also the five items that were least favoured (they were even ranked in the same order, see Appendix F).

7.1.1 Favourability v Effectiveness

The effects of perceived personal costs were also evident. When the items are ranked in order of perceived effectiveness and also in order of favourability towards them, then the discrepancy between these respective rankings becomes apparent. Table 7.1 shows the four items which showed the largest discrepancy in being ranked as relatively more effective than favourable. These items involve higher levels of personal cost, in terms of dimensions, such as reduced choice, increased journey times or inconvenience.

Table 7.1 – Items ranked as more effective than favourable

Ranking	Countermeasure	Extent of Discrepancy
1	Road humps (sleeping policeman)	–6
2	Ban the use of vehicles capable of exceeding the 70 mph speed limit	–5
3.5	Closure to through traffic in residential areas	–3
3.5	Enforce the testing of drivers yearly after the age of 65	–3

Table 7.2 displays the four items that were ranked as relatively more favoured than effective. The items that were ranked higher in terms of favourability than effectiveness carry little direct personal cost to the respondent. The only apparent cost would be an increase in government spending, hence taxation, and they result in many benefits other than improved road safety, (eg improved and better subsidised public transport).

Table 7.2 – Items ranked as more favourable than effective

Ranking	Countermeasure	Extent of Discrepancy
1	Improved and better subsidised public transport	+7
2	Simplify road designs and make road markings and directions clearer	+5.5
3	Advertising and publicity aimed at correcting the publics failings concerning road safety knowledge	+5
4	More frequently marked pedestrian crossing points	+3.5

Encouragement can be drawn from the high favourability scores given to many countermeasures. The mean scores of favourability for countermeasures were higher than those for effectiveness, on all but one item (the exception being 'Ban the use of vehicles capable of exceeding the 70 mph speed limit'). This suggests that most road safety initiatives would be welcomed by the general public. However, caution must always be used when interpreting the results of questionnaires such as this, as socially desirable responding may distort the data.

Overall, the main questionnaire results revealed a generally favourable attitude towards most countermeasures, especially those that were perceived both as likely to be effective in improving road safety and as involving little personal cost to the respondent.

7.1.2 Speeding countermeasures

The prospects for introducing countermeasures to reduce speeding are challenging and, though the results apply mainly to urban areas, there are implications for rural roads as well. The two countermeasures which showed the largest discrepancy between their ranking for effectiveness compared to favourability (ie were ranked as relatively high for effectiveness compared to their lower ranking for favourability) were measures which would compel drivers to reduce speeding (see Table 7.1). The more detailed questions on road humps offer no real explanation about why such a large discrepancy occurred. Many respondents appeared to favour increased implementation of road humps, especially those aspects referring to reducing speeding in residential areas. Answers to (Q21) suggest that speeding is the violation that drivers commit most often. On the question of the need for more or less enforcement of a traffic law (Q23), 79% of respondents suggested that more enforcement was needed of speed limits in built-up areas. This agrees closely with the Quimby and Glendinning (1990) survey, where 76% of respondents supported increased enforcement. Their survey also showed that 75% of respondents supported increased enforcement of motorway speed limits; in our survey this figure had dropped to 58%. Finally respondents estimated that 80% of drivers regularly exceed the speed limit in built-up areas.

This study is not alone in finding that speeding is condoned (Parker *et al*, 1992a; Stradling, Manstead and Parker, 1992). The reason for the apparent disregard of speed limits is that drivers do not consider speeding dangerous. Its consequences are matched by the responses to (Q19) where people grossly overestimated their chances of survival after being hit by a car. Any countermeasures which aim to reduce speed limits need to take account of Clayton's (1986) observation, "that for any law to succeed, contravention of it must produce social disapproval." Clearly, in the case of speeding, most people offend, and are therefore very unlikely to condemn others for doing likewise. Increased enforcement of existing laws are likely to have only limited success as most drivers will just take more care not to get caught. Quimby and Glendinning (1990) found that the largest discrepancy between perceived effectiveness and the relatively lower ranking of favourability towards the countermeasure, was for automatic and radar cameras to catch motorists speeding. This countermeasure would drastically increase the likelihood of being caught when speeding and suggests that drivers are not in favour of such stringent enforcement of

speed limits. Another alternative would be to pursue the line that speed may not cause the accidents but it will aggravate the injuries sustained.

The first step to reduce the prevalence of speeding might be to make drivers appreciate the inherent risk in speeding. This would result in the outcome evaluation of speeding becoming more negative, and would therefore reduce behavioural intention to speed. As the prevalence of speeding is reduced, then an environment is created whereby publicity campaigns can be conducted which emphasise that speeding is socially undesirable behaviour. This would result in normative pressure not to speed. The research conducted by Parker and her colleagues (1992a, 1992b) implies that this two-stage process would have the desired effect in reducing the prevalence of speeding.

Another possible approach to reducing speeding violations would be to induce the conditions for cognitive dissonance. Rolls *et al* (1991) showed that most mature drivers perceive themselves as safe drivers. If drivers can be made aware that speeding is hazardous, then they will hold two opposed beliefs, namely, 'I am a safe driver' and 'I break the speed limit, which is dangerous'. If this situation can be induced, then the process of cognitive dissonance will occur. The theory of cognitive dissonance (Festinger, 1957) proposes that if two opposing ideas or beliefs are held at the same time, and the individual is made aware that they are opposing, then the individual will try to reduce dissonance by making these attitudes compatible. As being a safe driver is likely to be more important to the individual's self-identity, then this attitude will be maintained and behavioural modification is probable (ie they will stop speeding). However, cognitive dissonance in this situation may lead the driver to abandon the notion that they are a safe driver. A third possibility exists also; the driver may hold another belief, 'I am an above average driver'. If this is the case, and studies have repeatedly shown that many drivers believe this (Reason *et al*, 1990; Svenson, 1978), then the driver may resolve the dissonance by concluding that speeding is only dangerous for the average driver, and not themselves. Reason *et al* (1990) seemed to tap this attitude directly. They found that drivers who regularly commit violations saw themselves as skilful enough to take risks, probably because they were only risks to less skilful drivers. So a campaign that stressed that safe drivers do not speed or highlighted the dangers of speeding, may not have much impact on young drivers, because they do not consider themselves as belonging to this category (Rolls and Ingham, 1992).

While education and enforcement countermeasures are likely to have only a gradual effect on speeding, the final type of countermeasure, engineering initiatives, offers the most immediate promise. Engineering countermeasures are usually direct (ie they enforce compliance), and they will therefore reduce the prevalence of speeding. There are numerous examples of traffic calming measures in operation that limit speeds dramatically and similarly, fitting devices that limit car speeds could be considered.

In summary, speeding (ie excess speed for the conditions) appears to be the most common driving violation, probably because it is not perceived as dangerous. The effects of countermeasures which involve increased enforcement and legislation are likely to have limited success in reducing speeding. Education offers a long-term solution to this problem but the intervention would have to be sustained and well directed.

7.2 Targeting groups

Having discussed one main approach to reducing accidents, *viz* identifying specific driving behaviours that make a significant contribution and discussing countermeasures to reduce their prevalence, we now turn to the second approach, to target groups of drivers that account for a disproportionate number of accidents, and to try to understand the underlying influences. Countermeasures can then be introduced to try to reduce their accident involvement. Of course these groups are also involved in pedestrian accidents but, until there are clearer categories of pedestrian activity, it is difficult to specify appropriate countermeasures or to identify appropriate sub-groups for intervention.

The next section will discuss young drivers who have been identified as a target group. The final section in this chapter will discuss older drivers. As in the previous chapter, the discussion of these two target groups will refer to the framework provided by Brown's model of subjective safety and use it to differentiate between different aspects of driving.

7.2.1 The young driver

The attitudinal cluster analysis in Section 6.2.3 identified seven clusters or variables which accounted for approximately half of the variance. Five of these clusters correlated significantly with the age of the respondents. Young drivers were characterised by being more self oriented and more likely to be characterised as unconcerned; they were also much less order oriented and less safety oriented. These clusters suggested that younger drivers were generally less in favour of countermeasures and were less concerned about anti-social behaviour (eg, committing violations).
In our study there was little evidence to show that young drivers associated road traffic accidents with violations and stupidity. Jonah (1986) suggests that taking risks has greater attraction among young drivers since it satisfies the expression of emotions like aggression, the seeking of peer approval, the facilitation of feelings of power and control, and the enhancement of self-esteem. The net effect is that some younger drivers may perceive the benefits of violations as greater and the costs as lower than do older drivers.

From a social perspective, one potential approach to reducing the involvement of young drivers in traffic accidents is to reduce their level of 'preferred' risk. This could be achieved by either reducing the perceived benefits or increasing the perceived costs. Unfortunately, several researchers (Wilson, 1991; Wells-Parker, Cosby and Landrum, 1986; Donovan and Marlatt, 1982) have shown that this propensity for risk taking whilst driving amongst certain young drivers is part of what Jessor and Jessor (1977) labelled "Problem Behaviour Syndrome". This syndrome has several correlates; elevated levels of impulsiveness, sensation-seeking and hostility, driving-related attitudes indicative of aggression, competitiveness and lack of caution, tobacco and drug use, higher incidence of personal problems and legal infractions. Wilson (1991) suggests that for this type of individual "driving may serve the means to expressing independence, defying authority, impressing peers or satisfying a need for excitement." Such individuals may require more positive social intervention than is afforded by media warnings. There is a need, therefore, to research the social and economic means of reducing the motivation for and development of such patterns of behaviour within the road environment.

Parker *et al* (1992a) suggested that one effective method of reducing the perceived benefits of risky behaviour may be through the manipulation of subjective norms. A media campaign that highlights the social disapproval of aberrant driving behaviour should reduce the perceived benefits from risky driving. This should be particularly effective if it focused on the disapproval shown by other young drivers because this would reduce the benefits to social esteem accrued from defying authority and impressing others.

7.2.2 The older driver

The older people in this survey perceive themselves to be safe drivers: Figure IV.2 shows their general rating minus personal rating of risk is the highest of any age group. This can be partly explained by the finding that the more people have had the opportunity to experience and survive hazards, the more control they feel over them and the less they consider them to be serious (Rantanen, 1981).

Brown's (1991) model associates safety with the correct maintenance of a balance between two inputs to a decision process:

(a) Drivers' detection, identification and evaluation of road and traffic hazards; and

(b) Drivers' assessment of their own ability to cope with engagement in manoeuvres potentially involving such hazards and recovery from any error they might make.

The effects of ageing will affect both of these inputs. Ageing results in reduced dynamic visual acuity and reaction time, and difficulties with divided attention tasks. These deficits have been shown to result in impaired driving (Ponds, Brouwer and Van Wolffelaar, 1988). Sivak, Olson and Pastalan (1981) showed that older drivers (over the age of sixty-one) exhibited legibility distances for sign reading that were only 65-77% of those of young drivers (under the age of twenty-five) on a night time sign reading task. This suggests they may have an impaired ability to detect hazards and their slower reaction time will mean they are less able to extricate themselves from hazardous situations.

The possibility of reduced cognitive functioning and information-processing capacities is not reflected by older drivers in their assessment of their driving ability, and has been shown to have little influence on whether they stop driving (Retchin, Cox, Fox and Irwin, 1988). The factors affecting such a decision may be crucially linked to the increased evidence of traffic accidents in this group and requires further investigation.

In a previous AA Foundation for Road Safety Research publication (Schlachman, Curtis, Wood and Carr, 1988) it was found that 77% of older drivers rated their car as essential or very important to their way of life. Gianturco, Romm and Erwin (1974) found that the total number of activities and life satisfaction were markedly higher in older people who still drove compared to those who had given up driving. Road safety is a pressing problem facing society, but any proposed legislation which results

in reducing the quality of life of such a large proportion of the people would find difficulty in gaining support.

Engineering countermeasures may have some success in reducing this problem. The road environment tends to be designed for 'average' drivers. If the needs of the older driver were considered more, then their involvement in accidents would be reduced. Some American evidence (California State Report of Motor Vehicles, 1984) on drivers over seventy suggests that potentially useful countermeasures would include road markings being made clearer and being placed a greater distance before the junction. Older drivers tend to suffer from specific deficits and therefore optional extras in that form of special equipment could be effective.

The involvement of elderly drivers in road traffic accidents, though not as evident as that for young drivers, is likely to become an increasing concern for road safety authorities because of substantial demographic changes. The report by a recent working group (Medical Commission on Accident Prevention (MCAP)/Automobile Association (AA), 1990) provides detailed advice on planning in advance and linking choices to a declining level of ability, including choice of car, special equipment, route and time of travel. It particularly emphasises that a sensitive approach will be required if such advice is to be accepted and examines effective means of communicating the relevant information. The evidence on attitudes from this study confirms the good prospects for successful implementation along the lines of their recommendations.

7.2.3 Pedestrians

It is equally important to tackle ways of reducing pedestrian accidents but more information on type and extent of exposure is needed before particular adult groups can be targeted. From our results one emphasis suggested follows from the drivers' viewpoint. Pedestrians' assumptions that they have right of way on crossings or in other situations may well be correct but irrelevant if the driver has failed to notice them. In addition to the various codes for crossing the road the need for eye contact to be established to check that the driver is giving way should be stressed. From the main questionnaire it was evident that people were unwilling to go out of their way to cross the road with the effect that risks were taken when they were within reach of a crossing, bridge or subway. With the latter the threat of possible violence can lead older people, in particular, to try to negotiate potentially dangerous paths through fast moving traffic. Amount and speed of traffic were the main attributes correlating with risk ratings in the walk survey.

A thoroughgoing campaign could be mounted to reflect the variable balance of attribution of blame for accidents. Because of the imbalance between vehicle and person, and the almost invariably worse consequences of an accident for the pedestrian, it is tempting to lay more blame on the driver than may be justified. Just as drivers in two vehicle accidents are inclined to shift responsibility away from themselves, pedestrians are unwilling to accept that often their intentions are difficult to predict by the driver. In the walks survey the margin of acceptability and favourability were high for increased driver training and with hindsight the equivalent question for pedestrian training would have been included.

8 Implications of the study

8.1 Introduction

In this chapter we turn to the potential applications of the results reported and review the extent to which the objectives outlined in Section 1.2 have been met. A number of methodological conclusions are drawn first and the value of the data collected is discussed in Section 8.2. Section 8.3 examines the objectives and how far we have been able to meet them and finally, in Section 8.4, we present our views on the potential applications for the results.

8.2 Methodological implications

An ambitious and innovative programme of linked surveys was undertaken. The main questionnaire made use of well established techniques, whereas the other three surveys were more innovatory in their approach. The use of linked surveys, where common sites were used for risk rating in three separate ways (by drivers on the road, by pedestrians from the roadside and by a wide range of participants viewing videos) and where some participants took part in two or more of the surveys, provided an opportunity to examine the validity of the techniques and offered unique opportunities for analysis.

8.2.1 The drives

Although previous studies have made use of live driving situations in order to obtain assessments of perceived risk, the 207 drivers and around 50 locations which each were asked to assess, produced a large enough data set to allow further disaggregation by age and gender of driver and by type of location. Sufficient accidents had occurred in the four years previous to the drives for a reasonable prospect that perceived risk could be correlated with one measure of objective risk (accident numbers), although insufficient traffic flow data were available to calculate accident rates, which are probably a better indicator of objective risk for these purposes. In the event weak, but significant correlations were found between perceived and objective risk in these terms, as has been found by others.

The task of rating locations for risk from both a general perspective (for other drivers) and a personal perspective (to the driver) proved an acceptable task to nearly all participants. Only two drives had to be aborted because the driver was felt to be unsafe; on one occasion because the driver had been drinking prior to the drive.

Because of individuals' tendency to use only part of the rating scales, most analysis were based on MSR (mean standardised risk ratings), that is transforming ratings to standard deviations about a mean of zero. Comparing differences between general and personal MSRs showed a generally close association, although differences tended to emerge as the rating increased. Older, male drivers tended to rate personal risk lower than general risk.

The overlap between drives and interviews (95 interviewees also undertook the drive) allowed analysis of risk assessments and attitudes to be carried out.

8.2.2 Pedestrian walks

The survey involved 133 participants and was carried out to explore the possible inconsistencies between driver and pedestrian assessments of risk, and the nature of consideration being given to pedestrian safety. The extent of the differences in perception from the two different perspectives was surprising.

In addition to obtaining risk assessments, the time available at the roadside (compared with the driving situation) allowed more detailed exploration of the attributes of the locations which may have influenced the ratings given. We were also able to propose specific countermeasures at the sites and seek views on their potential effectiveness and favourability. Participants were able to deal with these tasks, although there was a probable tendency for the overall risk rating to be justified in subsequent assessments of site attributes.

One interesting aspect to emerge from several analyses was that driving experience appeared to influence responses. There were differences in perception, as a pedestrian, between those with driving licences and those without. It is important, therefore, in surveys of this kind that background data about participants be recorded fully.

As will be apparent from the report of results in Section 4.3.3, participants appeared to have difficulty in imagining the sites with a particular countermeasure installed. Thus the effectiveness ratings of even extreme measures, such as pedestrianisation of a busy street, were low where in objective terms to remove all traffic is bound to offer a massive improvement in pedestrian safety in a busy street. Combined with a problem of envisaging a novel transformation, there is the additional factor of judging the practicality of a measure (or even its political feasibility) strongly influencing responses as to effectiveness. Notwithstanding these difficulties, the extent of the discrepancies between ratings of effectiveness and favourability can be used to inform and guide the implementation of appropriate countermeasures.

8.2.3 Videos

This methodology was an innovation. Large groups (of up to 40 people) were asked to respond simultaneously to the video material being presented; responses were recorded by an on-line computer. While remote from the actual driving or pedestrian task, the films shown were intended to give a realistic impression of what the driver or pedestrian faced at the site in question. 473 people took part in a period of two weeks. Clearly this is a very efficient way of collecting large volumes of data in a form which is immediately available for analysis.

Preparation of the video material took some time. Obviously it is possible to influence responses by the nature of the material presented and several pilot stages were undertaken before the eventual approach of using only film taken from a vehicle making the traffic manoeuvre for the driver perspective and film shot from the roadside for the pedestrian perspective was adopted. In order to reduce the possibility of a single event unduly influencing the responses a series of drives through were filmed for the

driver perspective and a set of different views, from various kerbside angles, were filmed for the pedestrian perspective.

The driver perspective was effectively conveyed for the locations in question, as confirmed by a good correlation between the risk ratings (for the same sites) given during the drives and during the videos from the driver's perspective. This gives us confidence in other aspects of the results from the videos and suggests that the technique has merit as an experimental method, even though it has limitations, eg that a single screen can only give a fairly narrow view of the road ahead and any site where wide views, or peripheral vision, are important is unlikely to be represented adequately. The locations used were all selected to avoid this problem, thus they do not include junctions where drivers must watch several streams of traffic.

All the locations were chosen to include pedestrian activity as a major component of the scene and the videos taken from the pedestrian perspective sought to replicate this. Only limited success was achieved in this respect and we conclude that the technique, as used, was not a complete representation of the pedestrian environment. There are a number of possible reasons for this. First, it is much more difficult to narrow down the pedestrian field of view to a series of common shots, as it was possible to do from the approaching driver's perspective. The driver is relatively constrained by the carriageway, road markings, other traffic and so on. As the driver approaches the location, attention is much more narrowly focused than the pedestrian's and it appears to be easier to replicate this effect fairly well on film. The pedestrian is much less constrained, and affected by many more stimuli that could not be replicated. Noise is a prime example and whilst the film soundtrack replicates reasonably well the prevailing noise level inside a vehicle, it does not cover the range experienced by pedestrians. Pedestrians also feel dominated by traffic, especially large vehicles, and film projected onto a 6' x 6' screen viewed from a distance does not convey the immediacy of this threat.

8.2.4 Main questionnaire

The main questionnaire was administered in card format, with participants being required to sort a set of cards into appropriate categories, depending upon the question. The main questionnaire dealt primarily with attitudes and the acceptability of countermeasures. The overlap of participants with the drives and the videos offered a unique opportunity to relate attitudes to assessment of risk.

The data collected were subjected to a range of analyses. A Tukey analysis was carried out to explore relationships within the data and then factor analysis was employed. This revealed a number of factors of concern to respondents; whilst road safety was not the most important social concern, it did fall in the middle range of issues put; below violent crime, house theft, educational standards, social health care and environmental pollution, but above drug abuse, unemployment, AIDS, cost of living and congestion. The analysis suggested that respondents viewed traffic accidents as resulting from one of three causes: global and external factors, violations and stupidity, and errors and slips.

A subsequent attitude cluster analysis suggested five main and two less important groups of respondents. These were labelled order oriented; community oriented; youth oriented; self oriented; and unconcerned; with convenience oriented and safety oriented as the less important groups.

These clusters revealed no correlation with accident involvement for men, but there was a positive correlation between self oriented women and self reported accidents. We also found a correlation between more competitive driving behaviour and both youth and self orientation. Those from the group labelled unconcerned are more likely to drink and drive and consider that violations and stupidity have little to do with road accidents.

8.2.5 Value of the data

As with much research, we think that there are many avenues as yet unexplored. The surveys have yielded an extensive data base which, of itself, is of potential value for further research. In the analyses carried out we sought to pursue the objectives of the research, discussed below. Other avenues suggested themselves as we went along but which there was insufficient time available to explore.

The richest individual source of data is the 319 in-depth interviews. We have presented here the more interesting and relevant results to emerge from the analyses to date, but more is possible. The opportunity to link individuals' attitudes to their assessments of risk is provided by the interlocking nature of the surveys. These linkages, too, merit further analysis.

We see three immediate areas for further research, building on the data already to hand and the methodology which has been developed. The first is to develop the competition model, based on animal behaviour analogies, which seems to explain a large proportion of drivers' perceptions of risk. A clearer definition of the model, and its application to the design of vehicles and countermeasures, can offer substantial benefits.

The second is to link the methodology with other studies of ageing, especially with the North East Age Research (NEAR) project, based in the University of Newcastle upon Tyne. Demographic trends, and the growing proportion of older car drivers, support the case for countermeasures targeted specifically at this group. We have established a number of differences in their perceptions of risk and attitudes which merit further, more detailed, study. The problems of the older pedestrian also need to be explored involving a range of questionnaire, diary and experimental methods.

The third area to investigate is the criminal element within the younger driver group (so-called "joyriders"). Local estimates by the Northumbria Police suggest current damage levels from this source at about £12 million per annum, with offenders as young as 10 years old. In this group normal processes of risk perception seem to be over-ridden in trying to satisfy their needs.

8.3 Achievement of objectives

The three specific objectives of the research are repeated below:

(a) to increase the understanding of peoples' perception of risk and their attitude to road safety engineering measures;

(b) to identify the reasons underlying what determines whether a measure is acceptable or unacceptable; and

(c) to suggest ways of changing attitudes through environmental aspects, promotional activities, or different approaches to enforcement.

8.3.1 Increased understanding of perceptions of risk and attitudes

Surveys were designed primarily around increasing understanding of both perceptions of risk and attitudes to road safety issues. The preceding results have demonstrated the extent to which this objective has been achieved. In our view the project has contributed to knowledge in these areas and has linked the previously discrete areas of risk perception and attitudes to road safety.

We have demonstrated clearly that drivers do not adequately perceive the risk to which pedestrians are exposed. Whilst there is a statistically valid correlation between drivers' perceptions of risk and accident frequencies as a whole, these risk ratings bear no relationship with pedestrian accidents. Interestingly, as pedestrians, drivers appeared better able to assess the risk at the roadside during the pedestrian walks survey. There was a clear difference between the responses of those pedestrians with a driving licence and those without. This perception seems not to work in the reverse direction; when in their car, drivers seem to take little account of pedestrian activity and their risk ratings do not correlate with pedestrian accidents.

In order to explore further the risk ratings which drivers had attached to particular locations, we attempted to identify attributes of the locations which may have influenced the ratings. A variety of physical attributes were considered and three were found to contribute significantly to the rating scores. These were:

- competing traffic flows or lane usage;
- reduced sight distance; and
- atypical road dynamic (an unusual layout).

A location rated as high risk was one where drivers were actively considering competitive or defensive manoeuvres, or were unclear about driver priorities. In contrast, it is interesting to note that competing pedestrian activity did not contribute to the explanation of drivers' risk ratings.

The regression model produced which was based on these three attributes accounted for about 83% of the variance in the risk ratings. This is a very strong result and gives powerful support to the concept that risk is being assessed by judgements of the complexity of the traffic situation being faced and the extent of competition which the driver feels is presented by other vehicles.

Parallels can be drawn from these results with animal behaviour in respect of competing for territory, viewing the driver as the animal and roadspace as territory. If priority (territorial right) is clearly determined and the dominant user is clear to all then risk (competition) is low. In contrast, if priorities are unclear and vehicles are evenly matched (two cars) then risk is high. If contenders are not evenly matched (one car and a pedestrian), then competition (risk) is disregarded, particularly by the car driver. Of course bluff and cheating can take place in both the animal/road environments. The participants in the 'contest' can try to impose their will against the rules, such as a driver making a fast approach to a pedestrian crossing, or even to violate the rules altogether, such as not giving way at a junction.

The analysis of attitudes revealed the existence of a number of distinct sub-groups within society, whose attitude to road safety and accident countermeasures are related to various perceptions of the social environment as a whole. Setting road safety into context in this way offers a number of approaches to changing attitudes, and hopefully behaviour, whilst reinforcing the need to target countermeasures at particular groups. These groups are defined not only in terms of straightforward classifiers such as age or gender. Within large groups such as 'the young', or 'the elderly', there are a wide variety of prevailing attitudes and greater or lesser concerns about road safety.

These sub-groups (or clusters within the confines of our analysis) are described in Section 5.4. Five main clusters of factors emerged:

1) order oriented	people who are rule directed, law abiding and concerned for a well ordered environment
2) community oriented	concerned for the fabric of society and the environment
3) youth oriented	shares the concerns of youth, anything goes outlook
4) self oriented	selfish, kicking against the constraints of social order and discipline
5) unconcerned	little or no concern with social issues, does not know and does not care

Answers to questions about driving behaviour revealed correlations between more competitive driving and clusters 3 and 4 (youth and self orientation). High mileage drivers were more likely to use their cars after drinking, as were those scoring high on cluster 5 (unconcerned).

It was also possible to establish relationships between the attitude clusters obtained from analysis of interview responses and the risk ratings which had enabled locations to be grouped into clusters with similar characteristics. Three main location clusters were found (Table 6.1). The first is a group of 'stretches' without any obvious problem; the second are high traffic locations with difficult manoeuvres, such as roundabouts, right turns and motorway merges; and the third is narrow bridges (single lane) and left turns with poor lines of sight.

The first location cluster correlated positively with age and negatively with self orientation. This suggests that older drivers tend to be more aware of risks on apparently simple stretches but that the self oriented drivers see little to concern them. Those revealing a rule orientation perceived complex locations as less risky, whereas those scoring higher on the unconcerned cluster found such locations more risky. In contrast, those with an order orientation found the left turns with poor visibility more risky, whereas the youth oriented found them less risky. It seems that the rule oriented person has a misplaced faith that the rules will protect them if they have priority, even in complex traffic situations.

8.3.2 Acceptability of countermeasures

To understand the reasons for the acceptability of countermeasures we sought perceived views on both potential effectiveness and favourability. However, as discussed above, such distinctions are not always made when responding to questionnaires, or on-site. There was a strong correlation between reported effectiveness and favourability in our data. Only a few of the suggested countermeasures were ranked as more effective than favourable. These might be seen as being associated with high personal costs (road humps, bans on vehicles capable of exceeding 70mph, road closures in residential areas and yearly tests for the over 65 year olds).

Those measures which were ranked more favourable than effective carried little direct cost, other than implied higher taxation to pay for them (better subsidised public transport, simpler and clearer road markings, advertising and publicity to improve road safety knowledge and more frequent marked pedestrian crossings).

Opinions tend to strengthen, however, when considering specific types of location. People stated that slowing down traffic outside one's own home and preventing drivers taking short cuts through residential areas were two of the most favoured aspects of countermeasures. (The highest ranking was improvement to traffic flow on main road routes.) The majority of opinion favoured road humps being introduced in a variety of locations where traffic speeds threatened pedestrians, for example outside schools, on main roads near shops and crossing points, and in residential streets. This extended to 53% more respondents preferring road humps outside their homes than against them. The vast majority of those preferring road humps outside their homes stated that it would be fair to pay a personal (indirect) cost of £2 per week for the provision. Thus for particular situations there are much stronger feelings of approval than the general case.

One area which received particular support was that of stricter controls on drinking and driving. Random breath testing was widely supported (by 78% of respondents, an almost identical level to that in the Lex Report, 1992). Whilst measures directed against speeding received high levels of support (79% of respondents agree that more enforcement of speeding was needed in built up areas), it was estimated that 80% of drivers regularly exceed the speed limit in built up areas and speeding was acknowledged as a regular violation by drivers.

There are three underlying aspects as exemplified by the contrast between drink-driving and speeding. The first is the attitude to the behaviour, what

will be its effect and how favourable will be that effect. The second is the subjective norm, how will 'significant others' (eg friends or parents) react to the behaviour and how much does their reaction matter. The third is volitional control, ie do individuals believe they have control over the behaviour or not?

With respect to attitudes, there are clearly different views on speeding compared with drink-driving. Speeding is not generally seen as dangerous (by drivers) whereas drink-driving is. Drink-driving is now widely disapproved of whereas speeding is widely accepted and in some sub-cultures encouraged. This can be reinforced by a feeling that speeding is necessary, to keep up with the traffic, rather than an act of choice. These factors all tend to reinforce support for countermeasures against drink-driving but to militate against speeding countermeasures.

This analysis goes some way towards meeting the second objective of understanding the acceptability of countermeasures, but as the discussion of attitudes suggests, the picture is complex and acceptability will vary between people in agreement with the various attitude clusters identified by our analysis.

8.3.3 Ways of changing attitudes

As will be apparent from the preceding paragraphs, changing attitudes depends upon a number of factors and the ways to achieve change will vary between groups in society. The traditional 3E's of road safety (Engineering, Education, Enforcement) will be relevant in varying degrees to different groups in society. Our results show that the risks of using the road are not fully appreciated or understood by drivers, in particular there is little sensitivity to the position of pedestrians, who do not seem to figure in drivers' assessments of risk. Certainly there was substantial overestimation of a pedestrian's probability of survival if hit by a car at a range of speeds, notwithstanding the recent publicity campaign to try to communicate the facts in this respect.

In a broader sense the study raises the question of whether changing attitudes is always the best strategy. It is an uncertain and potentially expensive objective and there can be other alternatives worth considering. Introducing countermeasures can even be counter-productive, alleviating by medical analogy one symptom but producing unwelcome side-effects. If countermeasures can be devised which operate unobtrusively, (eg spiral markings at roundabouts to lead drivers to the appropriate exit), then established attitudes do not have to be challenged.

8.4 Potential applications of findings

We have already reviewed the implications of the study for research purposes and we now turn to more immediate applications of practical concern.

8.4.1 Drivers' lack of perception of pedestrian activities

This aspect emerged strongly from several aspects of the study. The drive risk ratings did not correlate with pedestrian accidents, the regression model explaining variation in risk ratings did not even include level of pedestrian activity as a variable, video ratings did not reveal pedestrian activity as a motivating attribute and this was reinforced by the pedestrian walks where drivers' ratings differed from non-drivers'. Given that as many as one third of accidents in built up areas involve pedestrians, and their extreme vulnerability to injury in an accident, this misperception is important.

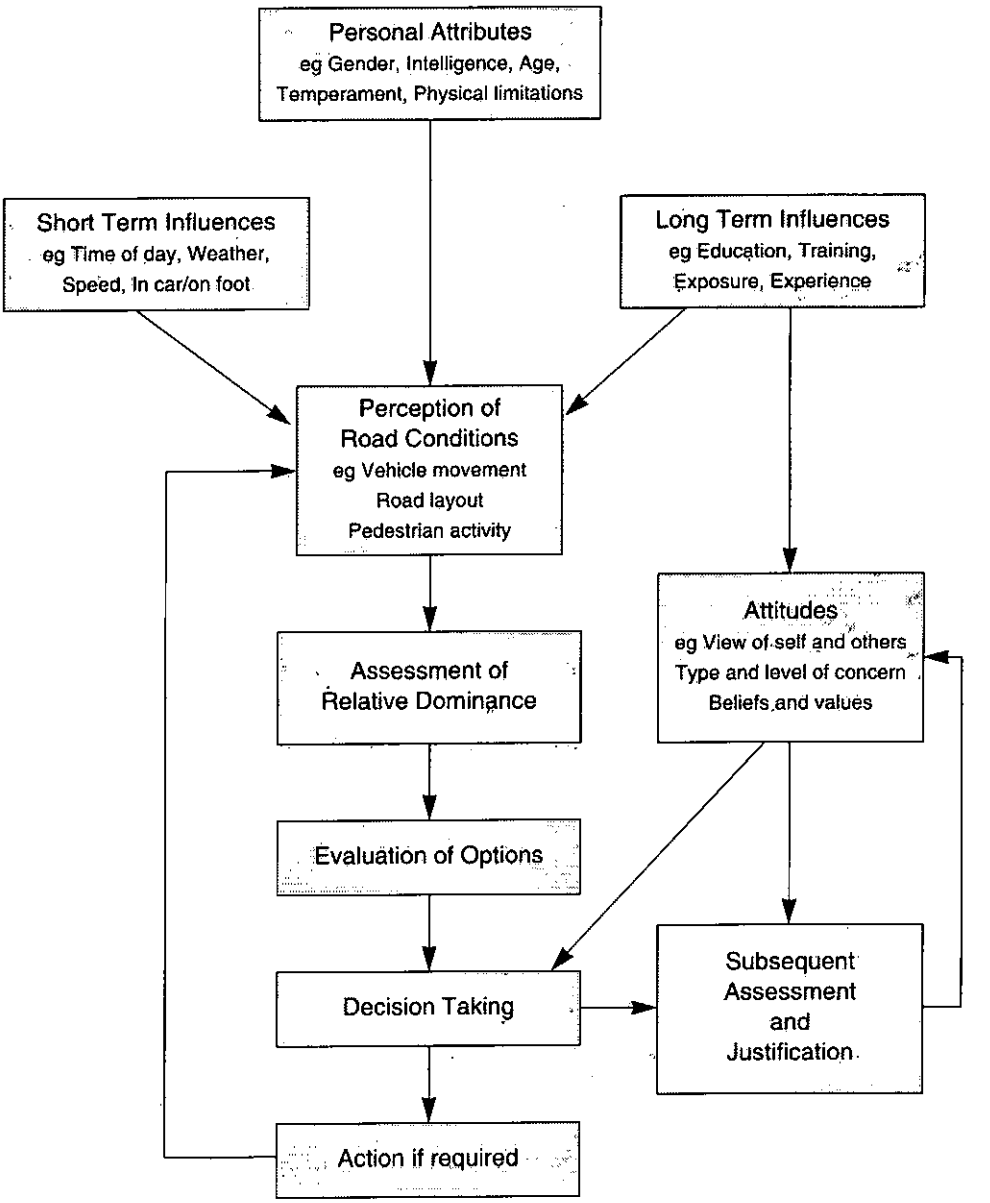
The analysis of attitudes suggests that there are some groups who are likely to respond favourably to better or more comprehensive information (the community oriented) and to rules (the order oriented), but that the self oriented and youth oriented groups offer less likelihood of success from information alone. In terms of a competition model, pedestrians are low in the dominance hierarchy and present so little competitive threat that few will be able, or even want to be able to bluff their way across the road. It is largely on engineering and environmental measures that pedestrian safety must rest.

8.4.2 The road user as a competitor

Competing for roadspace is a pervasive process according to our results. Risky locations, as assessed by the risk ratings given on the drives, tend to correspond to situations where the road user is subordinate to more dominant traffic and is prepared to take evasive action, such as slowing or rapidly accelerating. Risk is, therefore, associated with a point of critical decision. In locations which are of unusual design, eg at a double mini roundabout, the layout appears sufficiently confusing to some for doubt (additional subjective risk) to prevail.

From our results we have developed a competition model of road user behaviour (Figure VIII.1) that has been based on Brown's model of subjective safety (Figure VI.1). External influences at the time combine with individuals' attributes, as modified by their accumulated knowledge, to affect their perception of road conditions. They then assess whether they have priority to proceed before considering the available options.

Figure VIII.1 – Competition model of road user behaviour



Importantly the model proposes that this evaluation is affected by prevailing concerns and values rather than being based simply on estimates of statistical risk. The decision taken, therefore, may or may not be rational and this applies also to any subsequent justification of the action taken.

In terms of the results from the drive survey, the risk ratings predominantly reflect the assessment of relative dominance as they were made at the time. To the extent that delay in rating occurs, the model implies that an increasing component of the rating will reflect subsequent assessment and justification. Action may not always be required after a decision, either on the road or in simulated conditions such as video testing. Similar results, however, can be obtained if short-term influences are adequately replicated, as in the driver perspective condition. In contrast, the pedestrian perspective probably did not fully convey important short-term influences, such as the speed or size of vehicles.

If the competition model is accepted, then in one sense it simply underlines what traffic engineers have been trying to do for many years, namely to impose some degree of order and clarity of purpose onto the road network. If priorities can be defined more clearly and the requirement for one party to yield can be made more obvious, then such a location is likely to be safer. Markings, signs, and other visual cues should all point unambiguously to the same conclusion for all road users; one traffic stream has priority, the others do not. Whilst our analysis suggests that this approach will yield positive benefits with order and community oriented people, it may produce unwelcome side effects amongst self and youth oriented individuals. These groups may resent too rigid a set of rules and consciously seek to break them. If the need to compete is stifled at the road junction, it may emerge more aggressively on the next stretch of open road. Thus, any countermeasure that can achieve its planned aim (of avoiding conflicts) unobtrusively would be beneficial in that it would be effective in encouraging all road users to behave acceptably, but without provoking a negative response.

Apart from problems posed by the deliberate aggressor, it is obvious that purely engineering solutions are not sufficient. There can be a problem faced by the ordinary road user in a subordinate position in terms of the immediate hierarchy. If a driver or a pedestrian is kept in a waiting position too long, then the temptation to force entry into competing traffic will rise. Traffic in the dominant flow will tend to consider themselves justified in not giving way – and the likely attribution of blame will fall onto the subordinate road user. This represents a real traffic conflict which can only be avoided by road users, particularly in priority positions, recognising that their real dominance lies in controlling the initiative to give way.
Road users who possess this maturity will be safer drivers. In general, therefore, attitudes are as important as engineering countermeasures.

8.4.3 Changing attitudes

In order to change attitudes it is necessary to change one or more of: the individual's belief about the outcome of a particular behaviour and the costs and/or benefits of that outcome; subjective norms, that is how significant others would react and whether that reaction matters to the individual; and volitional control, that is whether individuals believe they have control over their behaviour.

Beliefs about outcomes can be influenced by education and publicity. The results of our studies suggest several important beliefs, some general and some very specific. It is widely held that accidents are the fault of the driver, yet most drivers see themselves as above average in skill. In other words, accidents are caused by other people.

Whilst some inherently risky driving behaviours are accepted as dangerous, (eg drink-driving), others are not (speeding). The wider availability of accurate information about the risks associated with speeding appears to be an important prerequisite to changing attitudes in this respect.

Amongst important lessons to be drawn from experience with the way in which attitudes to drink-driving have been changed is that of peer group pressure, or subjective norms. It was clear from our surveys that

drink-driving was widely condemned and countermeasures aimed against it were widely supported. If attitudes to other driving offences are to change, then individual groups in society will have to be targeted specifically, so that the subjective norms of that particular group are altered. Different approaches and materials will be needed for the different attitude groups identified by our study.

It is vital that if serious inroads are to be made into attitudes to speeding, then the prevailing view that speeding is neither a crime nor dangerous must be changed. One particular difficulty relates to the belief in above average driving skills. Even if people can be convinced that speeding is dangerous, they may still conclude that it is only dangerous for other people: they must be convinced that their own inappropriate choice of speed can kill or maim in many circumstances.

As for a safer environment for pedestrians, engineering solutions can be the most effective. Physical measures to control speeds at particular locations, such as speed humps, or broader policy based measures such as extensive use of speed detection cameras or area-wide, urban safety management, offer ways forward that already receive support (see Chapter 7).

Our results support others in identifying young drivers as a target group for specific attention. It is probable that some young drivers perceive that the benefits of aberrant behaviour outweigh the costs. Reducing the apparent benefits from offending is an effective way forward for this group, in order to curb the hazards they create for themselves and others.

Older drivers are a group which, in the light of demographic trends, demand special attention. Their awareness of road safety problems has been shown to be of quite a different nature. For example, older drivers rated risk on simple stretches of road more highly and were more aware of risks at locations with poor sight lines and unclear priority. However they may be unaware of their increasing limitations and here tactfully provided information and help could be both acceptable and beneficial.

The study has demonstrated the complexity of risk perception and its interaction with people's attitudes to road safety. Yet we believe we have gone some way towards meeting the ambitious objectives which were originally set. Relationships between risk perception and attitudes have been found and a reliable data base established. A competition model of road user behaviour has been proposed by analogy with detailed studies of competitive behaviour amongst animals. Distinct differences in attitudes have been identified between different groups in society and these have been related to different perceptions of risk. The resultant findings have been linked to the stated acceptability of countermeasures leading to specific suggestions regarding their implementation.

9 Glossary of special terms

Cluster analysis

This is a technique which divides a set of variables into a potential hierarchy of subsets according to the principle of common fate. Variables tend to be shown as members of the same cluster if they move in a similar linear fashion. In a similar way, people may perceive an object from its background because its parts move in a coherently related fashion. This technique provides a descriptive analysis of a set of variables which may subtly vary from the more abstract results of factor analysis. In the current research, a cluster approach has been adopted, for example, where the data utilized represents scores based on previous factor analysis. This reduces the difficulty of over-abstraction which may result from factor analysing a large group of previously generated factors.

Correlation coefficient (Pearson's r)

A measure of how the level of one variable (y) varies, in a linear fashion, with the level of one other particular variable (x). A correlation coefficient can vary between +1 and −1. When $r = +1$ or −1, then one variable is perfectly predicted by the other. The less the consistency of such a relationship, for example because of measuring error, non-linearity, or indirectness in the relationship, the nearer the correlation coefficient may come to zero. The significance of a correlation depends both upon the relative size of the coefficient and the number of data samples used in its estimate. A very small number of data samples, for example, may have a higher probability of accidentally generating a larger coefficient than would be generated by a larger number of samples.

Expressed preference

An approach to the acceptability or unacceptability of risk which concentrates on what people find as worrying. It considers how people think about or classify dangerous situations rather than the statistical probability of injury or death. For example, the current research suggests that the way drivers rate risk at a traffic site is better described by the competition hierarchy at the location (and manoeuvre in which they are involved) than by the frequency of injury accidents recorded.

Factor analysis

A method for investigating a set of defined variables (or responses) gathered from a set of individuals to seek whether they form a sub-set of linear dimensions. Each individual's responses on the variable set may subsequently be summarized according to scores on these underlying dimensions or 'Factors'. In a sense, these underlying dimensions are abstractions from the relatively concrete question set, but inspection of how individual question items load on or correlate with each factor is often enough to reveal the underlying significance of, and appropriate label for, a factor. (See also ***'Maximum Likelihood'***.)

General risk rating

The rating given to a location or 'stretch' which the respondent considers appropriate to the level of risk which the location and manoeuvre represents to the average driver, or drivers in general.

Heuristics

A system of generally simple rules or procedures which may be applied to a problem or situation with the objective of achieving a satisfactory outcome.

Maximum likelihood (ML)

A major assumption of factor analysis is that it is not possible to observe factors directly; the variables depend upon the factors but are also subject to random errors. In the general case, the maximum likelihood estimate (m.l.e) of an unknown parameter is that value of the parameter which maximizes the likelihood of the given observations. Thus, computer aided ML estimates utilize a series of iterative calculations to determine the most probable location of the factors without being determined, in a rule of thumb way, by summary 'moments' (for example, means and variances) which can effect other approaches, such as Principal Components, to produce less accurate assessments. Significant extra computer processing power is required for the ML method but this no longer poses a serious difficulty. One feature, and further advantage, of the ML technique is that it provides a test of the hypothesis H_k that k common factors are sufficient to describe the data against the alternative that more factors, or unlimited factors, should be appended.

Mean standard risk (MSR) for a location

The standardisation procedure eliminates possible spurious effects caused by individuals preferring different ranges within the original rating scales and, in effect, translates their ratings onto a common scale. The mean standard risk is found by standardising each individual's set of risk ratings for a set of locations, so that they have a mean of zero and a standard deviation of one, and then computing the average result for each location.

Multiple regression

A procedure for predicting a particular measure from the linear combination of a collection of several others. The multiple correlation coefficient may vary between +1 and –1. A zero, or near zero, correlation indicates a null relationship. Computerised multiple regression procedures commonly have the capacity for indicating which individual variables from the predictor set are reliably significant.

Risk homeostasis

The theory proposed by Wilde (1982) argues that people adopt a level of risk taking within their environment and will act to modify the level of their risk whenever they perceive it to have shifted.

Significance levels (eg $p<0.001$)

The significance levels quoted in the present text indicate the level of probability that a relationship would occur by chance. Thus, if a significance level is quoted as $p<0.001$, only once in a thousand similar data exercises should such a result be expected as a random, chance event.

Stated preference

A method of gauging the relative acceptability of alternative provisions (perhaps associated with risks, costs and benefits). This method attempts to evaluate the level of perceived cost or benefit at which people would choose to switch from one type of provision to another and can thus be used as an economic indicator of the preference for, or the viability of, a new service or provision.

The theory of planned behaviour (Ajzen, 1985)

This is a modified version of Fishbein and Ajzen's (1975) Theory of Reasoned Action which asserts that what the individual does is influenced not only by his or her own reported beliefs regarding the outcome or value of the behaviour but also by the individual's perception of whether important others (such as friends, parents, etc.) would approve or disapprove. The additional component added by Ajzen is the concept of control. Thus belief that one has control over a particular behaviour can sometimes be found significant when attempting to relate attitudes to behaviour.

Tukey analysis

Tukey proposed this variant to the basic analysis of variance methodology in 1953. Analysis of variance investigates whether data samples show significant evidence of belonging to the same population, for example, is there any significant evidence that people respond to items 1, 2 and 3 of a questionnaire with the same bias? Whereas analysis of variance will indicate some overall level of significance for the proposition that there is no general effect (a significance level less than 0.01 would suggest that the probability of no effect is small), it does not indicate which particular variables, or items, differ significantly from others, or in which direction. Tukey's analysis indicates which items differ significantly from others.

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11 Appendices

Appendix A – Instruction script for the drives

Thank you for volunteering to take part in the road drive phase of our project. What it involves is simply driving a route which represents a number of everyday driving environments in the area. Directions will be given by the researcher sitting beside you in the front seat. We are trying to find out which places people consider are more and which are less risky to the average driver (or drivers in general) in terms of being involved in an accident and how much risk the driver (yourself) feels in these locations in comparison. So you have to give a general rating which would apply to the average driver and a personal rating which would apply to yourself as the driver. The kind of situations which worry you most and least or which you feel are more or less hazardous to you personally may be different from the level of risk or hazard you think present to the average driver or to drivers in general. You have to give both ratings. We do not know whether you would wish to make them the same sometimes or not, but you can when and if you wish.

The rating scale is to be from one to ten in each case. One represents road locations with the lowest risk and ten represents road locations with the highest risk. The higher the number, the higher the risk.

Now try to think of a location where you would personally feel at least risk of being involved in an accident if you were driving, somewhere you would rate a one on your personal scale. What would that be? Okay now try to think of some road location where you would feel or have tended to feel most at risk when driving, somewhere you would rate a ten on your personal scale. What would that be? Fine, those would tend to represent locations which you would feel at least and most at risk as the driver. Other locations would fall either on those points or between them but those locations are good end points of the scale.

Let's try some examples to see whether you have the hang of it. Look at each picture. Try to quickly give a rating on a one to ten scale to indicate for that location, firstly, the risk of accident involvement to the average driver (or drivers in general) and, secondly, the risk of accident involvement you would feel yourself as the driver. Give your ratings as quickly as possible and then say whether you think you are familiar with the location (just say yes or no). You have to give answers without thinking too long so that things go smoothly on the drive.

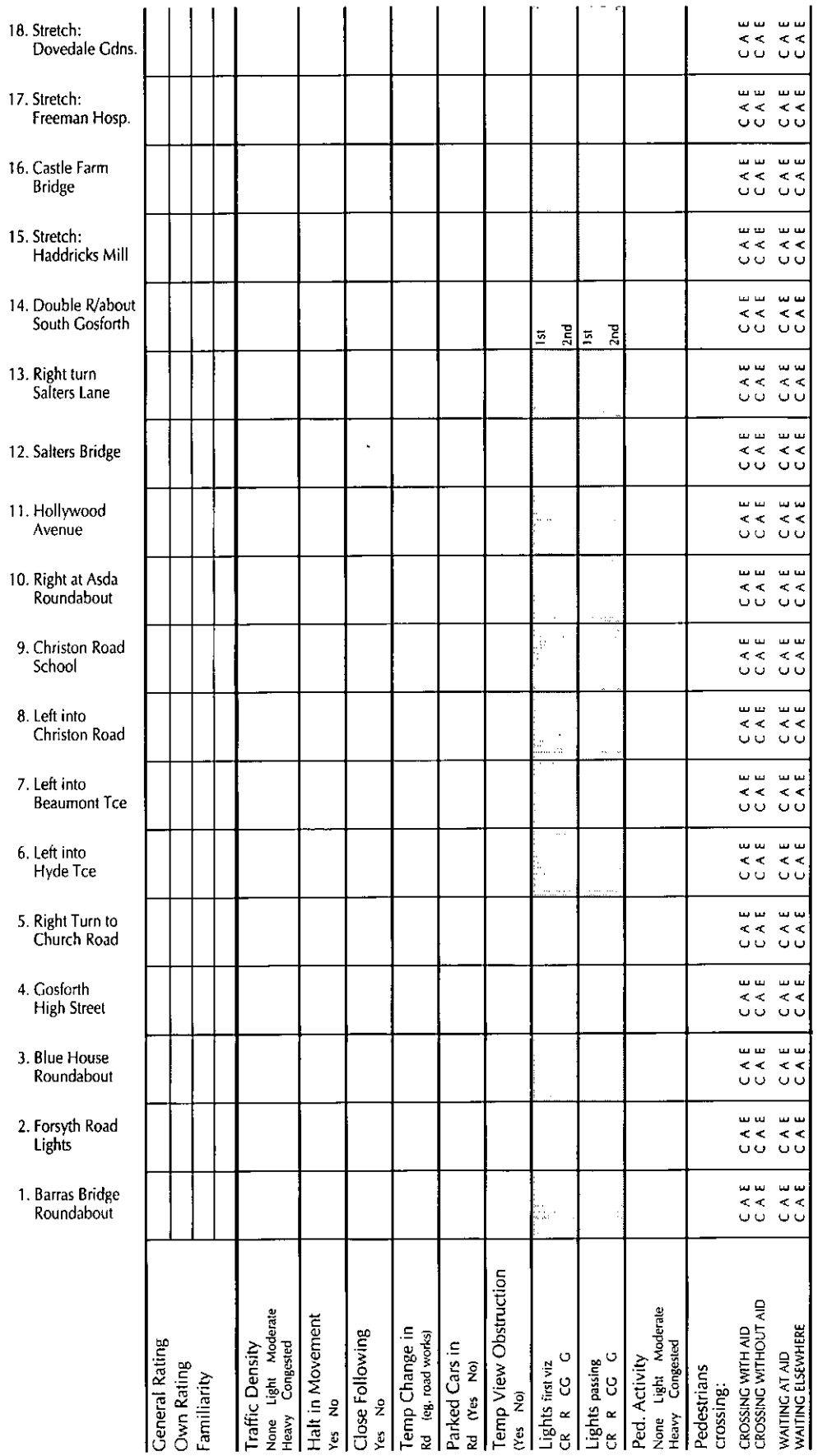
Try all four pictures here.

On the drive, you'll be given instructions about where to go on and where to turn. Instructions given will relate to directions of travel. If you feel unsure of them, please don't be afraid to ask. We have no intention of putting your life in danger or of causing stress. Since you are the driver, you are in charge of the car and we expect you to drive normally and safely. If you think a manoeuvre is dangerous, or that you have missed a turn, don't panic. Do what is safest in your opinion and we will, no doubt, get back on the route easily enough. Don't worry too much if we miss a turn. It can always be put right.

The last thing to note is when to give a rating. The researcher beside you in the front has a buzzer. The stretches you have to rate will be marked by a single buzz at their start and a double buzz at their end. Give your rating as soon as possible AFTER the double buzz: general rating, personal rating, and whether you are familiar with the location (yes or no). The researcher in the back is making a note of your responses. You should give your responses so that he/she can hear. You will not be judged as a driver so relax.

Do you feel clear about the instructions? After the single buzz you would wait for the double buzz and then you would give a general rating, then your personal rating and, finally, say whether you are familiar with the stretch. The researcher beside you will be responsible for giving clear directions. But do not allow us to distract you from driving safely.

Appendix B – Observation form for the drives



	18. Stretch: Dovedale Gdns.	17. Stretch: Freeman Hosp.	16. Castle Farm Bridge	15. Stretch: Haddricks Mill	14. Double R/about South Gosforth	13. Right turn Salters Lane	12. Salters Bridge	11. Hollywood Avenue	10. Right at Asda Roundabout	9. Christon Road School	8. Left into Christon Road	7. Left into Beaumont Tce	6. Left into Hyde Tce	5. Right Turn to Church Road	4. Gosforth High Street	3. Blue House Roundabout	2. Forsyth Road Lights	1. Barras Bridge Roundabout
General Rating																		
Own Rating																		
Familiarity																		
Traffic Density None Light Moderate Heavy Congested																		
Halt in Movement Yes No																		
Close Following Yes No																		
Temp Change in Rd (eg. road works)																		
Parked Cars in Rd (Yes No)																		
Temp View Obstruction (Yes No)																		
Lights first viz CR R CG G					1st 2nd													
Lights passing CR R CG G					1st 2nd													
Ped. Activity None Light Moderate Heavy Congested																		
Pedestrians crossing:																		
CROSSING WITH AID	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E
CROSSING WITHOUT AID	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E
WAITING AT AID	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E
WAITING ELSEWHERE	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E	C A E

Appendix C – Description of locations for the pedestrian walks

Location 0
Queen Victoria Road

A two-way stretch of road in between the university and the Royal Victoria Infirmary, near to a roundabout and including a lights controlled pedestrian crossing.

Location 1
Market Street

A busy lights controlled pedestrian crossing in the town centre on the edge of some crossroads. The street is two-way and contains a small island half-way across.

Location 2
St. Nicholas'/Mosley Street

A lights controlled junction in the town centre, with a single, caged, pedestrian island. Volume of traffic is high and approached from three directions.

Location 3
Newcastle Central Station

A one-way stretch outside of the Central Station portcullis, with railings and a lights controlled pedestrian crossing. Traffic volume is high and traffic travels in three lanes.

Location 4
West Road

A major two-way road densely packed with shops on both sides, and including a lights controlled pedestrian crossing.

Location 5
Gosforth High Street

A stretch of road with shops on both sides, with railings and a lights controlled pedestrian crossing. Traffic travels in both directions and the volume varies.

Location 6
Jesmond Road

A busy road with shops on one side and a high wall on the other, with a lights controlled pedestrian crossing. Traffic travels in two lanes in either direction.

Appendix D – Response form for the pedestrian walks

Day _____ Name _____

Date _____

am/pm _____ Site _____

Part 1

Rate the risk at this site on a scale of 1 to 10, where

1 = lowest risk and **10 = highest risk.**

Rate the risk that you feel to yourself at **this location** as a pedestrian:

Part 2

We would like to know which features of **this location** were important in deciding the rating score you have given it as a pedestrian.

Please indicate the effect of the features listed below on your decision by ticking one box for each feature.

If any other features were important to you in deciding your risk rating, please write them in the empty boxes at the end of the page.

	Effect of risk rating; tick one box				
	Made me strongly consider lower risk rating	Made me slightly consider lower risk rating	No effect on risk rating	Made me slightly consider higher risk rating	Made me strongly consider higher risk rating
Width of road to cross					
Amount of traffic					
View of oncoming traffic					
Crossing facilities (zebra, pelican, etc)					
Speed of traffic					
Standard of driving					
Signs and road markings					
Parked vehicles, or the absence of any					
Large vehicles (trucks, buses) or absence of any					
Pedestrian behaviour					

Write any other features below:

Part 3

What do you think could be done to improve road safety for pedestrians at **this location**?

A) Please indicate, **in your opinion**, the effectiveness of the following measures by ticking the appropriate box.

	Very Ineffective	Ineffective	Neutral	Effective	Very Effective
More space for pedestrians/ less for vehicles					
Strict enforcement of existing speed limits					
More barriers to protect and direct pedestrians					
Better driver training					
Road humps to slow traffic					
More zebra/pelican crossings					
More refuges in middle of the road					
Pedestrianisation/ban traffic					
More traffic signals to control traffic					
Lower speed limits					

Write your own ideas for safety improvements here if not listed above:

_____

_____

B) How would **you** react to these measures being implemented?

Please rate how favourable **you feel** to each measure being implemented at **this location** by ticking the appropriate box.

	Strongly Against	Slightly Against	Neutral	Slightly Favour	Strongly Favour
More space for pedestrians/ less for vehicles					
Strict enforcement of existing speed limits					
More barriers to protect/ direct pedestrians					
Better driver training					
Road humps to slow traffic					
More zebra/pelican crossings					
More refuges in middle of the road					
Pedestrianisation/ban traffic					
More traffic signals to control traffic					
Lower speed limits					

Your own ideas for new measures to be implemented:

_____

_____

C) Which measures would **you** personally recommend?

Select the three **you** recommend for **this location** in order of importance, by writing R1, R2, R3 in the spaces provided.

More space for pedestrians/less for vehicles _____

Strict enforcement of existing speed limits _____

More barriers to protect and direct pedestrians _____

Better driver training _____

Road humps to slow traffic _____

More zebra/pelican crossings _____

More refuges in the middle of the road _____

Pedestrianisation/ban traffic _____

More traffic signals to control traffic _____

Lower speed limits _____

Your own ideas for recommendations:

_____ _____

_____ _____

Appendix E – Instructions for the main interview questionnaire

Thank you for offering to take part in our research concerning attitudes and perceptions of risk in the road environment and for the time which you are allowing us in completing this questionnaire. Most of our questions require you to choose from given responses rather than create your own answers. This is because we are conducting a large number of interviews and need to be able to compare different groups easily. It will be of most benefit if, after ensuring that you understand each question reasonably well, you answer as you would normally feel rather than deliberating what you should say. Your answers are in confidence. Our research will report only in summary form and not on individuals. Please relax. We can start when you are ready.

Appendix F – Question set and data set for the main interview questionnaire

Q1 How much concern do you feel about the following issues compared to others in your life?

Issue	**Not concerned** 1	**Slightly concerned** 2	**Moderately concerned** 3	**Strongly concerned** 4	**Very strongly concerned** 5
	Response Frequencies				
(a) Violent crime	0 [4.31]	10	46	97	164
(b) Drug abuse	14 [3.82]	36	64	84	120
(c) Pollution in the environment	4 [3.93]	15	79	123	98
(d) Unhealthy food	20 [3.29]	52	103	105	39
(e) Road accidents	1 [3.91]	20	73	137	88
(f) Unemployment	11 [3.72]	36	71	113	88
(g) AIDS	21 [3.69]	40	58	98	102
(h) The 'cost of living'	9 [3.39]	52	114	95	49
(i) Traffic congestion	10 [3.31]	61	109	98	40
(j) House theft	2 [4.03]	19	56	131	110
(k) Standards of education	5 [3.95]	25	57	125	107
(l) Social Health Care (The Health Service)	8 [3.95]	18	71	107	114

[ ] = mean

Q2 Some of us feel happy to take a risk ourselves which we would not wish to be copied by others. How much do you think this applies to yourself?

Question	**Almost always 1**	**Often 2**	**Som-times 3**	**Rarely 4**	**Almost never 5**
	Response Frequencies				
(a) (if a driver) In choice of speed	8 [3.21]	45	69	66	21
(b) (if a driver) In adopting risky actions: e.g. overtaking with limited space or visibility	2 [4.01]	8	39	93	67
(c) (as a pedestrian) crossing roads among flowing traffic	12 [3.32]	62	122	53	69
(d) (as a pedestrian) In adopting risky actions: e.g. walking near or on the kerb	6 [3.38]	55	125	77	55

[ ] = mean

Q3 Could you put each statement into a category to show for what relative number of road traffic accidents you feel it is an important cause or blame.

	RELATIVE NUMBER Lowest 1	2	3	4	Highest 5
Statements	*Response Frequencies*				
(a) Selfish, aggressive and inconsiderate people	4 [4.03]	20	60	113	122
(b) Individual carelessness and lapses	6 [3.81]	32	77	106	97
(c) Deliberate rule breaking by individuals	14 [3.74]	36	67	103	99
(d) Unforeseen events and uncontrollable events	38 [3.11]	65	92	71	53
(e) Confusing road design or markings	47 [2.77]	93	93	57	29
(f) People who feel that riskier behaviour is stimulating	27 [3.53]	43	65	102	82
(g) People falling into bad driver and pedestrian habits	11 [3.61]	33	98	105	72
(h) Drinking alcohol or taking drugs	1 [4.44]	10	41	63	204
(i) People's hurry and impatience	3 [3.97]	11	73	137	95
(j) Insufficient road safety training and testing	26 [3.11]	77	100	65	50
(k) Traffic volumes	20 [3.25]	71	89	85	53
(l) Poor national and local government policy	74 [2.57]	90	81	46	27
(m) Insufficient policing of road traffic	64 [2.57]	105	81	43	26
(n) Lenient penalties for traffic offences	34 [3.31]	56	74	88	67
(o) Roads designed to encourage fast traffic	43 [3.03]	81	69	75	51
(p) The frustration of being held up by heavy and congested traffic	10 [3.41]	47	110	105	46
(q) The inconvenience, discomfort and cost of public transport	118 [2.22]	90	54	36	21

Q3 (Continued)

(r) Accidents are an inevitable consequence of a free society	132 [2.17]	81	59	28	17
(s) Inexperienced drivers/riders	17 [3.36]	67	77	99	59
(t) Drivers/riders and pedestrians who are old and do not react so fast in an emergency	26 [3.04]	86	93	77	37
(u) Temporary road conditions due to weather or road works	24 [3.15]	72	93	89	39
(v) People who show off by risk taking	9 [3.88]	31	60	109	110
(w) Unaccompanied and unsupervised children	21 [3.24]	72	88	84	54
(x) Vulnerable road users such as cyclists and pedestrians having to compete for priority against the motor car	11 [3.39]	59	94	106	49

[ ] = mean

Q4 Here are some general statements of ways to reduce road traffic accidents and injuries. Could you indicate how effective you think each would be by placing it under the appropriate category. Do not consider whether you would agree or disagree with the measure, just how effective it would be.

	EFFECTIVENESS RATING				
	Least				**Most**
	1	**2**	**3**	**4**	**5**
Measurements	*Response Frequencies*				
(a) More severe laws and punishments designed to deter dangerous driving	7 [4.13]	23	36	108	145
(b) Advertising and publicity aimed at correcting the public's failings concerning road safety knowledge and practice	49 [2.88]	68	104	68	30
(c) Humps in the road (sleeping policemen) to slow vehicles	20 [3.55]	50	73	88	88
(d) Closure to through traffic in residential areas	18 [3.42]	64	77	83	76

Q4 (Continued)

(e) Improve main road systems to handle the growing volume of traffic	16 [3.63]	35	76	116	76
(f) Stronger discipline in the training of drivers and young pedestrians	11 [3.68]	31	87	109	81
(g) More stringent driving tests	15 [3.67]	41	77	86	100
(h) Make car use/ownership more difficult and expensive	135 [2.12]	82	51	32	19
(i) Raise the legal driving age	83 [2.57]	87	66	49	34
(j) Enforce the re-testing of drivers yearly after the age of sixty-five	20 [3.53]	51	78	80	90
(k) Improved and better subsidised public transport	31 [3.50]	50	55	93	89
(l) Reduce the maximum speed limit on motorways and dual carriageways from 70 to 60 mph	88 [2.56]	86	59	51	35
(m) Reduce the speed limit in residential and shopping areas from 30 to 20 mph	43 [3.20]	65	69	69	73
(n) A total ban on drinking and driving	12 [4.33]	19	30	49	208
(o) Random breath testing	13 [4.03]	20	50	99	137
(p) Ban motorcycles and mopeds	175 [1.80]	74	42	16	12
(q) Ban the use of vehicles capable of exceeding the 70 mph speed limit (ensuring that speed limiting devices are fitted)	44 [3.23]	65	59	76	75
(r) Introduce more cycle paths and cycle priority lanes	13 [3.72]	42	62	104	97
(s) Simplify road designs and make road markings and directions clearer	24 [3.19]	67	97	87	44
(t) The fitting of non-skid (anti-lock) brakes to all motor vehicles	16 [3.45]	49	96	89	68
(u) Tougher laws and enforcement against pedestrians who wander or run across main roads, putting themselves and the motorist at risk	39 [3.08]	70	80	85	45

Q4 (Continued)

(v) Restrict drivers under twenty-one, or with less than a year's experience, from carrying passengers unless accompanied by a mature and qualified driver	49 [2.79]	102	74	56	38
(w) Greater use of warning signs at accident black spots	9 [3.82]	29	70	113	98
(x) More frequent marked pedestrian crossing points	15 [3.22]	71	106	80	46

[ ] = mean

Q5 Which of these measures would you favour, and which would you be against?

	In Favour Strongly 1	Slightly 2	Neutral 3	Against Slightly 4	Strongly 5
Measures	*Response Frequencies*				
(a) More severe laws and punishments designed to deter dangerous driving	209 [1.53]	68	31	5	6
(b) Advertising and publicity aimed at correcting the public's failings concerning road safety knowledge and practice	73 [2.28]	119	96	28	3
(c) Humps in the road (sleeping policemen) to slow vehicles	92 [2.31]	105	70	36	16
(d) Closure to through traffic in residential areas	96 [2.38]	89	64	56	14
(e) Improve main road systems to handle the growing volume of traffic	128 [1.96]	116	46	18	11
(f) Stronger discipline in the training of drivers and young pedestrians	136 [1.82]	117	55	9	2
(g) More stringent driving tests	119 [1.99]	116	56	24	4
(h) Make car use/ownership more difficult and expensive	24 [3.67]	51	47	80	117

Q5 (Continued)

(i) Raise the legal driving age	39 [3.10]	64	90	77	48
(j) Enforce the re-testing of drivers yearly after the age of sixty-five	118 [2.13]	97	58	36	10
(k) Improved and better subsidised public transport	169 [1.75]	78	57	8	6
(l) Reduce the maximum speed limit on motorways and dual carriageways from 70 to 60 mph	46 [3.21]	64	56	80	71
(m) Reduce the speed limit in residential and shopping areas from 30 to 20 mph	98 [2.48]	83	49	60	29
(n) A total ban on drinking and driving	228 [1.57]	41	19	22	9
(o) Random breath testing	178 [1.76]	87	32	14	8
(p) Ban motorcycles and mopeds	8 [3.98]	26	56	94	135
(q) Ban the use of vehicles capable of exceeding the 70 mph speed limit (ensuring that speed limiting devices are fitted)	81 [2.82]	61	58	65	54
(r) Introduce more cycle paths and cycle priority lanes	149 [1.78]	107	50	7	6
(s) Simplify road designs and make road markings and directions clearer	96 [2.08]	122	84	14	2
(t) The fitting of non-skid (anti-lock) brakes to all motor vehicles	104 [2.05]	114	89	5	6
(u) Tougher laws and enforcement against pedestrians who wander or run across main roads, putting themselves and the motorist at risk	65 [2.38]	139	67	31	17
(v) Restrict drivers under twenty-one, or with less than a year's experience, from carrying passengers unless accompanied by a mature and qualified driver	44 [2.88]	84	85	68	38

Q5 (Continued)

(w) Greater use of warning signs at accident black spots	155 [1.67]	124	36	2	2
(x) More frequent marked pedestrian crossing points	95 [2.09]	128	71	18	5

[ ] = mean

Q6 Vehicles can be slowed down by physical obstacles such as road humps being set in the road. In which of these kinds of places would you be in favour of introducing such measures?

	In Favour Strongly 1	Slightly 2	Neutral 3	Against Slightly 4	Strongly 5
Locations	*Response Frequencies*				
(a) Within suburban housing estates	157 [1.74]	120	17	18	7
(b) On main roads near shops and crossing points	88 [2.33]	127	38	44	22
(c) In the vicinity of schools	215 [1.46]	76	15	12	1
(d) On urban residential streets	104 [2.12]	128	42	35	10

[ ] = mean

Q7 (1) Here are several comments which can be made with regard to road humps. Please rate each one according to whether it is an issue which would cause you to favour or disfavour road humps in a residential area.

	Would incline me to strongly favour 1	Would incline me to slightly favour 2	Would not influence my opinion 3	Would incline me to be slightly against 4	Would incline me to be strongly against 5
Comments	*Response Frequencies*				
(a) Speed of the traffic on the road is reduced	158 [1.74]	110	29	16	5
(b) The amount of traffic on the road could be reduced since through traffic may prefer another route	92 [2.15]	123	76	18	9

Q7 (1) (Continued)

(c) Lower speed reduces the severity of accidents	179 [1.60]	105	22	7	5
(d) They can hinder emergency vehicles such as Fire/Police/ Ambulance	17 [3.96]	13	53	118	117
(e) They can present greater risk to the deliberate risk taker such as the drunk driver, 'racer' or joyrider	90 [2.64]	56	86	49	36
(f) Passengers in buses may be jolted if the driver crosses too fast	21 [3.28]	33	143	77	44
(g) They can cause extra traffic noise (e.g. bottles rattling as the milkman's lorry crosses or the sound of cars braking/accelerating	15 [3.25]	15	187	78	23
(h) They may increase traffic on alternative routes	30 [3.01]	62	125	76	25
(i) Pedestrians may assume it is safe to cross among flowing traffic and increase risks	10 [3.52]	34	99	130	45
(j) They can act as pedestrian crossing points if properly marked	65 [2.44]	129	64	35	24
(k) If placed at traffic lights, they would reduce the temptation for drivers to accelerate to beat lights changing to red	128 [2.07]	100	46	26	17
(l) It takes longer for motorists and passengers to travel through such areas	51 [2.84]	50	136	60	20
(m) They can severely jolt the car if the driver fails to be prepared for them	37 [3.15]	42	120	73	46

[ ] = mean

Q7 (2) Having considered these points concerning road humps, how would you now consider road humps in each of these places?

	In Favour Strongly 1	Slightly 2	Neutral 3	Against Slightly 4	Strongly 5
Locations	*Response Frequencies*				
(a) Within suburban housing estates	150	120	20	19	9
(b) On main roads near shops and crossing points	86	123	49	42	18
(c) In the vicinity of schools	219	71	13	14	1
(d) On urban residential	105	121	46	34	12

Q7 (3) Suppose you had the choice of living:

(a) in a home and street the same as your own or
(b) the same but with road humps in the road outside your house

Which would you prefer?

Option a Strongly 1	Slightly 2	No Preference 3	Option b Slightly 4	Strongly 5
Response Frequencies				
50	36	43	58	74

Q7 (3ii) If people prefer to live in one kind of street or road as opposed to another, it is often the case that the rent or mortgage is higher simply because property values relate to people's preferences.

If you preferred option (b), how much more per week would you be willing to pay to live in home (b)?

£	0	0.50	1.00	2.00	5.00	10.00	20.00
Response Frequencies							
	17	1	21	41	36	10	1

Q8 The current speed limit on most urban (built-up) roads is 30 mph. What speed limit would you prefer to be set on such roads (ignore dual carriageways, motorways and bypasses)?

(a) 10mph	(b) 20mph	(c) 30mph	(d) 40mph	(e) 50mph
3	94	196	23	3

Q9 Out of every ten drivers, how many do you believe regularly exceed the speed limit in urban areas?

Response:	1	2	3	4	5	6	7	8	9	10
Frequency:	0	2	0	6	15	27	45	107	82	34

Q10 If most days you had to make a journey to a destination three miles away and back (six miles in total) and you had the choice of these means of transport, which would you choose first, second, third etc? Please put them in order of your preference, assuming you had the choice and necessary skills and qualifications for each option. (Rank so that 1 is most preferred, 2 is next, etc.)

Rank:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	Response Frequencies							
(a) Walking	20 [5.73]	20	20	19	31	70	54	85
(b) Cycle	33 [5.39]	15	19	23	34	59	103	33
(c) Drive car	131 [2.99]	34	38	26	33	35	14	8
(d) Private car passenger	31 [3.47]	85	62	59	35	27	14	6
(e) Metro-train	49 [3.37]	61	67	64	41	23	7	7
(f) Bus	34 [3.59]	60	62	66	60	22	11	4
(g) Taxi	18 [5.03]	35	39	33	57	31	47	58
(h) Motor cycle/ scooter/moped	3 [6.42]	10	12	27	28	51	67	120

[ ] = mean

Q11 Assuming the same journey, rank the following in terms of risk of being involved in an accident? (Rank one means most risk of being involved in an accident)

Rank:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	Response Frequencies							
(a) Walking	8 [5.57]	7	63	23	45	49	35	88
(b) Cycle	97 [2.38]	135	25	23	20	10	7	2
(c) Drive car	40 [3.85]	24	81	67	46	37	11	12
(d) Private car passenger	6 [4.08]	30	61	114	73	15	14	5

Q11 (Continued)

(e) Metro-train	0 [7.29]	1	2	4	11	35	90	176
(f) Bus	2 [6.22]	4	9	19	28	94	138	25
(g) Taxi	7 [4.81]	11	53	49	91	74	19	14
(h) Motor cycle/ scooter/ moped	158 [1.84]	107	26	16	4	2	2	3

[ ] = mean

Q12 Again assuming the same journey, rank these ways of travelling with regard the probability of you being exposed to violence while using or attempting to use them.

Rank:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	Response Frequencies							
(a) Walking	174 [2.22]	31	64	14	10	9	3	12
(b) Cycle	7 [3.94]	74	33	108	50	16	15	14
(c) Drive car	4 [6.56]	3	14	29	19	54	59	135
(d) Private car passenger	0 [6.58]	3	9	13	27	50	154	61
(e) Metro-train	95 [2.73]	73	74	29	18	7	13	8
(f) Bus	31 [3.38]	107	63	42	25	19	11	19
(g) Taxi	2 [5.79]	4	22	44	43	106	34	62
(h) Motor cycle/ scooter/moped	5 [4.91]	20	36	37	123	52	24	20

[ ] = mean

Q13 How would you rank these ways of travelling if you were considering a **total** risk involved in each journey? (You need to consider both risk of accident and violence together)

Rank:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	Response Frequencies							
(a) Walking	98 [3.27]	44	57	28	33	19	11	26
(b) Cycle	68 [2.96]	105	43	39	27	13	9	12

Q13 (Continued)

(c) Drive car	24 [5.52]	15	26	52	27	33	42	97
(d) Private car passenger	5 [5.72]	16	19	37	45	55	103	36
(e) Metro-train	24 [4.98]	30	34	48	52	24	39	65
(f) Bus	25 [4.90]	27	33	48	47	48	49	39
(g) Taxi	4 [5.87]	9	20	27	50	96	42	68
(h) Motor cycle/ scooter/moped	62 [3.31]	64	78	32	29	21	16	14

[ ] = mean

Q14 Given these times of day, when would you feel there is the most risk of an accident on the roads for a driver/rider or passenger? Indicate the first, second, and third riskiest times (R1, R2, R3,) and the first, second, and third least risky times (L1, L2, L3).

(a) 12.00*-2.00am	(b) 2.00-4.00	(c) 4.00-6.00	(d) 6.00-8.00	(e) 8.00-10.00	(f) 10.00-12.00†
49 71	13 174	3 213	77 64	201 20	15 94
(g) 12.00†-2.00pm	**(h) 2.00-4.00**	**(i) 4.00-6.00**	**(j) 6.00-8.00**	**(k) 8.00-10.00**	**(l) 10.00-12.00***
46 50	11 111	224 18	68 27	36 82	209 12
R L	R L	R L	R L	R L	R L

Note: R = Sum R1 + R2 + R3; L = Sum L1 + L2 + L3

*midnight † mid-day

Q15 Are there any of these times you would avoid travelling as far as possible, that is be least happy to travel as a driver/rider or a passenger? State the times you would avoid (A) and the times you would prefer (P).

(a) 12.00*-2.00am	(b) 2.00-4.00	(c) 4.00-6.00	(d) 6.00-8.00	(e) 8.00-10.00	(f) 10.00-12.00†
49 12	22 37	13 56	47 42	110 25	8 102
(g) 12.00†-2.00pm	**(h) 2.00-4.00**	**(i) 4.00-6.00**	**(j) 6.00-8.00**	**(k) 8.00-10.00**	**(l) 10.00-12.00***
23 34	3 86	138 15	26 43	17 39	104 7
A P	A P	A P	A P	A P	A P

Note: A = Sum A; P = Sum P

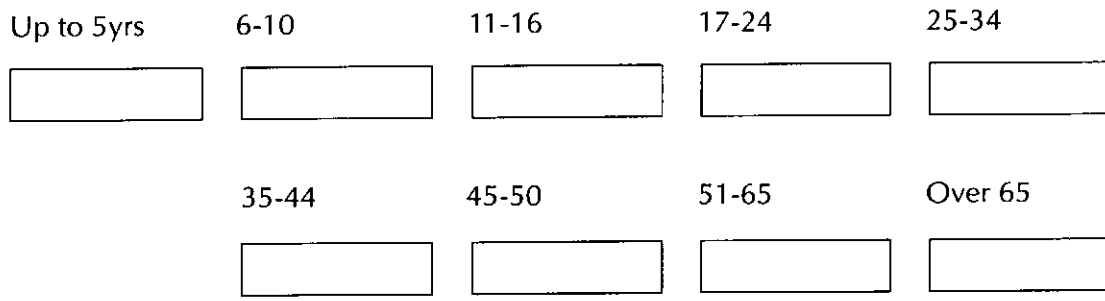
*midnight † mid-day

Q16 Please rate the following factors to indicate how much influence you feel they have on your transport preference.

	STRENGTH OF INFLUENCE				
	Very strong	**Strong**	**Moderate**	**Hardly any**	**None**
	1	**2**	**3**	**4**	**5**
Influence Factor	*Response Frequencies*				
(a) Not having to rely on others	79 [2.31]	132	62	21	24
(b) To minimise your own financial costs	64 [2.62]	78	111	44	21
(c) Saving time	75 [2.29]	123	80	33	7
(d) Warmth and comfort	48 [2.61]	99	120	32	19
(e) To be able to express personal style and ability	7 [4.05]	21	52	106	132
(f) The risk of an accident	56 [2.78]	79	87	68	27
(g) To be able to attract and encourage friends	8 [4.17]	21	42	84	163
(h) To feel safe from personal violence	80 [2.55]	84	76	54	24
(i) Flexibility	89 [2.22]	109	91	18	11
(j) Excitement	5 [4.24]	13	45	94	161
(k) The risk of injury	58 [2.83]	71	82	81	26
(l) To demonstrate success	6 [4.31]	12	36	88	175
(m) To protect the environment	47 [2.84]	53	138	63	17
(n) Exercise/fitness	24 [3.27]	51	111	80	52
(o) To avoid physical effort	30 [3.28]	44	109	76	59
(p) Relaxation/ enjoyment	49 [2.65]	97	14	51	17

[ ] = mean

Q17 People of all ages are killed or injured in road traffic accidents. Which ages do you think are most likely to have an accident? Rank the different age groups by placing the most likely to have an accident at the top.



Rank	1	2	3	4	5	6	7	8	9
Age	*Response Frequencies*								
Up to 5yrs	89	57	44	44	27	17	14	7	20
6-10	71	81	72	36	28	13	5	11	2
11-16	10	37	47	80	72	35	23	8	7
17-24	94	44	45	38	37	21	17	13	10
25-34	6	20	19	25	31	72	54	44	48
35-44	1	3	5	8	11	20	65	103	103
45-50	0	0	2	9	14	47	56	115	76
51-65	5	6	14	36	57	70	67	28	36
65+	43	71	72	44	40	25	11	5	8

Q18 How do you consider your chances of being involved in a road traffic accident compared with others of your sex and approximate age?

(a) As a pedestrian

1	2	3	4	5
Much more	Slightly more	The same	Slightly less	Much less
Response Frequencies				
2	25	163	85	44

(b) As a driver (if a driver)

1	2	3	4	5
Much more	Slightly more	The same	Slightly less	Much less
Response Frequencies				
3	23	97	72	14

Q19 As a pedestrian, if you were involved in a road traffic accident in which you were directly hit by a car, how serious do you imagine most likely consequences to yourself if the car had been travelling at the undermentioned speeds?

Car speed (mph)	Uninjured	Superficially injured	Temporarily incapacitating injuries	Serious and long-term injury/ disability	Killed
Response Frequencies					
10	46	188	66	12	4
20	4	74	174	53	11
30	0	10	109	152	45
45	0	0	18	124	174
60	0	0	0	15	301

Q20 Can you rate as a pedestrian how often you do the following?:

	Always 1	Nearly always 2	Some-times 3	Hardly ever 4	Never 5
Behaviour	*Response Frequencies*				
(a) As a pedestrian, while crossing at busy pedestrian lights which are against you, dash across when you see a slight gap in the traffic	9 [3.68]	26	114	80	90
(b) As a pedestrian, follow the lead of others across the lights without checking	6 [4.03]	14	66	112	121
(c) As a pedestrian, cross at the quickest point rather than using crossing facilities	14 [3.21]	52	155	50	48
(d) When crossing at pedestrian lights cross on the green man without checking that cars/vehicles are actually stopping	19 [3.89]	28	46	102	124
(e) Walk or cross on a part of the road where barriers have been placed to keep pedestrians off	4 [4.13]	10	71	91	143

[ ] = mean

Q21 Drivers. Can you rate how often you do the following?

	Always 1	Nearly always 2	Some-times 3	Hardly ever 4	Never 5
Behaviour	*Response Frequencies*				
(a) Exceed the speed limit when the road is quiet and clear	16 [2.77]	57	103	22	10
(b) Take your car when you are going out and know you might be drinking alcohol	2 [4.24]	7	44	41	114
(c) If you have taken the car and had a drink, drive it back uncertain whether you might be above the limit	1 [4.50]	3	26	39	139
(d) If you are approaching traffic lights which you think are about to turn red, accelerate to pass them before they change	2 [3.65]	10	87	68	41
(e) On a short journey, leave your seat-belt unfastened	4 [4.55]	8	16	21	157
(f) Show off a bit by demonstrating your skill at handling the vehicle when driving with friends	1 [4.55]	1	17	52	137
(g) Race other vehicles away from traffic lights	0 [4.42]	4	24	60	120
(h) Check that all passengers have fastened their seat-belts	94 [2.04]	57	22	19	14

[ ] = mean

Q22 Would you either object to or favour a road accident countermeasure if it involved the following?

	Object Strongly 1	Slightly 2	Neutral 3	Favour Slightly 4	Strongly 5
Involves	*Response Frequencies*				
(a) Slowing down traffic outside your own home	9 [4.07]	15	51	112	131
(b) When it prevents the motorists from taking short cuts through residential areas to avoid traffic congestion	10 [4.08]	30	37	90	152
(c) When the measure is experimental and is being tried out in the area	6 [3.55]	17	135	117	44
(d) When the measure would worsen the established appearance of the location – such as traffic lights distracting from the old fashioned character of a place or parkland being reduced so that a bypass can relieve local congestion	23 [2.93]	88	121	62	25
(e) When it causes the addition of several minutes onto your normal journey	6 [3.18]	70	138	72	33
(f) When pedestrians are inconvenienced instead of the car	77 [2.39]	112	79	32	19
(g) When it might re-route traffic and reduce business to local traders	21 [2.83]	90	145	49	14
(h) When it improves traffic flow on main road routes	5 [4.25]	9	30	131	144
(i) When people have further to walk to bus stops	38 [2.68]	114	99	48	20
(j) When it prevents the motorist stopping to drop someone off or pick them up just where he/she wants	11 [3.39]	54	110	89	55

Q22 (Continued)

(k) When pedestrians have to go out of their way to cross the road	57 [2.53]	131	61	44	26
(l) When it makes going by car less convenient than public transport	21 [3.40]	53	83	103	59
(m) When the measure would worsen the established appearance of your area – such as traffic lights distracting from the old fashioned character of a place or parkland being reduced so that a bypass can relieve local congestion	37 [2.76]	92	126	40	24

[ ] = mean

Q23 Do you feel that there is a *need* for more, less or the same degree of enforcement of the following traffic laws *compared with the present time?*

	Need for Enforcement				
	Much more 1	**Slightly more 2**	**The same 3**	**Slightly less 4**	**Much less 5**
	Response Frequencies				
(a) Seat belt laws for child passengers	154 [1.74]	93	68	1	1
(b) Seat belt laws for front seat car passengers and drivers	88 [2.21]	82	141	3	3
(c) Crash helmet laws for motorcyclists	100 [2.23]	64	141	8	5
(d) Drinking and driving	268 [1.20]	38	11	1	0
(e) Laws relating to obeying traffic signals	91 [2.00]	139	84	4	0
(f) Speed limits on motorways	108 [2.18]	76	107	22	5
(g) Speed limits on built-up areas	126 [1.83]	126	60	6	0
(h) Vehicle roadworthiness	130 [1.83]	117	66	4	1

Q23 (Continued)

(i) Law relating to motorists not entering a zebra crossing while pedestrians are crossing	100 [1.92]	145	70	3	0
(j) Taking a vehicle without the owner's consent	247 [1.31]	45	26	0	0
(k) Driving without a valid licence	201 [1.50]	75	42	0	0
(l) Laws requiring vehicles to signal before a manoeuvre	94 [1.97]	142	80	2	0
(m) Law requiring motor vehicle drivers/riders to have appropriate insurance	147 [1.79]	94	74	2	1
(n) Driving with undeclared disability	95 [2.00]	129	91	1	1
(o) Use of a car telephone while driving	186 [1.61]	91	27	6	8

[ ] = mean

Appendix G – Description of locations for the videos

Location 1
Castle Farm Bridge

A narrow stone-built bridge with no footpaths on the roadside. Traffic approaches the single lane from two directions, and so must give way from one side.

Location 2
Jesmond Road

A busy road with shops on one side and a high wall on the other, with a lights controlled pedestrian crossing. Traffic travels in two lanes in either direction.

Location 3
Gosforth High Street

A stretch of road with shops on both sides, with railings and a lights controlled pedestrian crossing. Traffic travels in both directions and the volume varies.

Location 4
Freeman Road

A two-way stretch of road with the Freeman Hospital on one side and a fenced off sports ground on the other, with a small pedestrian island in the middle of the road.

Location 5
Newcastle Central Station

A one-way stretch outside of the Central Station portcullis, with railings and a lights controlled pedestrian crossing. Traffic volume is high and traffic travels in three lanes.

Location 6
Wingrove Road

A long, straight, wide two-way road with houses on either side. A small pedestrian island is in the middle of the road, near to a sidestreet crossroads.

Location 7
St. Nicholas'/Mosley Street

A lights controlled junction in the town centre, with a single, caged, pedestrian island. Volume of traffic is high and approaches from three directions.

Appendix H – Drive route data

Appendix H1 – Cumulative accidents for four years ending Dec 1990

Definitions: *A = Motor Vehicles Only; B = Pedestrian Involvement; C = Cyclist; D = Other. 1 = In the same direction or manoeuvre. 2 = Involved in another direction or manoeuvre*

Location		Total	A1	A2	B1	B2	C1	C2	D1	D2
1	Barras Bridge roundabout	18	4	12	0	1	0	1	0	0
2	Great North Road traffic lights controlled junction with Forsyth Road	10	6	1	1	1	0	1	0	0
3	Blue House roundabout	42	8	31	0	1	0	2	0	0
4	Gosforth High Street	11	2	2	2	3	0	0	0	2
5	Lights controlled T-junction of Church Road onto Gosforth High Street	8	3	2	2	0	0	0	0	1
6	Left turn from Church Road into Hyde Terrace	1	1	0	0	0	0	0	0	0
7	Left turn from Christon Road into Beaumont Terrace	0	0	0	0	0	0	0	0	0
8	Left turn into Christon Road at T-Junction of Wolverton Terrace with Christon Road	2	0	0	0	2	0	0	0	0
9	Travelling west along Christon Road, passing Gosforth Middle School	1	1	0	0	0	0	0	0	0
10	Right turn at the 'Asda' roundabout outside the Regent Centre Metro Station on the Great North Rd	15	2	8	0	0	1	4	0	0
11	Hollywood Avenue	2	2	0	0	0	0	0	0	0
12	Salters Bridge	0	0	0	0	0	0	0	0	0
13	Turning right at the T-junction from the roadway leading from Salters Bridge into Salters Lane	6	4	2	0	0	0	0	0	0
14	South Gosforth double roundabout	26	7	8	3	2	1	5	0	0
15	Stretch of Haddricks Mill Lane from the public house on east side to the T-junction with Dene Cres. on west side	4	2	1	1	0	0	0	0	0
16	Castle Farm Bridge	0	0	0	0	0	0	0	0	0
17	Freeman Road	5	4	0	0	1	0	0	0	0
18	Dovedale Gardens	0	0	0	0	0	0	0	0	0
19	Right turn at the junction between Dovedale Gardens and Benton Road	10	3	1	1	4	1	0	0	0
20	Crossing the roundabout on the Benton Road/Etherstone Avenue junction	17	8	6	1	0	0	2	0	0
21	The Corner House traffic lights controlled junction	33	6	10	7	7	1	1	0	1
22	Jesmond Road (Cradlewell)	24	6	6	5	5	1	0	0	1
23	Sandyford Road	3	0	0	2	1	0	0	0	0
24	Jesmond double roundabout	11	5	5	0	0	0	0	0	1

Appendix H1 – Cumulative accidents for four years ending Dec 1990 (continued)

	Location	Total	A1	A2	B1	B2	C1	C2	D1	D2
25	Merging from Jesmond Road onto the southbound carriageway of the Newcastle Central Motorway	6	4	2	0	0	0	0	0	0
26	Pilgrim Street roundabout – approaching from the Central Motorway and taking the 3rd (Mosley St) exit	19	2	14	0	1	0	2	0	0
27	Mosley Street/St Nicholas lights controlled junction	25	1	0	3	21	0	0	0	0
28	Traffic lights controlled junction beside Gateshead Old Town Hall	5	1	3	0	1	0	0	0	0
29	Askew Road dual carriageway	0	0	0	0	0	0	0	0	0
30	Cuthbert Street roundabout	2	0	2	0	0	0	0	0	0
31	Bensham Road roundabout	5	0	4	0	1	0	0	0	0
32	Lights controlled T-junction of Saltwell Road onto Bensham Road	13	0	10	1	2	0	0	0	0
33	Dunsmuir Grove	0	0	0	0	0	0	0	0	0
34	Staggered junction of Dunsmuir Grove onto Rectory Road and into Westfield Road	4	0	0	0	4	0	0	0	0
35	Crossroads junction of Westfield Road and Westbourne Avenue	3	0	0	0	2	1	0	0	0
36	Staggered junction between Westfield Terrace and Shipcote Lane, crossing Alexandra Road	5	1	0	0	4	0	0	0	0
37	Traffic lights controlled crossroads between Old Durham Road, Shipcote Lane and Split Crow Rd	7	0	2	1	4	0	0	0	0
38	Split Crow Road (stretch between Deckham Terrace and Teviot Street)	1	0	0	0	1	0	0	0	0
39	Y-junction formed by Hendon Road joining Split Crow Road	3	1	0	1	1	0	0	0	0
40	Zebra crossing on Crowhall Lane, outside the Felling shopping precinct	2	0	0	0	2	0	0	0	0
41	Watermill Lane stretch	2	0	0	1	1	0	0	0	0
42	High Lanes stretch in front of Heworth Grange Comprehensive School	3	0	1	0	2	0	0	0	0
43	Turning left from Grange Road, merging with Felling bypass traffic	1	1	0	0	0	0	0	0	0
44	Heworth roundabout	16	1	11	0	1	1	2	0	0

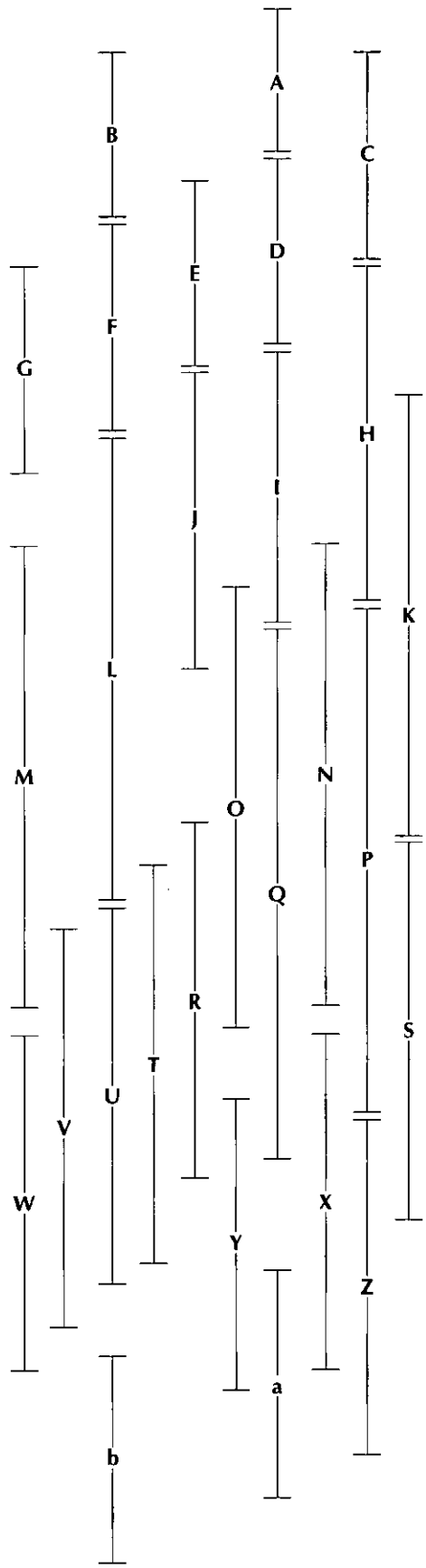
Appendix H1 – Cumulative accidents for four years ending Dec 1990 (continued)

	Location	Total	A1	A2	B1	B2	C1	C2	D1	D2
45	Traffic lights controlled Y-junction of feeder road from Stoneygate Lane onto the westbound carriageway of the Felling bypass	0	0	0	0	0	0	0	0	0
46	Traffic lights controlled crossroads on the Felling Bypass at the junction with Green Lane and Hepburn Gardens	12	3	6	1	2	0	0	0	0
47	Speed warning sign on the Felling bypass at the minor junction with Eastwood Gardens	1	0	0	0	1	0	0	0	0
48	Park Lane left bend and junction with Albany Road	6	3	2	0	1	0	0	0	0
49	Hamburger junction	13	8	5	0	0	0	0	0	0
50	Tyne Bridge stretch	9	1	8	0	0	0	0	0	0
51	Newcastle Central Motorway, travelling north and passing the merging lane from the New Bridge St roundabout	3	2	1	0	0	0	0	0	0
126	Pilgrim Street roundabout (approaching from Central Motorway and turning right into Pilgrim St)	19	2	14	0	1	0	2	0	0
127	Lights controlled pedestrian crossing at the bend of Market Street into Grainger Street	3	0	0	0	3	0	0	0	0
128	Neville Street one-way stretch outside the Newcastle Central Station portcullis (including the lights controlled pedestrian crossing)	26	0	0	25	1	0	0	0	0
129	Right turn at the traffic lights at the junction of Westmorland Road and Blenheim Street	17	1	6	3	7	0	0	0	0
130	Left turn from Blenheim Street into Westgate Road at the lights controlled crossroads	5	0	3	0	1	0	0	0	1
131	Westgate Road stretch	2	1	1	0	0	0	0	0	0
132	Westgate Road junction with Elswick Row	5	1	1	3	0	0	0	0	0
133	Zebra crossing outside Westgate Hill School, on Westgate Road	10	3	0	6	1	0	0	0	0
134	Westgate Road, passing the hospital entrance, lights controlled pedestrian crossing and turning left into Grainger Park Road	17	2	5	6	3	0	1	0	0

Appendix H1 – Cumulative accidents for four years ending Dec 1990 (continued)

Location		Total	A1	A2	B1	B2	C1	C2	D1	D2
135	Western Avenue stretch	0	0	0	0	0	0	0	0	0
136	Crossing the Ladykirk Road junction with Wellfield Road	1	0	0	0	1	0	0	0	0
137	Stretch along Ellesmere Road	0	0	0	0	0	0	0	0	0
138	Crossing the Strathmore Crescent junction with Glebe Street	0	0	0	0	0	0	0	0	0
139	Lights controlled T-junction of Condercum Road onto West Road	5	0	2	2	1	0	0	0	0
140	West Road shopping area, including lights controlled pedestrian crossing	7	1	0	3	3	0	0	0	0
141	Wingrove roundabout: left turn from Westgate Road into Wingrove Road	20	0	18	0	0	0	2	0	0
142	Cross-roads junction of Hadrian Road with Wingrove Road	4	0	1	1	2	0	0	0	0
143	Nuns Moor Road bend	5	4	0	1	0	0	0	0	0
144	Lights controlled crossroads between Hunter's Grove and Barrack Road	17	3	6	0	0	1	7	0	0
145	Hunter's Road left bend	2	0	0	1	1	0	0	0	0
146	Richardson Road stretch, passing the minor crossroads with Morpeth Street	0	0	0	0	0	0	0	0	0
147	Left turn at the junction between Richardson Road and Queen Victoria Road	1	0	1	0	0	0	0	0	0

Appendix H2 – Locations in order of MSR ratings – grouped by Tukey analysis (Groups indicated by arbitrary lettering)



MSR rating	No. of drivers	Location
1.28	203	14
1.13	202	24
0.96	204	3
0.95	203	12
0.92	203	5
0.91	202	25
0.88	102	126
0.84	100	44
0.80	98	26
0.79	203	16
0.71	204	19
0.66	204	13
0.46	100	51
0.46	100	28
0.45	98	36
0.44	99	49
0.39	202	22
0.37	100	31
0.31	204	4
0.30	104	129
0.25	102	133
0.25	100	43
0.24	97	35
0.23	99	34
0.17	201	10
0.15	204	21
0.10	201	8
0.09	103	138
0.00	103	139
–0.03	102	134
–0.03	101	127
–0.05	105	147
–0.05	200	7
–0.06	103	128
–0.08	98	50
–0.08	99	48
–0.09	100	45
–0.09	96	27
–0.11	100	130
–0.12	102	140
–0.15	100	40
–0.16	203	20
–0.20	100	37
–0.21	203	1
–0.21	105	144
–0.22	104	145
–0.26	102	131
–0.32	100	33
–0.33	103	141
–0.34	201	6
–0.34	101	136
–0.38	104	143
–0.42	100	46
–0.43	203	17
–0.52	104	142
–0.52	204	2
–0.53	103	137
–0.54	95	47
–0.56	202	9
–0.59	102	132
–0.61	201	23
–0.62	100	32
–0.70	96	30
–0.74	204	11
–0.79	99	38
–0.80	99	39
–0.80	203	15
–0.82	100	42
–0.99	100	41
–1.00	104	146
–1.14	204	18
–1.15	104	135
–1.15	99	29

Appendix H3 – Mean judgements of location attributes

Definitions: *(a) Lights (traffic) or crossing; (b) Competing traffic flow or lane usage; (c) Competing pedestrian activity; (d) Reduced sight distance; (e) Atypical road dynamic*

	Location	(a)	(b)	(c)	(d)	(e)
1	Barras Bridge roundabout	0	3.25	0.75	1.75	0.25
2	Forsyth Road	1	0.75	1.00	0.00	0.25
3	Blue House roundabout	0	4.50	0.75	0.25	0.00
4	Gosforth High Street	1	2.75	4.00	2.00	0.00
5	Lights controlled T-junction of Church Road onto Gosforth High Street	1	3.50	2.25	1.25	1.00
6	Left turn from Church Road into Hyde Terrace	0	0.50	0.75	0.50	0.00
7	Left turn from Christon Road into Beaumont Terrace	0	0.25	1.00	2.00	0.00
8	Left turn into Christon Road at T-Junction of Wolverton Terrace with Christon Road	0	0.75	1.00	3.00	0.00
9	Travelling west along Christon Road, passing Gosforth Middle School	0	0.50	2.00	0.50	0.00
10	Right turn at the 'Asda' roundabout outside the Regent Centre Metro Station on the Great North Rd	0	2.50	1.00	0.50	0.00
11	Hollywood Avenue	0	0.75	1.25	1.25	0.00
12	Salters Bridge	0	3.50	0.50	4.00	1.50
13	Turning right at the T-junction from the roadway leading from Salters Bridge into Salters Lane	0	4.50	0.75	1.00	0.00
14	South Gosforth double roundabout	1	4.50	1.75	1.00	3.50
15	Stretch of Haddricks Mill Lane from the public house on east side to the T-junction with Dene Cres. on west side	0	0.50	0.25	0.00	0.00
16	Castle Farm Bridge	0	3.00	0.50	3.25	1.50
17	Freeman Road	0	1.50	2.00	0.50	0.00
18	Dovedale Gardens	0	0.50	0.75	0.00	0.00
19	Right turn at the junction between Dovedale Gardens and Benton Road	1	3.50	1.50	0.50	0.00
20	Crossing the roundabout on the Benton Road/Etherstone Avenue junction	0	1.75	0.50	0.50	0.00
21	The Corner House traffic lights controlled junction	1	2.25	2.00	0.50	0.50
22	Jesmond Road (Cradlewell)	1	2.75	3.00	2.25	0.25
23	Sandyford Road	0	1.00	0.50	0.25	0.00
24	Jesmond double roundabout	1	4.00	2.25	1.75	2.75
25	Merging from Jesmond Road onto the southbound carriageway of the Newcastle Central Motorway	0	3.75	0.00	1.25	1.75
26	Pilgrim Street roundabout – approaching from the Central Motorway and taking the 3rd (Mosley St) exit	1	2.75	0.25	1.25	1.50
27	Mosley Street/St Nicholas lights controlled junction	1	1.75	2.25	1.00	0.50

Appendix H3 – Mean judgements of location attributes (continued)

Location		(a)	(b)	(c)	(d)	(e)
28	Traffic lights controlled junction beside Gateshead Old Town Hall	1	2.25	0.75	0.75	0.50
29	Askew Road dual carriageway	0	0.75	0.25	0.00	0.00
30	Cuthbert Street roundabout	0	1.50	0.50	0.50	0.00
31	Bensham Road roundabout	0	3.00	0.50	0.75	1.00
32	Lights controlled T-junction of Saltwell Road onto Bensham Road	1	1.75	1.25	1.00	0.00
33	Dunsmuir Grove	0	1.00	1.00	1.25	0.00
34	Staggered junction of Dunsmuir Grove onto Rectory Road and into Westfield Road	0	2.25	1.75	2.00	0.25
35	Crossroads junction of Westfield Road and Westbourne Avenue	0	1.75	1.25	2.75	0.50
36	Staggered junction between Westfield Terrace and Shipcote Lane, crossing Alexandra Road	0	2.75	1.25	2.75	0.25
37	Traffic lights controlled crossroads between Old Durham Road, Shipcote Lane and Split Crow Rd	1	1.75	1.00	0.50	0.00
38	Split Crow Road (stretch between Deckham Terrace and Teviot Street)	0	0.75	0.75	0.50	0.00
39	Y-junction formed by Hendon Road joining Split Crow Road	0	0.50	0.75	0.00	0.00
40	Zebra crossing on Crowhall Lane, outside the Felling shopping precinct	1	1.50	3.25	0.25	0.00
41	Watermill Lane stretch	0	0.25	0.50	0.00	0.00
42	High Lanes stretch in front of Heworth Grange Comprehensive School	0	0.50	1.75	0.50	0.00
43	Turning left from Grange Road, merging with Felling bypass traffic	0	3.50	0.00	0.25	1.00
44	Heworth roundabout	0	4.00	0.25	0.50	0.25
45	Traffic lights controlled Y-junction of feeder road from Stoneygate Lane onto the westbound carriageway of the Felling bypass	1	1.25	0.00	0.25	0.75
46	Traffic lights controlled crossroads on the Felling bypass at the junction with Green Lane and Hepburn Gardens	1	2.25	1.00	0.25	0.00
47	Speed warning sign on the Felling bypass at the minor junction with Eastwood Gardens	0	1.00	0.25	0.00	0.25
48	Park Lane left bend and junction with Albany Road	0	1.75	0.25	2.50	0.00
49	Hamburger junction	1	2.75	0.75	0.75	2.25
50	Tyne Bridge stretch	0	1.75	0.00	0.00	0.00
51	Newcastle Central Motorway, travelling north and passing the merging lane from the New Bridge St roundabout	0	1.75	0.00	1.25	2.00

Appendix H3 – Mean judgements of location attributes (continued)

Location		(a)	(b)	(c)	(d)	(e)
126	Pilgrim Street roundabout (approaching from Central Motorway and turning right into Pilgrim St)	1	3.00	0.25	1.25	1.50
127	Lights controlled pedestrian crossing at the bend of Market Street into Grainger Street	1	1.50	3.50	1.25	0.00
128	Neville Street one-way stretch outside the Newcastle Central Station portcullis (including the lights controlled pedestrian crossing)	1	2.50	4.00	0.75	1.00
129	Right turn at the traffic lights at the junction of Westmorland Road and Blenheim Street	1	2.75	1.25	0.75	0.25
130	Left turn from Blenheim Street into Westgate Road at the lights controlled crossroads	1	1.50	1.50	1.75	0.25
131	Westgate Road stretch	0	1.50	2.00	0.50	0.00
132	Westgate Road junction with Elswick Row	0	1.50	0.75	0.25	0.00
133	Zebra crossing outside Westgate Hill School, on Westgate Road	1	1.50	3.00	0.25	0.00
134	Westgate Road, passing the hospital entrance, lights controlled pedestrian crossing and turning left into Grainger Park Road	1	1.50	2.50	0.25	0.00
135	Western Avenue stretch	0	0.50	0.25	0.75	0.00
136	Crossing the Ladykirk Road junction with Wellfield Road	0	1.50	1.25	2.75	0.25
137	Stretch along Ellesmere Road	0	0.75	0.75	0.75	0.50
138	Crossing the Strathmore Crescent junction with Glebe Street	0	1.75	1.00	2.50	0.00
139	Lights controlled T-junction of Condercum Road onto West Road	1	1.75	1.50	1.25	0.00
140	West Road shopping area, including lights controlled pedestrian crossing	1	2.00	3.00	1.25	0.00
141	Wingrove roundabout: left turn from Westgate Road into Wingrove Road	0	1.75	0.75	0.75	0.00
142	Cross-roads junction of Hadrian Road with Wingrove Road	0	1.00	0.75	0.25	0.00
143	Nuns Moor Road bend	0	1.25	0.25	2.25	0.25
144	Lights controlled crossroads between Hunter's Grove and Barrack Road	1	1.75	0.50	0.25	0.75
145	Hunter's Road left bend	0	0.75	1.00	2.00	0.00
146	Richardson Road stretch, passing the minor crossroads with Morpeth Street	0	0.50	0.00	0.25	0.00
147	Left turn at the junction between Richardson Road and Queen Victoria Road	0	2.50	0.75	1.50	0.25

Appendix I – Technical annexes

The following items have been produced to provide comprehensive supporting detail to this report. These are available under a separate cover.

TECHNICAL ANNEX 1: Literature Survey.

TECHNICAL ANNEX 2: Description of Locations Assessed on the Drive Route.

TECHNICAL ANNEX 3: Large Group Test Facility (technical description).

TECHNICAL ANNEX 4: Data Field Descriptions and Raw Data Files (on 3.5" floppy discs) related to the research.

The above are available through Mike Boyle, AA Foundation for Road Safety Research, Fanum House, Basingstoke, Hampshire, RG21 2EA.
Telephone 0256 492196, International +44 256 492196.
Facsimile 0256 492092, International +44 256 492092.

12 Acknowledgments

We would like to thank all those who contributed to the project:–

The people of Tyneside who gave up their time generously to participate in one or more phases of the work;

Those who helped us collect, code and analyse the data –
Alex Carmichael, Melissa Carthy, Jaimie Dibden, Guy Dodgson, Beverley Gibson, Fiona Hills, Ian Kinnair, Mike Johnson, Tamara Silcock, Paula Stopford, Emma Watson, Diane Westwood, Pam Woolner and The North East Age Research Team – their enthusiasm and good humour was invaluable;

Lynda Morgan for her secretarial assistance;

Alison Teasdale, a member of the team in the early months, whose careful design and planning stood the project in good stead;

Those who offered advice on the drive route, the Traffic and Accident Data Unit, Gateshead Metropolitan Borough Council, and the Northumbria Police;

Dr Anthony Downing and John Paisley for their assistance in operating the Multiple Test Facility for the video procedures;

Dr John Lazarus for readily sharing his considerable knowledge of the animal behaviour literature;

Professor Peter Hills for his continued interest and guidance throughout;

Dr Ivan Brown of the MRC Applied Psychology Unit, Cambridge, for copyright release (Figure VI.1);

Mike Boyle and Brian Langer of the AA Foundation for Road Safety Research for smoothing the administrative path from inception to completion and especially the Foundation's Technical Advisor, Barbara Sabey, whose advice and encouragement at all stages improved the study considerably.

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